

CRITERIA

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**(Proceedings of BoS and
Study Scheme)**

Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department

Minutes of Meeting

No. CE-293

Dated: 10/12/2016

The 6th meeting of Board of Studies (Civil Engineering) was held on 10th December, 2016 in the office of Head of Department, Civil department and chaired by Dr. K S Gill (Professor & Head).

Following members were present in the meeting:

- Dr. K S Gill- Chairman - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harpal Singh - Member - Guru Nanak Dev Engineering College, Ludhiana,
- Dr. H S Rai -Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. B S Walia -Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harvinder Singh - Member - Guru Nanak Dev Engineering College, Ludhiana
- Er. Inderpreet Kaur - Member - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Sanjeev Aggarwal - Member- GZSPTU Campus, Bathinda - Subject Expert- VC Nominee
- Er. J K Sharma - Special Invitee - Former Manager in L & T
- Er. Harjinder Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Gurdeepak Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Prashant Garg - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Rupinder Singh Litt- Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Charnjeet Singh- Special Invitee- Guru Nanak Dev Engineering College, Ludhiana

The Following decisions were taken against the Agenda items:

1. The BOS approved the proposal of four departmental elective and one open elective in UG Batch 2014 & onwards as departmental elective -I (Practical subject of 01 credit) in fifth semester, departmental elective-II (theory Subject of 04 credits) in sixth semester, departmental elective -III & IV (theory subjects of 04 credits each) in



seventh/eighth semester and open elective (theory subject of 03 credits) in sixth semester.

2. The BOS approved the nomenclature of departmental elective and open elective as DECE-14XXX & OECE-146XX respectively in UG Batch 2014 & onwards.
3. The BOS has approved the Minor project of 01 hour duration (01 credit) in sixth semester having total marks as 50 (30 marks as internal and 20 marks as external) in UG Batch 2014 & onwards.
4. Department has merged the two lab subjects (Computer Aided Structural Drawing-I of fifth semester and Computer Aided Structural Drawing-II of sixth semester) depending upon their syllabus content as one subject named as Computer Aided Structural Drawing & Detailing and float in fifth semester in UG Batch 2014 & onwards. The same has been approved by BOS.
5. The BOS suggested and approved the name of "Industrial Training - I" offered in fifth semester as "Industrial Training - I (Survey Camp)" for UG Batch 2014 & onwards.
6. The BOS suggested and approved the nomenclature of subject code Industrial Training - I and Industrial Training - II as TRCE-14501 & TRCE-14701 from TR-14501 and TR14701 for UG Batch 2014 & onwards.
7. The BOS suggested and approved to merge the Industry oriented program (01 credit) and Industrial Training part (14 credits) as Industrial Training- II (with 15 credits) offered in 7th /8th semester for UG Batch 2014 and onwards.
8. The BOS approved the total credit distribution of the UG Batch 2014 & onwards after incorporating the amendments as:

Year	Credits
First	54
Second	54
Third	55
Forth	43
Total Credits	206

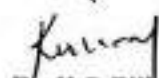
9. The allocation of credits has been discussed and the some changes has been approved for the following subjects for UG Batch 2014 & onwards:

S No	Sem	Course Code	Course Name	Previous Credits	Purposed Credits
1	3 rd	TR-14301	Workshop Training	00	02
2	4 th	CE-14401	Geomatics Engineering	04	03

3	4 th	CE-14402	Construction Machinery & Works Management	04	03
4	4 th	CE-14403	Design of Concrete Structures- I	05	04
5	4 th	GF-14401	General Fitness	00	01
6	5 th	TRCE-14501	Industrial Training-I (Survey Camp)	04	02
7	5 th	DECE-145XX	Departmental Elective-I	00	01
8	6 th	CE-14601	Design of Concrete Structures- II	05	04
9	6 th	DECE-146XX	Departmental Elective-II	00	04
10	6 th	OECE-146XX	Open Elective	04	03
11	6 th	GF-14601	General Fitness	00	01
12	7 th /8 th	TRCE-14701	Industrial Training-II	20	15
13	7 th /8 th	CE-14801	Design of Steel Structures-II	05	04
14	7 th /8 th	DECE-148XX	Departmental Elective-III	03	04
15	7 th /8 th	DECE-148YY	Departmental Elective-IV	03	04
16	7 th /8 th	CE-14819	Major Project	04	03
17	7 th /8 th	GF-14701	General Fitness	00	01

10. The BoS approved the Study scheme and syllabus content of UG Batch 2014 & onwards as proposed.
11. The BOS has given the flexibility to chairman (BOS) to introduce new departmental electives in UG Batch 2014 & onwards as per demand and feedback from stakeholders.
12. The BOS approved the credits of pre-thesis seminar and pre-thesis project of PG Batch 2014 & 2016 onwards as 02 and 03 from previous credits of 04 & 04 respectively.
13. The BOS approved the total marks of pre-thesis seminar as 100 (internal only).
14. The total credits of PG course as 65 have been approved by BOS.
15. The BOS approved the Study Scheme and syllabus content of PG Batch 2016 & onwards for all different courses as proposed.
16. The BOS also approved the Program Outcomes and Course Outcomes for UG Batch 2014 and PG Batch 2014 & 2016 onwards.
17. The BOS approved the list of examiners for UG and PG courses as proposed.

The meeting ended with vote of thanks.


Dr. K S Gill
(Chairman)



Study Scheme of B.Tech (Civil Engineering)- Batch 2014 & Onward

Year	Credits
First	54
Second	54
Third	52
Forth	45
Total Credits	205

Third Semester							Contact Hours: 31 Hrs	
Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
CE-14301*	Engineering Mathematics-III	3	1	-	40	60	100	4
CE-14302	Fluid Mechanics-I	3	1	-	40	60	100	4
CE-14303	Rock Mechanics & Engineering Geology	3	1	-	40	60	100	4
CE-14304	Strength of Materials	3	1	-	40	60	100	4
CE-14305	Surveying	3	1	-	40	60	100	4
CE-14306	Building Materials & Construction	3	0	-	40	60	100	3
CE-14307	Fluid Mechanics-I Lab	-	-	2	30	20	50	1
CE-14308	Strength of Materials Lab	-	-	2	30	20	50	1
CE-14309	Surveying Lab	-	-	3	30	20	50	2
TR-14301	Workshop Training	-	-	-	30	20	50	2
Mentoring Class		-	1	-	-	-	-	-
Total		18	06	07	360	440	800	29

* This subject shall be taught by the faculty of Applied Science Department.

Fourth Semester					Contact Hours: 27 Hrs			
Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
CE-14401	Geomatics Engineering	3	-	-	40	60	100	3
CE-14402	Construction Machinery & Works Management	3	-	-	40	60	100	3
CE-14403	Design of Concrete Structures– I	3	1	-	40	60	100	4
CE-14404	Fluid Mechanics-II	3	1	-	40	60	100	4
CE-14405	Irrigation Engineering-I	3	1	-	40	60	100	4
CE-14406	Structural Analysis-I	3	1	-	40	60	100	4
CE-14407	Concrete Technology Lab	-	-	2	30	20	50	1
CE-14408	Structural Analysis Lab	-	-	2	30	20	50	1
GF-14401	General Fitness				100	-	100	1
	Mentoring Class	-	1	-	-	-	-	-
Total		18	05	04	400	400	800	25

Fifth Semester					Contact Hours: 27 Hrs			
Course Code	Course Name	L	T	P	Internal	External	Total	Credits
CE-14501	Design of Steel Structures-I	3	1	-	40	60	100	4
CE-14502	Geotechnical Engineering	3	1	-	40	60	100	4
CE-14503	Structural Analysis - II	3	1	-	40	60	100	4
CE-14504	Transportation Engineering-I	3	1	-	40	60	100	4
CE-14505	Environmental Engineering-I	3	1	-	40	60	100	4
CE-14506	Transportation Engineering Lab	-	-	2	30	20	50	1
CE-14507	Environmental Engineering Lab	-	-	2	30	20	50	1
DECE-145XX	Departmental Elective – I	-	-	2	30	20	50	1
TRCE-14501	Industrial Training – I (Survey Camp)				60	40	100	2
	Mentoring Class	-	1	-	-	-	-	-
Total		15	06	06	350	400	750	25

Departmental Elective –I

S No	Course Code	Course Name
1	DECE-14508	Computer Aided Structural Drawing & Detailing
2	DECE-14509	Computer Aided Structural Analysis & Design
3	DECE-14510	Building Information Modeling

Sixth Semester					Contact Hours: 29 Hrs			
Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
CE-14601	Design of Concrete Structures-II	3	1	-	40	60	100	4
CE-14602	Foundation Engineering	3	1	-	40	60	100	4
CE-14603	Professional Practice	3	1	-	40	60	100	4
CE-14604	Environmental Engineering – II	3	1	-	40	60	100	4
DECE-146XX	Departmental Elective –II	3	1	-	40	60	100	4
OEXX-146YY	Open Elective*	3	-	-	40	60	100	3
CE-14609	Geotechnical Engineering Lab	-	-	2	30	20	50	1
CE-14610	Computer Aided Analysis & Design	-	-	2	30	20	50	1
PRCE-14601	Minor Project	-	-	1	60	40	100	1
GF-14601	General Fitness	-	-	-	100	-	100	1
	Mentoring Class	-	1	-	-	-	-	-
Total		18	06	05	460	440	900	27

List of Departmental Elective – II (6th Semester)

S No	Course Code	Course name
1	DECE-14605	Numerical Methods in Civil Engineering
2	DECE-14606	Finite Elements Methods
3	DECE-14607	Reinforced Earth and Geotextiles
4	DECE-14608	Infrastructure Development and Management

List of Open Electives (6th Semester)*

S No	Course Code	Course Name
1	OECE-14601	Building Maintenance & Safety
2	OECE-14602	Project Monitoring & Management

*(The students of Civil Engineering Department will select any one subject floated by the other department as their open elective subject other than their parent department.)

Seventh/Eighth Semester

Course Code	Course Name	Mark Distribution		Total Marks	Credits
		Internal	External		
TRCE-14701	Industrial Training – II	450	350	800	13
TRCE-14702	Industry Oriented Program	200	-	200	02
Total		650	350	1000	15

Seventh/Eighth Semester							Contact Hours: 30 Hrs	
Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
CE-14801	Design of Steel Structures-II	3	1	-	40	60	100	4
CE-14802	Elements of Earthquake Engineering	3	1	-	40	60	100	4
CE-14803	Irrigation Engineering-II	3	1	-	40	60	100	4
CE-14804	Transportation Engineering-II	3	1	-	40	60	100	4
CE-14805	Seminar	-	-	2	50	-	50	2
DECE-148XX	Departmental Elective–III*	3	1	-	40	60	100	4
DECE-148YY	Departmental Elective- IV*	3	1	-	40	60	100	4
PRCE-14701	Major Project	-	-	3	120	80	200	3
GF-14701	General Fitness	-	-	-	100	-	100	1
	Mentoring Class	-	1	-	-	-	-	-
Total		18	07	05	510	440	950	30

** Departmental Elective III and IV should not be from the same group.*

List of Departmental Elective – III (7th/8th Semester)		
S No	Course Code	Course name
1	DECE-14806	Dynamics of Structures
2	DECE-14807	Advanced Reinforced Concrete Design
3	DECE-14808	Pre-stressed Concrete
4	DECE-14809	Pavement Design
5	DECE-14810	Traffic Engineering
6	DECE-14811	Bridge Engineering
7	DECE-14812	Matrix methods of Structural Analysis
List of Departmental Elective – IV (7th/8th Semester)		
S No	Course Code	Course Name
1	DECE-14815	Ground Improvement Techniques
2	DECE-14816	Soil Dynamics and Machine Foundation
3	DECE-14817	Earth and Earth Retaining Structures
4	DECE-14818	Advanced Environmental Engineering
5	DECE-14819	Environmental Impact Assessment
6	DECE-14820	Flood Control and River Engineering
7	DECE-14821	Hydrology and Dams
8	DECE-14822	Disaster Management

Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department

Minutes of Meeting

No CE-3904/A

Dated: 04/08/2017

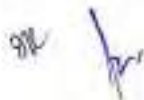
The 7th meeting of Board of Studies (Civil Engineering) was held on 04 August, 2017 in the office of Head of Department, Civil department and chaired by Dr. K S Gill (Professor & Head).

Following members were present in the meeting:

- Dr. K S Gill- Chairman - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harpal Singh - Member - Guru Nanak Dev Engineering College, Ludhiana,
- Dr. H S Rai -Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. B S Walia -Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harvinder Singh - Member - Guru Nanak Dev Engineering College, Ludhiana
- Er. Inderpreet Kaur - Member - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Gurdeepak Singh - Member- Guru Nanak Dev Engineering College, Ludhiana
- Er. Prashant Garg - Member - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Sanjeev Aggarwal - Member- GZSPTU Campus, Bathinda
- Dr. N K Khullar - Member - PAU, Ludhiana
- Dr. Rajiv Chauhan - Member - IKG PTU Campus, Kapurthala
- Er. Rupinder Singh Litt- Special Invitee- Guru Nanak Dev Engineering College, Ludhiana

The Following decisions were taken against the Agenda items:

1. Department has proposed a new subject 'Seminar' in 7th/8th semester in UG program having internal marks 50 and 02 credits only and same has been accepted with suggestions of framing report format of seminar.
2. Credits of Irrigation Engineering-II, Design of Steel Structures-II (7th/8th semester), Design of Concrete Structures-II (6th semester) have been changed from 5 to 4 credits. It was accepted.





3. As per the NBA guidelines, department has proposed new Program Education Objectives (PEO), Program Specific Objectives (PSO), Program Outcomes (PO) and Course Outcomes (CO) for UG program and these have been approved.
4. Department proposes the syllabus of program elective subject 'Environmental Systems Engineering (MTEV-16601)' of M.Tech "Environmental Science and Engineering" and same has been approved

The meeting ended with vote of thanks.

Dr. K S Gill
(Chairman)

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Study Scheme 2018

Third Semester										
Category	Subject Code	Course Title	Subject Type (Theory/ Practical)	Hours per week			Marks Distribution			
				L	T	P	Int	Ext	Total	
Professional Core courses	PCCE-101	Surveying & Geomatics	Theory	3	1	0	40	60	100	4
Professional Core courses	PCCE-102	Solid Mechanics	Theory	3	0	0	40	60	100	3
Professional Core courses	PCCE-103	Fluid Mechanics	Theory	3	0	0	40	60	100	3
Professional Core courses	PCCE-104	Disaster Preparedness & Planning	Theory	3	0	0	40	60	100	3
Engineering Science Course	ESCE-101	Basic Electronics & applications in Civil Engineering	Theory	3	0	0	40	60	100	3
Humanities and Social Sciences including Management	HSMCE-101	Civil Engineering-Introduction, Societal & Global Impact	Theory	3	0	0	40	60	100	3
Professional Core courses	LPCCE-101	Surveying & Geomatics Laboratory	Practical	0	0	2	30	20	50	1
Professional Core courses	LPCCE-102	Fluid Mechanics Laboratory	Practical	0	0	2	30	20	50	1
Professional Core courses	LPCCE-103	Solid Mechanics Laboratory	Practical	0	0	2	30	20	50	1
Project/Training	TR-101	Training - I	Practical	-	-	-	60	40	100	1
Mandatory course		Mentoring and Professional Development	Practical	0	0	1		-	-	0
		26		18	1	7	390	460	850	23
Fourth Semester										
Category	Subject Code	Course Title	Subject Type (Theory/ Practical)	Hours Per Week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	

			Practical)							
Professional Core courses	PCCE-105	Concrete Technology	Theory	3	0	0	40	60	100	3
Professional Core courses	PCCE-106	Material, Testing & Evaluation	Theory	4	0	0	40	60	100	4
Professional Core courses	PCCE-107	Hydrology & Water Resources Engineering	Theory	3	1	0	40	60	100	4
Professional Core courses	PCCE-108	Transportation Engineering	Theory	3	1	0	40	60	100	4
Basic Science Course	BSCE-101	Mathematics-III	Theory	3	0	0	40	60	100	3
Professional Core courses	LPCCE-104	Concrete Testing Laboratory	Practical	0	0	2	30	20	50	1
Professional Core courses	LPCCE-105	Transportation Laboratory	Practical	0	0	2	30	20	50	1
Project	PRCE-101	Seminar and Technical Report Writing	Practical	0	0	2	50	-	50	1
Mandatory Courses (Non-credit)	MCCE-101	Environment Science	Theory	2	0	0	50	-	50	0
Mandatory Courses	MPD-102	Mentoring and Professional Development	Practical	0	0	1	100	-	100	1
		27		18	2	7	460	340	800	22

*4 weeks Industrial/Institutional training for which viva will be conducted along End semester exam of Fifth semester.

Fifth Semester

Category	Subject Code	Course Title	Subject Type (Theory/Practical)	Hours Per Week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Professional Core courses	PCCE-109	Engineering Geology	Theory	3	0	0	40	60	100	3
Professional Core courses	PCCE-110	Engineering Economics, Estimation and Costing	Theory	3	1	0	40	60	100	4
Professional Core courses	PCCE-111	Construction Engineering & Management	Theory	3	0	0	40	60	100	3

Professional Core courses	PCCE-112	Environmental Engineering	Theory	4	0	0	40	60	100	4
Professional Core courses	PCCE-113	Structural Engineering	Theory	3	1	0	40	60	100	4
Professional Core courses	PCCE-114	Geotechnical Engineering	Theory	3	0	0	40	60	100	3
Professional Core courses	LPCCE-106	Geotechnical Laboratory	Practical	0	0	2	30	20	50	1
Professional Core courses	LPCCE-107	Environmental Engineering Laboratory	Practical	0	0	2	30	20	50	1
Professional Core courses	LPCCE-108	Structural Laboratory	Practical	0	0	2	30	20	50	1
Training	TR-102	Training - II*	Practical	-	-	-	60	40	100	1
Mandatory Course		Mentoring and Professional Development	Practical	0	0	1	-	-		0
		28		19	2	7	390	460	850	25

Sixth Semester

Category	Subject Code	Course Title	Subject Type (Theory/ Practical)	Hours Per Week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Professional Core courses	PCCE-115	Elements of Earthquake Engineering	Theory	3	0	0	40	60	100	3
Professional Core courses	PCCE-116	Building Construction Practice	Theory	3	0	0	40	60	100	3
Professional Elective courses	PECE-XXX	Elective – I	Theory	3	1	0	40	60	100	4
Professional Elective courses	PECE-XXX	Elective – II	Theory	3	1	0	40	60	100	4
Professional Core courses	LPCCE-109	CAD Laboratory	Practical	0	0	2	30	20	50	1
Professional Core courses	LPCCE-110	BIM Laboratory	Practical	0	0	2	30	20	50	1
Open Elective courses	OEZZ-XXX	Open Elective – I	Theory	3	0	0	40	60	100	3
Project	PRCE-102	Minor Project (Estimation & costing)	Practical	0	0	4	60	40	100	2

Mandatory Courses (Non-credit)	MCI-102	Constitution of India	Theory	2	0	0	50	-	50	0
Mandatory Course	MPD-103	Mentoring and Professional Development	Practical	0	0	1	100	-	100	1
		28		17	2	9	470	380	850	22
#6 weeks Industrial/Institutional training for which viva will be conducted along End semester exam of Seventh semester.										
Seventh Semester										
Category	Subject Code	Course Title	Subject Type (Theory/ Practical)	Hours Per Week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Professional Elective courses	PECE-XXX	Elective – III	Theory	3	1	0	40	60	100	4
Professional Elective courses	PECE-XXX	Elective – IV	Theory	3	1	0	40	60	100	4
Open Elective courses	OEZZ-XXX	Open Elective – II	Theory	3	0	0	40	60	100	3
Project	PRCE-103	Project -I (Project work / internship in industry or at appropriate work place)	Practical	0	0	6	120	80	200	3
Training	TR-103	Training - III [#]	Practical	-	-	-	100	50	100	2
Mandatory Courses (Non-credit)	MCI-103	Management- I (Organizational Behavior)	Theory	2	0	0	50	-	50	0
Mandatory Course		Mentoring and Professional Development	Practical	0	0	1		-		0
		20		11	2	7	390	310	700	16
Eighth Semester										
Category	Subject Code	Course Title	Subject Type (Theory/ Practical)	Hours Per Week			Marks			Credits
				L	T	P	Int	Ext	Total	
Professional Elective courses	PECE-XXX	Elective – V	Theory	3	1	0	40	60	100	4
Professional Elective courses	PECE-XXX	Elective – VI	Theory	3	1	0	40	60	100	4

Open Elective courses	OEZZ-XXX	Open Elective – III	Theory	3	0	0	40	60	100	3
Project	PRCE-104	Project -II (Project work / internship in industry or at appropriate work place)	Practical	0	0	6	120	80	200	3
Mandatory Course	MPD-104	Mentoring and Professional Development	Practical	0	0	1	100	-	100	1
		18		9	2	7	340	260	600	15

* Industrial /Institutional Training will be imparted at the end of 2nd semester in the institute or students can go to industry for four weeks.

There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

Guru Nanak Dev Engineering College, Ludhiana
Department of Computer Science & Engineering

Ref. No.: C.S.E./26/94

Dated: ...13/7/2017

Minutes of 6th meeting of Board of Studies of Computer Science and Engineering Department held on 12.07.2017 at 11:00 am in the Committee Room, GNDEC, Ludhiana.

The following persons were present:

1. Dr. Parminder Singh, Professor & Head, Department of Computer Science and Engineering, GNDEC, Ludhiana (Chairman)
2. Er. Amanpreet Singh Brar, Associate Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
3. Er. Sumeet Kaur Sehra, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
4. Er. Vivek Thapar, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
5. Dr. Gurpreet Singh Lehal, Professor, Department of Computer Science, Punjabi University, Patiala (Member)
6. Dr. Paramjit Singh, Professor, Giani Zail Singh Campus, College of Engineering and Technology, Bathinda (Member)
7. Dr. Shaveta Rani, Professor, Giani Zail Singh Campus, College of Engineering and Technology, Bathinda (External Expert)

The meeting started with welcome address by chairman BOS, and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Dr. Parminder Singh

Er. Amanpreet Singh Brar

Er. Sumeet Kaur Sehra

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Paramjit Singh

Dr. Shaveta Rani

12/7/17

Proceedings:

Agenda Item 1

Approval of change of conduct hours and credits of following courses of 1st year B.Tech. program:

a. Fundamentals of Computer Programming and Information Technology

Lecture: 03 hours, Credit: 03

Tutorial: 01 hour, Credit: 0.5

b. Fundamentals of Computer Programming and Information Technology Lab.

Practical: 02 hour, Credit: 01

Approved

Committee approved the syllabi and authorized Chairman BOS for further changes if required.

The followings suggestions are given

Course Code	Course Name	Suggestions
BTCS-101	FCPIT	• Section wise no. of hours to be mentioned • Revision of syllabus is required
BTCS-102	FCPIT Laboratory	• Revision of contents is required

Agenda Item 2

Approval of changed subject codes of already finalized course scheme of B.Tech. Computer Science and Engineering (Batch 2014 onwards).

Approved

Dr. Parminder Singh

Er. Amanpreet Singh Brar

Er. Sumeet Kaur Sehra

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Paramjit Singh

Dr. Shaveta Rani

12/11/17

B.Tech. Computer Science and Engineering Course Scheme

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
Third Semester								
CS-14301	Mathematics-III	3	1	-	40	60	100	4
CS-14302	Computer Architecture and Organization	3	1	-	40	60	100	4
CS-14303	Digital Circuits and Logic Design	3	1	-	40	60	100	4
CS-14304	Data Structures and Algorithms	3	1	-	40	60	100	4
CS-14305	Object Oriented Programming using C++	3	1	-	40	60	100	4
CS-14306	Digital Circuits and Logic Design Lab	-	-	4	30	20	50	2
CS-14307	Data Structures and Algorithms Lab	-	-	4	30	20	50	2
CS-14308	Object Oriented Programming using C++ Lab	-	-	4	30	20	50	2
TR-14301	Workshop Training*				60	40	100	2
Total		15	5	12	350	400	750	28
		Contact Hours= 32						
Fourth Semester								
CS-14401	Discrete Structures	3	1	-	40	60	100	4
CS-14402	Operating System	3	1	-	40	60	100	4
CS-14403	Computer Networks	3	1	-	40	60	100	4
CS-14404	Microprocessor Architecture and Programming	3	1	-	40	60	100	4
CS-14405	Java Programming	3	1	-	40	60	100	4
CS-14406	Operating Systems Lab	-	-	4	30	20	50	2
CS-14407	Computer Networks Lab	-	-	4	30	20	50	2

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CS-14408	Microprocessor Architecture and Programming Lab	-	-	2	30	20	50	1
CS-14409	Java Programming Lab	-	-	4	30	20	50	2
GF-14401	General Fitness				100	-	100	1
Total		15	5	14	420	380	800	28
		Contact Hours= 34						
Fifth Semester								
CS-14501	Relational Database Management System	3	1	-	40	60	100	4
CS-14502	Computer Graphics	3	1	-	40	60	100	4
CS-14503	Design and Analysis of Algorithms	3	1	-	40	60	100	4
CS-14504	Web Technologies	3	1	-	40	60	100	4
DECS-145xx	Elective-I	3	1	-	40	60	100	4
CS-14511	Relational Database Management System Lab	-	-	4	30	20	50	2
CS-14512	Computer Graphics Lab	-	-	2	30	20	50	1
CS-14513	Design and Analysis of Algorithms Lab	-	-	2	30	20	50	1
CS-14514	Web Technologies Lab	-	-	4	30	20	50	2
TR-14501	Industrial Training-I				60	40	100	2
Total		15	5	12	380	420	800	28
		Contact Hours= 32						
Sixth Semester								
CS-14601	Theory of Computation	3	1	-	40	60	100	4
CS-14602	Advanced Database Systems	3	1	-	40	60	100	4
CS-14603	Software Engineering	3	1	-	40	60	100	4
DECS-146xx	Elective-II	3	1	-	40	60	100	4
OECS-146xx	Open Elective	3	-	-	40	60	100	3

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CS-14610	Advanced Database Systems Lab	-	-	4	30	20	50	2
CS-14611	Software Engineering Lab	-	-	4	30	20	50	2
DECS-146xx	Elective-II Lab	-	-	2	30	20	50	1
PRCS-14601	Minor Project	-	-	1	40	60	100	1
GF-14601	General Fitness				100	-	100	1
Total		15	4	11	390	360	750	26

Contact Hours= 30

Seventh/Eighth Semester

CS-14701	Advanced Computer Networks	3	1	-	40	60	100	4
CS-14702	Compiler Design	3	1	-	40	60	100	4
CS-14703	Cyber Laws and IPR	3	1	-	40	60	100	4
DECS-147xx	Elective-III	3	1	-	40	60	100	4
DECS-147xx	Elective-IV	3	1	-	40	60	100	4
CS-14715	Advanced Computer Networks Lab	-	-	4	30	20	50	2
PRCS-14701	Major Project	-	-	3	120	80	200	3
DECS-147xx	Elective-III Lab	-	-	2	30	20	50	1
GF-14701	General Fitness				100	-	100	1
Total		15	5	09	460	440	900	27

Contact Hours= 29

Seventh/Eighth Semester

TRCS-14701	Industrial Training-II*	-	-	-	450	350	800	13
TRCS-14702	Industry Oriented Training†	-	-	-	-	200	200	02
Total					450	550	1000	15

*Institutional training will be imparted at the end of 2nd semester in the institute for four weeks

† This component will be based on Industrial Training/Institute Department Training/Project Work/Skill Development (Grade-6) Entrepreneurship Training facility created by IKG-PTU, Mohali.

‡ This component will be based on Two Weeks Workshop/Software/Latest Development through Global Initiative of Academic Networks (GIAN).

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List of Electives

Elective-I

DECS-14505 Advanced Computer Architecture

DECS-14506 Cryptography and Network Security

DECS-14507 Wireless Networks

DECS-14508 Ethical Hacking

DECS-14509 Network Protocols

DECS-14510 Embedded Systems

Elective-II

DECS-14604 Simulation and Modelling

DECS-14605 Digital Image Processing

DECS-14606 Artificial Intelligence

DECS-14607 Advanced Java

DECS-14608 .NET Technologies

DECS-14609 Linux Administration

DECS-14613 Simulation and Modelling Lab

DECS-14614 Digital Image Processing Lab

DECS-14615 Artificial Intelligence Lab

DECS-14616 Advanced Java Lab

DECS-14617 .NET Technologies Lab

DECS-14618 Linux Administration Lab

Elective-III

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DECS-14704 Parallel Computing

DECS-14705 Mobile Computing

DECS-14706 Cloud Computing

DECS-14707 Big Data and Business Analytics

DECS-14708 Data Warehouse and Data Mining

DECS-14717 Parallel Computing Lab

DECS-14718 Mobile Computing Lab

DECS-14719 Cloud Computing Lab

DECS-14720 Big Data and Business Analytics Lab

DECS-14721 Data Warehouse and Data Mining Lab

Elective-IV

DECS-14709 Natural Language Processing

DECS-14710 Machine Learning

DECS-14711 Software Testing and Quality Assurance

DECS-14712 Information Security

DECS-14713 Soft Computing

DECS-14714 Agile Software Development

Open Electives

OECS-14601 Software Project Management

OECE-14602 Object Oriented Programming using JAVA

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Agenda Item 3

Finalizing the syllabus of subjects of 7th/8th semester of B.Tech. Computer Science and Engineering (Batch 2014 Onwards)

After discussion and deliberation, certain modifications have been done and others recommendations will be incorporated in the proposed Syllabi of subjects of B.Tech. Computer Science and Engineering.

Committee approved the syllabi and authorized Chairman BOS for further changes if required.

The followings suggestions are given:

SEVENTH SEMESTER		
Course Code	Course Name	Suggestions
CS-14702	Compiler Design	To check the syllabus of Theory of Computation offered in 6th semester for repetition
CS-14703	Cyber Laws and IPR	- To include the latest amendment of IT Act 2000. - Case studies related to breach of cyber laws in different categories. - Books related with case studies to be explored.
DECS-14704	Parallel Computing	Parallel programming support environments used in laboratory work to be explored in detail in theory e.g. OpenMP, and MPI.
DECS-14707	Big Data and Business Analytics	Business Analytics portion should be included and machine learning portion can be reduced.
DECS-14708	Data Warehouse and Data Mining	- Sequencing of topics of first section to be checked. - Terms used in second section to be checked. - In last section specify data warehousing applications and data mining trends
DECS-14709	Natural Language Processing	- In recommended book section, book of author Rajeev Sangal, PHI publication to be included. - Section corresponding to Application of Natural Language Processing to be incorporated.
DECS-14710	Machine Learning	- Section corresponding to Application of Machine Learning to be incorporated. - Hidden Markov model to be included. - Introduction to Deep Learning concept to be included in Artificial Neural Networks Section
DECS-14711	Software Testing and Quality Assurance	In introduction section software testing and quality assurance topics to be incorporated

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		- Sequencing of second, third and fifth section to be checked. - Debugging and defect management should be included in one section. - Testing automation may be included.
DECS-14712	Information Security	- Sniffing network traffic topic to be incorporated in information security hurdles section - In cryptography section reorganization of topics should be done. - Book of author Frozen to be incorporated in recommended books section. - Repetition of topics to be checked.
DECS-14713	Soft Computing	Section other computing techniques should be renamed as optimization techniques.
DECS-14714	Agile Software Development	- Section Agile Design should be renamed as Design principles - Section Agile Testing should be renamed as Testing - Reorganization of topics should be done and section heading should be renamed.
DECS-14719	Cloud Computing Lab	Practical V iCanCloud can be skipped.
DECS-14721	Data Warehouse and Data Mining Lab	Simple calculator program can be skipped
OECS-14601	Software Project Management	- Staffing pattern should be included along with recruitment process - No. of lectures should be mentioned
OECS-14602	Object Oriented Programming using Java	Inheritance section should be splitted into two sections and polymorphism topic should be included in the second section.

Agenda Item 4

Approval of panel of external question paper setters for end semester examinations of B.Tech.and M.Tech.

Approved

Committee approved the Panel and authorized Chairman BOS for further changes if required.

Dr. Parminder Singh

Er. Amanpreet Singh Brar

Er. Sumeet Kaur Sehra

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Paramjit Singh

Dr. Shaveta Rani

12/7/17

Guru Nanak Dev Engineering College, Ludhiana
Department of Computer Science & Engineering

Ref. No.: CSE/2220

Dated: 30-7-19

Minutes of 10th meeting of Board of Studies of Computer Science and Engineering Department held on 26.07.2019 at 10:00 am in the Committee Room, GNDEC, Ludhiana.

The following persons were present:

1. Dr. Parminder Singh, Professor & Head, Department of Computer Science and Engineering, GNDEC, Ludhiana (Chairman)
2. Prof. Amanpreet Singh Brar, Associate Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
3. Prof. Amandeep Kaur Sohal, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
4. Dr. Sumeet Kaur Sehra, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
5. Dr. Vivek Thapar, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
6. Mr. Rinku Garg, Senior Technical Lead, Fidelity Information Services India Pvt. Ltd., Chandigarh (Member)
7. Mr. Ravi Kumar, Assistant Professor, Department of CSE, Atal Bihari Vajpayee Govt. Institute of Engineering and Technology, Pragati Nagar, District Shimla. (Member)
8. Dr. Maninder Singh, Professor, Dept. of CSE, Thapar Institute of Engineering and Technology, Patiala (External Expert)
9. Dr. K.S. Gill, Dean Academics, GNDEC, Ludhiana.
10. Prof. Gagandeep Singh Sodhi, Training and Placement officer, GNDEC, Ludhiana.
11. Dr. Amit Kamra, Nominee, Controller of Examination, GNDEC, Ludhiana.

The meeting started with welcome address by chairman BOS, and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Dr. Parminder Singh

Dr. Vivek Thapar

Dr. Maninder Singh

Dr. Amanpreet Singh Brar

Nominee, COE

TPO

Dr. Amandeep Kaur Sohal

Mr. Rinku Garg

Dean Academics

Dr. Sumeet Kaur Sehra

Mr. Ravi Kumar

Agenda Item 1

Discussion about course scheme 2018 of B.Tech. Computer Science and Engineering applicable to students of 2018 admission batch onwards and to finalise study scheme of 3rd and 4th semester.

Approved

Agenda Item 2

Discussion about syllabus of 3rd and 4th semester of B.Tech. Computer Science and Engineering of study scheme 2018.

Syllabus of different subjects were discussed and following suggestions were given for different subjects.

1. Course outcomes of subjects needs to be in align with NBA standards and blooms Taxonomy
2. Encourage the students to use tools like Domjudge , Hackerrank, EBox, Packet Tracer, and NS2
3. Practical Examination duration may be changed to 2 hours.
4. Practicals should be open ended for Data structures and Object Oriented Programming.

Further, Committee authorize the BOS chairman for further changes if required.

Dr. Parminder Singh

Dr. Vivek Thapar

Dr. Maninder Singh

Dr. Anandjeet Singh Brar

Nominee, COE

TPO

Dr. Anandeep Kaur Sohal

Mr. Rinku Garg

Dean Academics

Dr. Sumeet Kaur Sehra

Mr. Ravi Kumar

Agenda Item 3

Discussion about subjects to be offered for minor degree in Computer Science and Engineering.

1. Courses to be taken through classroom study are approved.
2. MOOC courses approved for current session and committee authorize BOS chairman along with internal members to finalize list of courses offered for minor degree from time to time and take suggestions of experts through e-mail.

Agenda Item 4

Discussion about courses to be offered through MOOC for Honour degree.

Approved for current session and committee authorize BOS chairman along with internal members to finalize list of courses offered through MOOC from time to time and take suggestions of experts through e-mail.

Agenda Item 5

Discussion about study scheme 2019 of M.Tech. Computer Science and Engineering applicable to students of 2019 admission batch onwards.

Approved

Dr. Parminder Singh

Dr. Amanpreet Singh Brar

Dr. Amandeep Kaur Sohal

Dr. Sumrit Kaur Sehra

Dr. Vivek Thapar

Nominee, COE

Mr. Rinku Garg

Mr. Ravi Kumar

Dr. Maninder Singh

TPO

Dean Academics

Agenda Item 6

Discussion about syllabus of subjects of M.Tech. Computer Science and Engineering study scheme 2019.

Syllabus of different subjects were discussed and following suggestions were given for different subjects.

1. SDNs, Interplanetary networks, and Delay tolerant networks can be added in Advances in Computer Networks subject.
2. Practicals need to be changed and datasets to be added in Data warehousing and data mining laboratory.
3. ECC and Stream cipher RC5 has to be added in Cryptography.
4. WPA2 to be added in Network Security.
5. Wireshark has to be deleted from Simulation and Modelling.
6. JIRA, Mycolab and Orange Scrum (Project management tools) to be added in Project Management

Further Committee authorize the BOS chairman for any further changes if required.

Dr. Parminder Singh

Dr. Anandpreet Singh Brar

Dr. Amandeep Kaur Sohal

Dr. Sumreet Kaur Sehra

Dr. Vivek Thapar

Nominee, COE

Mr. Rinku Garg

Mr. Ravi Kumar

Dr. Maninder Singh

Dean Academics

Course: B.Tech. Computer Science and Engineering

(Scheme - 2018 Batch onwards)

3rd Semester

Category	Course Code	Course Name	Subject Type (Theory / Practical)	Load Allocation (per week)				Marks Distribution		Total Marks	Credits
				L	T	P		Internal	External		
Professional Core Courses	PCCS-101	Object Oriented Programming	Theory	3	0	0		40	60	100	3
Professional Core Courses	PCCS-102	Computer Networks	Theory	3	0	0		40	60	100	3
Engineering Science Courses	ESCS-101	Digital Electronics	Theory	3	0	0		40	60	100	3
Basic Science Course	BSCS-101	Mathematics-III	Theory	3	1	0		40	60	100	4
Humanities and Social Sciences including Management Courses	HSMCS-101	Human values and Professional Ethics	Theory	3	0	0		40	60	100	3
Professional Core Courses	LPCCS-101	Object Oriented Programming Laboratory	Practical	0	0	4		30	20	50	2
Professional Core Courses	LPCCS-102	Computer Networks Laboratory	Practical	0	0	2		30	20	50	1
Engineering Science Courses	LESCS-101	Digital Electronics Laboratory	Practical	0	0	2		30	20	50	1
Training	TR-101	Training-I	Practical	0	0	0		60	40	100	1
Seminar/Project	PRCS-101	Seminar and Technical Report Writing	Practical	0	0	2		50	0	50	1
Mentoring and Professional Development*		Mentoring and Professional Development	Practical	0	0	1		-	-	-	-
Total				15	1	11		400	400	800	22
Contact Hours = 26+1*											

*Evaluation of 4 weeks institutional/industrial training held after 2nd semester in the institute.

There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

4th Semester

Category	Course Code	Course Name	Subject Type (Theory / Practical)	Load Allocation (per week)			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
Professional Core Courses	PCCS-103	Discrete Mathematics	Theory	3	1	0	40	60	100	4
Professional Core Courses	PCCS-104	Computer Architecture and Microprocessor	Theory	3	0	0	40	60	100	3
Professional Core Courses	PCCS-105	Operating Systems	Theory	3	1	0	40	60	100	4
Professional Core Courses	PCCS-106	Data Structures	Theory	3	0	0	40	60	100	3
Professional Core Courses	PCCS-107	Software Engineering	Theory	3	1	0	40	60	100	4
Professional Core Courses	LPCCS-103	Computer Architecture and Microprocessor Laboratory	Practical	0	0	2	30	20	50	1
Professional Core Courses	LPCCS-104	Operating Systems Laboratory	Practical	0	0	2	30	20	50	1
Professional Core Courses	LPCCS-105	Data Structures Laboratory	Practical	0	0	4	30	20	50	2
Mandatory Courses	MCI-101	Environmental Sciences	Theory	2	0	0	50	0	50	0
Mentoring and Professional Development #	MPD-102	Mentoring and Professional Development	Practical	0	0	1	100	0	100	1
Total				17	3	9	440	360	800	23
			Contact Hours = 28+1*							

There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

M.Tech. Computer Science and Engineering (Scheme-2019)

Total Credits=19+17+16+16=68

SEMESTER 1

Sr. No.	Category	Course Code	Subject Name	Subject Type	Load Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Core	MCS-101	Mathematical Foundations of Computer Science	Theory	3	0	0	50	100	150	3
2	Programme Core	MCS-102	Advanced Data Structures	Theory	3	0	0	50	100	150	3
3	Programme Core	MRM-101	Research Methodology and IPR	Theory	3	0	0	50	100	150	3
4	Programme Elective	MCS-11X	Elective -1	Theory	3	0	0	50	100	150	3
5	Programme Elective	MCS-12X	Elective -2	Theory	3	0	0	50	100	150	3
6	Programme Core	LMCS-102	Advanced Data Structures Laboratory	Practical	0	0	4	50	50	100	2
7	Programme Elective	LMCS-11X	Elective -1 Laboratory	Practical	0	0	2	50	50	100	1
8	Programme Elective	LMCS-12X	Elective -2 Laboratory	Practical	0	0	2	50	50	100	1
9	Audit Course*	MAC-XXX	Audit Course	Theory	2	0	0	50	0	50	S/US
					17	0	8	450	650	1100	19
TOTAL Contact Hours: 25											

SEMESTER 2

Sr. No.	Category	Course Code	Subject Name	Subject Type	Scheme of Studies Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Core	MCS-103	Advance Algorithms	Theory	3	0	0	50	100	150	3
2	Programme Core	MCS-104	Soft Computing	Theory	3	0	0	50	100	150	3
3	Programme Elective	MCS-13X	Elective-3	Theory	3	0	0	50	100	150	3
4	Programme Elective	MCS-14X	Elective-4	Theory	3	0	0	50	100	150	3
5	Programme Core	LMCS-103	Advance Algorithms Laboratory	Practical	0	0	2	50	50	100	1
6	Programme Core	LMCS-104	Soft Computing Laboratory	Practical	0	0	2	50	50	100	1
7	Programme Elective	LMCS-XXX	Based on Electives-3	Theory	0	0	2	50	50	100	1
8	Core	LMPCS-101	Project	Practical	0	0	4	50	50	100	2
9	Audit Course*	MAC-XXX	Audit Course	Theory	2	0	0	50	0	50	S/US
					16	0	6	450	600	1050	17
TOTAL Contact Hours: 26											

**M. Tech (CSE) Scheme
(2019 Batch Onwards)
SEMESTER 3**

Sr. No.	Category	Course Code	Subject Name	Subject Type	Load Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Elective	MCS-15X	Elective -5	Theory	3	0	0	50	100	150	3
2	Open Elective	MOCS-XXX	Open Elective	Theory	3	0	0	50	100	150	3
3	Proj Thesis	MPTCS-XXX	Formulation of Research Problem	Practical	0	0	20 (2*+18*)	100	100	200	10
					6	0	20	200	300	500	16

TOTAL Contact Hours: 8

#Maximum hours for Teacher

*Independent study Hours

SEMESTER 4

Sr. No.	Category	Course Code	Subject Name	Subject Type	Load Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Core	MTCS-101	Thesis	Practical	0	0	32 (4*+28*)	100	200	300	10
					0	0	20	100	200	300	10

TOTAL Contact Hours: 4

#Maximum hours for Teacher

*Independent study Hours

LIST OF ELECTIVES

List of Elective-1

Sr. No.	Course Code	Subject Name
1	MCS-111	Machine Learning
2	MCS-112	Advances in Artificial Intelligence
3	MCS-113	Wireless and Mobile Networks
4	MCS-114	Advances in Computer Networks
5	MCS-115	Advanced Operating Systems
6	LMCS-111	Machine Learning Laboratory
7	LMCS-112	Advances in Artificial Intelligence Laboratory
8	LMCS-113	Wireless and Mobile Networks Laboratory
9	LMCS-114	Advances in Computer Networks Laboratory
10	LMCS-115	Advanced Operating Systems Laboratory

List of Elective-2

Sr. No.	Course Code	Subject Name
1	MCS-121	Data Ware House & Data Mining
2	MCS-122	Advance Data Base System Concepts
3	MCS-123	Software Engineering Methodologies
4	MCS-124	Cloud Computing and Security
5	MCS-125	Digital Image Processing
6	LMCS-121	Data Ware House and Data Mining Laboratory
7	LMCS-122	Advance Data Base System Concepts Laboratory
8	LMCS-123	Software Engineering Methodologies Laboratory
9	LMCS-124	Cloud Computing and Security Laboratory
10	LMCS-125	Digital Image Processing Laboratory

List of Elective-3

Sr. No.	Course Code	Subject Name
1	MCS-131	Cryptography
2	MCS-132	Wireless Sensor Networks
3	MCS-133	Network Security
4	MCS-134	Data Science
5	MCS-135	Web Crawler and Search Engines
6	MCS-136	Software Testing and Quality Assurance
7	LMCS-131	Cryptography Laboratory
8	LMCS-132	Wireless Sensor Networks Laboratory
9	LMCS-133	Network Security Laboratory
10	LMCS-134	Data Science Laboratory
11	LMCS-135	Web Crawler and Search Engines Laboratory
12	LMCS-136	Software Testing and Quality Assurance Laboratory

List of Elective-4

Sr. No.	Course Code	Subject Name
1	MCS-141	Agile Software Development Approaches
2	MCS-142	Human and Computer Interaction
3	MCS-143	Natural Language Processing
4	MCS-144	Information Storage and Management
5	MCS-145	Introduction to Intelligent System
6	MCS-146	Computer Vision

List of Elective-5

Sr. No.	Course Code	Subject Name
1	MCS-151	Optimization Techniques
2	MCS-152	Social Network Analysis
3	MCS-153	Distributed Systems
4	MCS-154	Neural Networks and Fuzzy Logic
5	MCS-155	Data Preparation and Analysis
6	MCS-156	Smart Sensors and Internet of Things

List Of Open Electives offered to other Departments

Sr. No.	Course Code	Subject Name
1	MOCS-101	Simulation and Modeling
2	MOCS-102	Project Management
3	MOCS-103	Business Information System
4	MOCS-104	Human Resources Development and Training Methods
5	MOCS-105	Multimedia Communications

LIST OF AUDIT COURSES

Sr. No.	Course Code	Subject Name
1.	MAC-101	English for Research Paper Writing
2.	MAC-102	Disaster Management
3.	MAC-103	Sanskrit for Technical Knowledge
4.	MAC-104	Value Education
5.	MAC-105	Constitution of India
6.	MAC-106	Pedagogy Studies
7.	MAC-107	Stress Management
8.	MAC-108	Personality Development through Life Enlightenment Skills

BOS Minutes of Meetings

Minutes of Meeting, Board of Studies, 30.6.15

Minutes of the Board of Studies Meeting Of Electrical Engineering Department Held on 30th June, 2015 Venue: Committee Room

The following were present:

1. Dr. J.S.Dhillon
2. Dr. Piyush Verma
3. Dr. Sanjay Marwaha
4. Dr. Lakhwinder Singh
5. Er. Pritam Singh
6. Pf. Jaswinder Singh
7. Dr. Y.S.Brar
8. Pf. Preetinder Singh
9. Dr. Kanwardeep Singh
10. Pf. Gagandeep Singh Sodhi
11. Pf. Arvind Dhillra
12. Pf. Navneet Singh Bhangu
13. Pf. Harneet Singh Gill

Pf. Jaswinder Singh, Chairman, BOS welcomed the participants to the meeting. The agenda which had already been circulated was placed before the board.

1. The new study scheme was put up for discussion and approval. The chairman apprised the board that as per the college norms credit based scheme was being introduced and the same was put for approval of the board. The board after certain amendments unanimously approved the same.

APPROVED

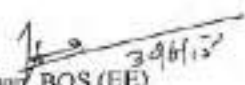
2. The syllabus for 3rd and 4th semester was also presented. The syllabus for all the subjects included their Course Objectives and Course Outcomes. The syllabus was discussed at length and certain amendments were suggested which were duly incorporated. This was approved by the board.

APPROVED

3. The board members were of the view that syllabi for 5th, 6th & 7th/8th semester must be ready before December, 2015.

AGREED

There being no other matter, the meeting ended with a vote of thanks.


Chairman, BOS (EE)

Cc: Director for kind information
Dean (Academic)
All members of BOS (EE)

Minutes of Meeting, Board of Studies, 9.12.16

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA ELECTRICAL ENGINEERING DEPARTMENT

Minutes of Meeting (Board of Studies)

Held on 9th December, 2016

Venue: Committee Room

The following members were present:

1. Dr.J.S.Dhillon
2. Dr.Y.S.Brar
3. Dr. Lakhwinder Singh
4. Er.Pritam Singh
5. Pf.Jaswinder Singh
6. Pf.Preetinder Singh
7. Dr.Kanwandeep Singh
8. Pf.Gagandeep Singh Sodhi
9. Pf.Arvind Dhingra
10. Dr. Navneet Singh Bhangu
11. Pf.Harmeet Singh Gill

Pf.Jaswinder Singh, Chairman, BoS welcomed the participants to the meeting. The agenda which had already been circulated was placed before the board.

1. The codes for all subjects of B.Tech (Electrical Engineering) were placed before the board. The Chairman informed the members that code change was necessary as the Dean(Academics), Guru Nanak Dev Engineering College, Ludhiana has directed all departments to follow uniform structure for subject codes. This is also necessary as per directions received from affiliating university: IKG Punjab Technical University, Kapurthala.

The board members agreed for the change and the changed codes are appended alongwith.

2. The Program Educational Objectives and Program out comes for B.Tech (Electrical Engineering) and M.Tech (Power engineering) alongwith mission and vision statement of department were placed for review before the board.

The board members gave their valuable inputs which were recorded. The Chairman assured the board members that their suggestions shall be incorporated in the revised documentation.

3. The Chairman informed the board regarding upcoming accreditation visit for PG and compliance report for UG courses. In view of this board was of the view that Ph.D qualification faculty may be recruited to maintain cadre ratio.

[Signature]
9.12.16

Minutes of Meeting, Board of Studies, 14.7.17

Guru Nanak Dev Engineering College, Ludhiana

Electrical Engineering Department

Minutes of BoS Meeting

Date: 14.7.2017

Ref.No.

A meeting of Board of Studies of Electrical Engineering Department was held in the college committee room on 14.7.2017 at 10.00AM. The following were present:

1. Dr. J.S. Dhillon
2. Dr. Pioush Verma
3. Dr. Sanjay Marwaha
4. Dr. Lakhwinder Singh
5. Dr. Yadwinder Singh Brar
6. Pf. Jaswinder Singh
7. Pf. Khushdeep Singh
8. Pf. Preetinder Singh
9. Pf. Rupinderjit Singh
10. Dr. Kanwarddeep Singh
11. Pf. Gagandeep Singh Sodhi
12. Dr. Navneet Singh Bhangu
13. Pf. Harmeet Singh Gill
14. Pf. Arvind Dhingra

Chairman, BoS welcomed all to the 6th Board of Studies meeting.

The following points were discussed:

1. The revised vision and mission of Electrical Engineering Department were discussed and approved.
2. The syllabus for 7th/8th semester 2014 scheme B.Tech (Electrical) was put up for discussion. The members gave their valuable suggestions which were duly incorporated. The board members approved the syllabus.
3. The PEOs and POs of B.Tech (Electrical Engineering) & M.Tech (Power Engineering) were presented for validation of the board. These were duly validated by the board.
4. The syllabus for Basic Electrical Engineering 2017 batch was discussed and approved.

There being no other matter for discussion, the meeting ended with a vote of thanks.

HOD (EED) &

Chairman, BoS

Minutes of Meeting, Board of Studies (internal), 27.2.18

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

ELECTRICAL ENGINEERING DEPARTMENT

Minutes of Meeting Board of Studies (Internal)

Held on: 27th February, 2018

Venue: Committee Room

Ref. No. EE/ 200/A

Dr. 27/2/18

The following member were present:

1. Pf. Jaswinder Singh, Chairman *Jaswinder Singh*
2. Pf. Khushdeep Singh (On Leave)
3. Pf. Preetinder Singh *Preetinder Singh*
4. Pf. Rupinderjit Singh *Rupinder Singh*
5. Dr. Kanwardeep Singh *Kanwardeep Singh*
6. Pf. Gagandeep Singh Sodhi *Gagandeep Singh Sodhi*
7. Dr. Navneet Singh Bhangu *Navneet Singh Bhangu*
8. Pf. Harmeet Singh Gill *Harmeet Singh Gill*
9. Dr. Arvind Dhillon *Arvind Dhillon*

Special Invitee

Er. Satish Saini *Satish Saini*
Chairman, Smart Grid Technical Activities,
(SG TAC)- IEEE
Senior Projects & Program Manager, Hydro One Networks Inc.
Mississauga, Ontario, Canada.

Pf. Jaswinder Singh, Chairman, BoS welcomed the participants to the meeting and the following agenda points were discussed:-

1. The syllabus of the subject Smart Grids: Fundamentals & Technologies was placed before the board as it has to be added as an elective subject in 7th semester of B.Tech (Electrical Engg) in 2017 Syllabus Scheme. The same was approved. (subject code: DEEE-ITE11)
2. The Environment Engg. Subject for 2017 Syllabus Scheme has to be taught to the students of 2017 batch B.Tech. (Electrical Engg) immediately after the completion of 2nd Semester. The syllabus for Environment Engg. is common to all branches and will be supplied by Civil Engineering department. The item was approved.
3. New codes and hours allotted for the subjects of 2017 Syllabus Scheme was discussed and placed before the board. The board approved the same.
4. Course outcomes of B.Tech (Electrical Engg) and M.Tech (Power Engg.) were reformulated and deliberated upon in the meeting. The board approved the same.

Jaswinder Singh
HOD(Electrical) &
Chairman, BoS

27/02/2018

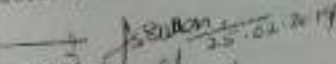
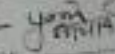
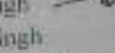
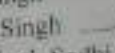
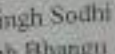
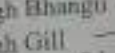
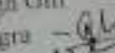
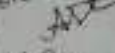
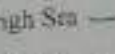
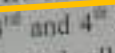
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
DEPARTMENT OF ELECTRICAL ENGINEERING

February 25, 2019

Ref.No. EE/ 198 /A

Minutes of Meeting

A board of studies meeting of department of Electrical Engineering was held in college committee room on 25.2.2019. The following members were present:

1. Dr. J.S.Dhillon — 
2. Dr. Y.P.Verma — 
3. Er. Dheeraj Kumar — 
4. Pf. Preetinder Singh — 
5. Pf. Rupinderjit Singh — 
6. Dr. Kanwardeep Singh — 
7. Pf. Gagandeep Singh Sodhi — 
8. Dr. Navneet Singh Bhangu — 
9. Pf. Harmeet Singh Gill — 
10. Dr. Arvind Dhillon — 
11. Dr. Amit Kamra — 
12. Pf. Jaswinder Singh Sra — 

Study scheme as per AICTE revised 2018 model curriculum was discussed for 2018 batch onwards. Syllabus for 3rd and 4th semester was discussed. The suggestions of the experts were incorporated. The scheme and syllabus after incorporating the comments are enclosed.


Chairman, BoS

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
ELECTRICAL ENGINEERING DEPARTMENT

Semester-III

Course Code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
EE-14301	Engineering Mathematics-III	3	1	--	40	60	100	4
EE-14302	Network Analysis and Synthesis	3	1	--	40	60	100	4
EE-14303	Electrical Measurements & Measuring Instruments	3	1	--	40	60	100	4
EE-14304	Transformers & Direct Current Machines	3	1	--	40	60	100	4
EE-14305	Electronic Devices and Circuits	3	1	--	40	60	100	4
EE-14306	Laboratory-I: Transformers& Direct Current Machines	--	--	3	30	20	50	2
EE-14307	Laboratory-II: Electronic Devices and Networks	--	--	3	30	20	50	2
EE-14308	Laboratory-III: Electrical Measurements & Measuring Instruments	--	--	2	30	20	50	1
TR-14301	Workshop Training (Undertaken after 2nd semester)	--	--	--	60	40	100	2
Total		15	5	8	350	400	750	27

Semester-IV

Course Code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
EE-14401	Asynchronous Machines	3	1	--	40	60	100	4
EE-14402	Control Systems	3	1	--	40	60	100	4
EE-14403	Electromagnetic Field Theory	3	1	--	40	60	100	4
EE-14404	Power System-I (Transmission & Distribution)	3	1	--	40	60	100	4
EE-14405	Digital Electronics	3	1	--	40	60	100	4
EE-14406	Object Oriented Programming	3	1	--	40	60	100	4
EE-14407	Laboratory-IV: Control Systems	--	--	2	30	20	50	1
EE-14408	Laboratory-V: Digital Electronics	--	--	2	30	20	50	1
EE-14409	Laboratory-VI: Object Oriented Programming	--	--	2	30	20	50	1
GF-14401	General Fitness	--	--	--	100	--	100	1
Total		18	6	6	430	420	850	28

Semester-V

Course Code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
EE-14501	Synchronous Machines	3	1	--	40	60	100	4
EE-14502	Numerical & Statistical Techniques	3	1	--	40	60	100	4
EE-14503	Industrial Electronics	3	1	--	40	60	100	4
EE-14504	Instrumentation Engineering	3	1	--	40	60	100	4
DEEE-145XX	Elective-I	3	1	--	40	60	100	4
EE-14505	Laboratory-VII: Asynchronous & Synchronous Machines	--	--	2	30	20	50	1
EE-14506	Laboratory-VIII: Industrial Electronics	--	--	2	30	20	50	1
EE-14507	Laboratory-IX: Instrumentation & Measuring Devices	--	--	2	30	20	50	1
EE-14508	Laboratory-X: Numerical & Statistical Techniques	--	--	2	30	20	50	1
TR-14501	Industrial Training - I (Undertaken after 4th semester)	--	--	--	60	40	100	2
Total		15	5	8	380	420	800	26

Semester-VI

Course Code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
EE-14601	Power System-II (Switchgear & Protection)	3	1	--	40	60	100	4
EE-14602	Electrical Drives & Utilization	3	1	--	40	60	100	4
EE-14603	Electrical Generation & Economics	3	1	--	40	60	100	4
EE-14604	Microcontroller & Programmable Logic Controllers	3	1	--	40	60	100	4
DEEE-146XX	Elective-II	3	1	--	40	60	100	4
OEEE-146XX	Open Elective	3	--	--	40	60	100	3
EE-14605	Laboratory-XI: Power System	--	--	2	30	20	50	1
EE-14606	Laboratory-XII: Electric Drives	--	--	2	30	20	50	1
EE-14607	Laboratory-XIII: Microcontroller & Programmable Logic Controllers	--	--	2	30	20	50	1
PREE-14601	Minor Project	--	--	1	60	40	100	1
GF-14601	General Fitness	--	--	--	100	--	100	1
Total		18	5	7	490	460	950	28

Semester-VII/VIII

Course Code	Course Title	Marks Distribution		Total Marks	Credits
		Internal	External		
Industrial Training (One Semester)					
FREE-14701	Industrial Training - II	450	350	800	13
FREE-14702	Industry Oriented Training (02 week)	200	---	200	2
Total		650	350	1000	15

Semester-VII/VIII

Course Code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
EE-14801	Computer Aided Power System Analysis	3	1	--	40	60	100	4
EE-14802	Digital Control System	3	1	--	40	60	100	4
EE-14803	High Voltage Engineering	3	1	--	40	60	100	4
DEEE-148XX	Elective-III	3	1	--	40	60	100	4
DEEE-148XX	Elective-IV	3	1	--	40	60	100	4
EE-14804	Laboratory-XIV: Computer Aided Power System Analysis	--	--	2	30	20	50	1
EE-14805	Laboratory-XV: High Voltage Engineering	--	--	2	30	20	50	1
EE-14806	Seminar	--	--	2	100	--	100	2
PREE-14701	Major Project	--	--	3	120	80	200	3
GF-14701	General Fitness	--	--	--	100	--	100	1
Total		15	5	9	580	420	1000	28

Course Code	Course Title
Elective-I	
DEEE-14501	Renewable Energy Resources
DEEE-14502	Electrical Design & Illumination Engineering
DEEE-14503	Electrical Engineering Materials
DEEE-14504	Energy Auditing & Management
DEEE-14505	Solar Technologies
DEEE-14506	Analog Integrated Circuits
Elective-II	
DEEE-14601	Power System Operation & Control
DEEE-14602	Computer Aided Electrical Machine Design
DEEE-14603	Optimization Techniques
DEEE-14604	Energy Conversion
DEEE-14605	Robotic Control System
DEEE-14606	Process Dynamics and Control
Elective III	
DEEE-14801	Fuzzy Logics & Systems
DEEE-14802	Power System Planning
DEEE-14803	Power System Restructuring & Deregulation
DEEE-14804	System Engineering & Reliability
DEEE-14805	Advanced Microprocessors
Elective IV	
DEEE-14806	Digital Signal Processing
DEEE-14807	Signals and Systems
DEEE-14808	Flexible AC Transmission Systems
DEEE-14809	Neural Networks
DEEE-14810	Energy Efficient Machines
Open Elective(To be offered by Electrical Engineering Department to other Departments)	
OEEE-14601	Non-Conventional Energy Sources
OEEE-14602	Energy Auditing and Management

EE-14301ENGINEERING MATHEMATICS-III

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Analyse Fourier series applications for electrical Engineering problems
- Evaluate linear differential equations which are often the part of electrical engineering problems using techniques of Laplace Transforms.
- Evaluate the special functions which arise as a result of differential equations with variable coefficients.
- Analyse different types of partial differential equations.
- Apply the methods of partial differential equations to solve one dimensional heat equation and wave equation.
- Analyze the differential and integral calculus for complex functions.

CONTENTS**1. FOURIER SERIES**

Periodic functions, Euler's formula, Even and Odd functions, Half range expansions, Fourier series of different wave forms.

2. LAPLACE TRANSFORMS

Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, periodic function, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

3. SPECIAL FUNCTIONS

Power series solution of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind, Recurrence relations.

4. PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations, Linear partial differential equations, Homogeneous partial differential equations with constant coefficients.

5. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Wave equation and Heat conduction equation in one dimension, Two dimensional Laplace equations in Cartesian Coordinates, Solution by the method of separation of variables.

6. FUNCTION OF COMPLEX VARIABLE

Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's Integral Formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues.

BOOKS RECOMMENDED

1. Kreyszing, E., *Advanced Engineering Mathematics*, 8th edition, John Wiley, New Delhi.
2. Grewal, B. S., *Higher Engineering Mathematics*, Khanna Publishers, New Delhi.
3. Ian N. Sneedon, *Elements of Partial Differential Equations*, McGraw- Hill Publisher.
4. Peter. V. O'Nil, *Advanced Engineering Mathematics*, Wadsworth Publishing Company.
5. Taneja, H. C., *Engineering Mathematics*, Volume-I& Volume-II, I. K. Publisher.
6. Babu Ram, *Advance Engineering Mathematics*, Pearson Education.
7. Bindra, J. S., *Applied Mathematics*, Volume-III, Kataria Publications.
8. O'Neil, *Advanced Engineering Mathematics*, Cengage Learning.

EE-14302 NETWORK ANALYSIS AND SYNTHESIS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Evaluate the circuit quantities using the circuit theorems.
- Create graph from given circuit.
- Analyze the transient response of a circuit to test signal.
- Analyze AC circuits.
- Analyze filters.
- Analyze the given equations to find out the circuit parameters.

CONTENTS**1. DC CIRCUITS**

Basic concepts: Current, Voltage and Power, Sources: Dependent and Independent sources; their circuit representation, Ideal Sources, source transformation, Ohm's law: applications and limitations, Kirchoff's laws: current and voltage, Nodal and Mesh analysis, Series and parallel circuit analysis, star and delta connected loads, Superposition theorem, Thevenin theorem, Norton theorem, Maximum Power transfer theorem, Tellegen's Theorem.

2. NETWORK TOPOLOGY

Concept of graph, tree, co-tree, branch, link of a network and their application to formation of incidence matrices, Tie-set, Cut-set matrix formation.

3. STEADY STATE AND TRANSIENT ANALYSIS

Concept of steady state and transient state, Introduction to Laplace transform, Conversion of circuit from Time domain to frequency domain, Test signals: Unit Impulse, Unit step, Unit Ramp, Unit Doublet, Parabolic signals and their graphical and mathematical representation, Application of Laplace transform to solution of transient state of a simple network with independent sources only, First order and Second order networks, Poles and zeros and transfer function, Convolution theorem and Convolution Integral.

4. AC CIRCUITS

Instantaneous Power, Average Power, Effective Power, Apparent Power and Reactive Power, Polyphase circuits, Analysis of series and parallel RLC circuits, Application of Superposition, Thevenin, Norton and Maximum power transfer theorems to AC circuits.

5. TWO PORT NETWORKS & FILTERS

Concept of two port network, Impedance parameters, Admittance parameters, ABCD parameters, h-parameters, g-parameters, Concept of filters, Need for filters, Prototype filters, half section, m-derived filters, Composite filters.

6. NETWORK SYNTHESIS

Synthesis of simple networks using Foster and Cauer forms.

BOOKS RECOMMENDED

1. Hayt W. H., Kemmerly J. E. and Durbin S. M., *Engineering Circuit Analysis*, McGraw Hill Publications, 7th edition.
2. Bruce Carlson A., *Circuits*, Cengage Learning.
3. David Irwin J. and Robert M. Nelms, *Engineering Circuit Analysis*, Wiley Publications, 10th edition.
4. Sudhakar A. Rao and Shyammohan, *Circuits and Networks*, Tata McGraw Hill Publications.
5. Sukhija M.S. and Nagsarkar T.K., *Circuits Networks*, Oxford University Press.
6. Chakravorty Abhijeet, *Circuit Theory*, Dhanpat Rai and Sons.

EE-14303 ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze and compare different types of analog measuring instruments and their applications.
- Evaluate power and energy by using energy meter and power factor meters.
- Understand bridges and calculate unknown values.
- Understand techniques and acquire skills related to application of potentiometers.
- Evaluate the different types of errors using instrument transformers.
- Understand various magnetic measurements.

CONTENTS**1. UNITS, SYSTEMS AND STANDARDS**

Review of MKS & Rationalized MKSA System, SI Units, Standards of EMF, Resistance, Capacitance and Inductance, Systematic errors.

2. ANALOG MEASURING INSTRUMENTS

Operating, damping & controlling torques, Torque/Weight ratio, Pointers & Scales. Principles of operation of various types of electro-mechanical indicating/registering instruments viz. PMMC, moving iron, dynamometer, induction, thermal for DC&AC measurement of voltage, current, power, frequency, phase & power factor, energy meter(Single Phase induction type): their sources of error & compensation, shunts & multipliers, insulation testing using Meggar.

3. POTENTIOMETERS

Basic DC potentiometer circuit, Modern form of DC potentiometer, measurement of voltage, current, Resistance and calibration of voltmeter & ammeter using DC potentiometer, volt ratio box, Self balancing potentiometer, AC potentiometers and their applications.

4. BRIDGES

Sources and Detectors, General equation for bridge balance, Wheatstone bridge and its sensitivity analysis, Kelvin double bridge, AC bridges: applications and conditions for balance, Maxwell's bridge, Hay's bridge, Schering bridge, Wien bridge, Anderson bridge, DeSauty's bridge, Insulation testing, Sources of errors in bridge circuits, Shielding of bridge elements, Wagner Earthing Device.

5. MAGNETIC MEASUREMENTS

Determination of B-H curve and hysteresis loop, Flux meter, Measurement of iron losses by Wattmeter and Bridge methods.

6. INSTRUMENT TRANSFORMERS

Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of current transformers (CT) and potential transformers (PT) and their Testing, Burden and its ratings.

BOOKS RECOMMENDED

1. Golding Edward William and Widdis Frederick Charles, *Electrical Measurements and Measuring Instruments*, Wheelers India.
2. Bell David A., *Electronics Instrumentation and Measurements*, Prentice Hall, India.
3. Reissland Martin V, *Electrical Measurements Fundamentals, Concepts, Applications*, Wiley Eastern Limited, New Delhi.
4. Erenest O. Doebelin, *Measurement Systems-Application and Design*, McGraw Hill, 5th edition, 2005.
5. Helfrick A.D. and Cooper W.D., *Modern Electronic Instrumentation & Measurement Techniques*, Prentice Hall.
6. Murthy D. V. S., *Transducers and Instrumentation*, Prentice-Hall, India.

EE-14304 TRANSFORMERS AND DIRECT CURRENT MACHINES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the principle, construction and analyze the operation of transformers and DC machines.
- Testing of transformer and evaluate efficiency and voltage regulation.
- Develop basic skills in construction and analysis of equivalent circuit, phasor diagram and circuit parameters of transformer and DC machine.
- Analyze the performance characteristics of DC machines for different operating conditions.
- Evaluate the speed control and starting method of DC motor for specific purpose.
- Explore knowledge in context of applications of transformer and dc machines in industry.

CONTENTS**1. SINGLE PHASE TRANSFORMERS**

Overview: Magnetic circuits, Working principle of transformer, constructional features and E.M.F equation, Phasor diagram on no-load and loaded conditions, Referred parameters equivalent circuit, Inrush phenomenon, Voltage regulation and efficiency, All day efficiency. Testing: Open-circuit test, short-circuit test and back-to-back test.

2. THREE PHASE TRANSFORMERS

Construction of three phase transformer & its comparison with single-phase transformer, poly phase transformer connections, Scott connections, power and distribution transformers, Operational features of on-load tap changer (OLTC), Parallel operation of transformers, Different diagnostic techniques of transformers.

3. SPECIAL TYPE TRANSFORMERS

Constructional details and principle of Auto transformer, Saving of copper, Applications of auto transformer, Introduction to special purpose transformer: dry type and amorphous core.

4. D.C. GENERATOR

Working principle, construction of DC machines, armature windings, E.M.F. and torque equations, armature reaction: effect of brush shift and compensating winding. Commutation: causes of bad commutation, methods of improving commutation. D.C. generator characteristics.

5. D.C. MOTOR

Working principle, characteristics, starters (3-point, 4-point and soft starters), speed control methods (field and armature control). Braking: plugging, dynamic and regenerative braking. Estimation of losses and efficiency by Swinburn's test and Hopkinson test. Introduction to brushless direct current (BLDC) machines.

BOOKS RECOMMENDED

1. Say M. G., *Alternating Current Machines*, 5th edition, Sir Isaac Pitman & Sons Ltd.
2. Fitzgerald A.E., Kingsley C. and Umans S.D., *Electric Machinery*, 6th edition, McGraw Hill.
3. Langsdorff E.H., *Principles of D.C. Machines*, McGraw Hill.
4. Bimbhra P.S., *Electrical Machinery*, Khanna Publishers.
5. Nagrath I.J. and Kothari D.P., *Electrical Machines*, 4th edition, Tata McGraw Hill.
6. Charles I. Hubert, *Electrical Machines*, 2nd edition, Pearson Education.
7. B.H.E.L., *Transformers*, Tata McGraw-Hill Education.

EE-14305 ELECTRONIC DEVICES AND CIRCUITS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Comprehend the principle, construction, characteristics, operation and application of various electronic devices viz: Diode, BJT, FET, Special purpose Diodes and MOSFET.
- Analyze and understand different electronic devices as a circuit element.
- Troubleshoot, design and create electronic circuits meant for different applications.
- Evaluate performance of electronic circuits.
- Understand the applications of amplifiers.
- Understand the working and application of power supplies.

CONTENTS**1. SOLID STATE DEVICES**

Solid-State electronic materials, Characterize resistivity of insulators, semiconductors, and conductors. Diode, *pn* junction electrostatics, Space charge region formation at the *pn* junction, Internal diode currents, diodes I-V characteristics, Diode as a circuit element Half wave rectifier, Full wave (Center tap and Bridge type) rectifier. Wave shaping and voltage multiplier circuits. Special purpose diodes Principle, construction, characteristics and applications of LED's, Schottky, Varactor and Photodiodes.

2. BIPOLAR JUNCTION TRANSISTOR (BJT)

Physical structure and operation regions of Bipolar transistors, *I-V* Transistor characteristics and parameters, Common Base, Common Emitter and Common Collector Configurations. Transistor biasing (Two resistor bias networks and four resistor biasing), Four resistor bias network for BJT: Design objectives. Transistor thermal runaway and thermal stability, transistor cut off region model (switch).

3. BJT AC ANALYSIS

Basics characteristics of an amplifier, Simple transistor model (r_e model), hybrid equivalent circuit, circuit analysis using h-parameters. CE Fixed bias configuration, emitter follower, Difference between BJT and FET. Junction field effect transistor (JFET) and Metal oxide semiconductor field effect transistor (MOSFET): Characteristics, parameters and biasing. BJT Frequency Response Decibels, General Frequency considerations, Low frequency response-BJT amplifier.

4. OPERATIONAL AMPLIFIERS AND APPLICATIONS

Introduction, Differential amplifier circuit, Op-Amp basics, Practical Op-Amp circuits, Op-Amp specification- DC offset parameters, Op-Amp specifications- Frequency parameters, Op-Amp unit specifications, differential and common mode operation. Constant gain multiplier, voltage summing, voltage buffer, controlled sources, Instrumentation circuits, Active filters.

5. POWER AMPLIFIERS

Difference between small signal and large signal amplifiers Introduction and types. Series fed Class A amplifier and transformer coupled amplifier, Class B amplifier circuits. Amplifier Distortion, Heat Sinks, Class C and Class D amplifier

6. POWER SUPPLIES

RC and LC filters and their design. Surge Current and PIV rating, discrete voltage regulators, Line and Load regulations, Transistor Series and Shunt regulators, Current limiting, IC voltage regulators, Practical applications of Power Supply.

BOOKS RECOMMENDED

1. Mottershead A., *Electronic Devices and Circuits: An Introduction*, Prentice Hall of India Learning Pvt Ltd, 2011, New Delhi.
2. Boylestad R.L., and Nashelsky L., *Electronic Devices and Circuit Theory*, 10th edition, Pearson (LPE) India.
3. Floyd T.L., *Electronic Devices*, 9th Edition, Pearson (LPE), India.
4. Malvino A., *Electronic Principles*, Tata Mc-Graw Hill.
5. Millman and Halkias, *Electronic Devices and Circuits*, Tata Mc-Graw Hill.
6. Jaeger R.C. and Blalock T.N., *Microelectronic Circuit Design*, 4th Edition, Mc-Graw Hill.
7. Deshpande N.P., *Electronic Devices and Circuits: Principles and Applications*, 2007, Mc-Graw Hill companies.

EE-14306 LABORATORY-I: Transformers & Direct Current Machines

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	3	2
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Evaluation of equivalent circuit parameters, efficiency and voltage regulation by performing various tests on transformer.
- Analyze three-phase transformer connections.
- Analyze parallel operation of transformers.
- Analyze performance characteristics of DC generators.
- Evaluate various speed controls and starting methods of DC motor.
- Construct and analyze torque slip characteristics of DC motor.

LIST OF EXPERIMENTS

- To perform open circuit and short circuit tests on a single-phase transformer and hence find equivalent circuit parameters, voltage regulation and efficiency.
- To find the efficiency and voltage regulation of single-phase transformer under different loading conditions.
- To perform back-to-back test (Sumpner's Test) two single-phase transformers.
- To perform polarity test and parallel operation of two single-phase transformers.
- To make Scott connections on three-phase transformer to get two phase supply.
- To verify the outputs of various connections in three-phase transformer.
- To start the dc motor and study in detail the three-point and four-point starters.
- To measure armature and field resistance of direct current (d.c.) shunt generator and to obtain its open circuit characteristics.
- To perform speed control on dc shunt motor by field current and armature voltage.
- To draw speed-torque characteristics of dc shunt/series /compound motor.
- To perform Swinburne's test (no load test) to determine losses of dc shunt motor.
- Application of MATLAB for solution of problems regarding transformers and dc machines.

EE-14307 LABORATORY-II: ELECTRONIC DEVICES AND NETWORKS

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	3	2
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Identify and test different types of electrical and electronic components.
- Ability to make circuits on bread-board and understand the use and importance of various types of equipment's used in the laboratory.
- Analyze, take measurements to understand circuit behavior and performance under different conditions.
- Troubleshoot, design and create electronic circuits meant for different applications.
- Acquire experience in creating and troubleshooting simple projects employing semiconductor devices.
- Evaluate the performance electronic circuits and working small projects employing semiconductor devices

LIST OF EXPERIMENTS

- Verification of KVL and KCL law.
- Verification of Superposition theorem.
- Verification of Thevenin's and Maximum Power Transfer theorem.
- Verification of Norton's theorem using Current sources.
- To obtain transient response of RL& RC circuits (dc).
- To obtain frequency response of RLC Circuits.
- To design a full wave and half wave rectifier and observe the waveforms with and without filters.
- To design a voltage regulator using Zener diode and also see the effect of line and load regulation.
- To design various clippers and clampers using diodes.
- To plot the transistor characteristics in common emitter configuration and also determine the h-parameters from these characteristics.
- To design, study and compare various transistor biasing techniques and also see the effect on operating point (Q-point) when using various transistors at different temperatures.
- To obtain the frequency response and calculate the gain bandwidth of the amplifier.
- To analyze a voltage follower circuit.
- To plot the VI characteristics of FET.
- To plot the characteristics of a class B amplifier and also calculate the overall efficiency.

16. To plot the characteristics of a class AB amplifier.
17. To plot the characteristics of symmetry amplifier.
18. To design various type of oscillators and to determine the frequency of oscillations.
19. To design a transistor series voltage regulator with current limits and observes current feedback characteristics.
20. To plot the characteristics of a complementary symmetry amplifier.

EE-14308 LABORATORY-III: ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Measure precisely R, L, C, M & F by using different bridges.
- Determine ratio error by using current & potential transformers.
- Compute frequency by using Weston Frequency Meter.
- Measure three phase power and power factor by two wattmeter method
- Construct characteristic graph of potentiometer and hysteresis loop using flux meter.
- Measurement of insulation resistance using Earth Tester.

LIST OF EXPERIMENTS

- Measurement of resistance using Wheatstone bridge.
- Measurement of resistance using Kelvin's Bridge.
- Measurement of frequency using Wein's Bridge.
- Measurement of capacitance using Schering Bridge
- Measurement of self-inductance using Anderson's Bridge.
- To find the ratio error of Current and Potential Transformers.
- To measure power consumed by a 3-phase load and to find its power factor using 2 Wattmeter methods.
- To plot EMF vs. Displacement characteristics of a potentiometer.
- To plot Hysteresis loop for a magnetic material using Flux Meter.
- To calibrate the induction type Energy Meter.
- To find 'Q' of an inductance coil and verify its value using Q-meter.
- To measure insulation resistance using Meggar.
- To measure the earth resistance by Earth Tester.
- To measure frequency of ac supply using Weston Frequency meter.

EE-14401 ASYNCHRONOUS MACHINES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the principle, construction and analyze the operation of three phase induction motor.
- Design and analysis of equivalent circuit for construction of phasor diagram and evaluation of various circuit parameters of induction machine.
- Interpolate the performance and construct torque slip characteristics of an induction motor.
- Interpret the different techniques for the speed control and starting of an induction motor.
- Analyze different types of fractional horse power motors.
- Comprehend and solve industry related problems in context of induction motors.

CONTENTS**1. THREE PHASE INDUCTION MOTORS**

Analogy between induction motor and transformer, constructional features, production of rotating field in space distributed three-phase winding, concept of slip, rotor frequency, current and power, Development of circuit model (equivalent circuit), phasor diagram, torque-slip characteristics, effect of rotor circuit resistance, starting torque, crawling and cogging, High torque cage motors: double cage and deep bar motor.

2. STARTING METHODS AND SPEED CONTROL

Starting methods, Speed control methods, Motor tests for estimation of equivalent circuit parameters, Introduction to variable frequency drives (VFD).

3. INDUCTION GENERATOR

Operation: Isolated and Grid mode, method of excitation, application of induction generator in wind mills and micro hydel power plants.

4. SINGLE –PHASE MOTORS

Double revolving field theory, types of single phase motors, characteristics. Shaded pole motor: working principle and characteristics.

5. SPECIAL PURPOSE MOTORS

Stepper Motors: construction, principle of operation and applications. Linear Induction Motor: construction, principle of operation and applications. Universal Motor: construction, principle of operation and applications.

BOOKS RECOMMENDED

1. Fitzgerald A.E., Kingsley C. and Umans S.D., *Electric Machinery*, McGraw Hill.
2. Say M. G., *Alternating Current Machines*, Sir Isaac Pitman & Sons Ltd.
3. Bimbhra P.S., *Electrical Machinery*, Khanna Publishers.
4. Nagrath I.J. and Kothari D.P., *Electrical Machines*, Tata McGraw Hill.
5. Guru B.S. and Hiziroglu H.R., *Electric Machinery and Transformers*, Saunders College Publishing.
6. Bandyopadhyay M.N., *Electrical Machines*, PHI Learning Private Ltd.

EE-14402 CONTROL SYSTEMS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze the Control Systems by Transfer Function Models.
- Evaluate the Transfer Function Models using Block Diagram Reduction or Signal Flow Graph.
- Evaluate critical Time Response of Control Systems.
- Design and construct the Frequency Response of Control Systems.
- Evaluate the Stability Analysis of Control Systems.
- Design various types of Compensators.

CONTENTS**1. SYSTEMS AND THEIR REPRESENTATION**

Basic elements in Control Systems, Open and Closed loop systems, Electrical analogy of Mechanical and Thermal systems, Concept of Linear and Non Linear System, Use of Laplace Transforms, Transfer function, Block Diagram reduction techniques, Signal Flow Graphs, Synchros, potentiometers, AC and DC servomotors, AC and DC Tacho-generators.

2. TIME RESPONSE

Time response, Time domain specifications, Types of Test Input, first and second order system response, Error Coefficients, Generalized error series, Steady State Error, Proportional (P), Proportional Integral (PI), Proportional Integral Derivative (PID) modes of feedback control.

3. FREQUENCY RESPONSE

Frequency response, Bode plot, Polar plot, Determination of Closed loop response from Open loop response, Correlation between Frequency domain and Time domain specifications.

4. STABILITY OF CONTROL SYSTEM

Characteristics Equation, Location of roots in S- plane for stability, Routh-Hurwitz Criterion, Root Locus construction, Effect of Pole-Zero addition, Gain Margin and Phase Margin, Nyquist Stability criterion.

5. COMPENSATOR DESIGN

Performance Criterion, Lag, Lead and Lag-Lead networks, Compensator design using Bode Plots.

BOOKS RECOMMENDED

1. Nagrath I.J. and Gopal M., *Control Systems Engineering*, New Age International Publishers, 2003.
2. Benjamin C. Kuo, *Automatic Control systems*, Pearson Education, New Delhi, 2003.
3. Ogata K, *Modern Control Engineering*, 4th edition, PHI, New Delhi, 2002.
4. Norman S. Nise, *Control Systems Engineering*, 4th Edition, John Wiley, New Delhi, 2007.
5. Gopal M., *Control Systems, Principles and Design*, Tata McGraw Hill, New Delhi, 2002.

EE-14403ELECTROMAGNETIC FIELD THEORY

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Apply vector calculus to solve field theory problems.
- Comprehend the relations between divergence, curl & gradient and analysis for different coordinate systems in electromagnetics and their interrelations.
- Understand the concept of electric and magnetic fields and associated quantities in different coordinates.
- Understand the concept of time varying fields and boundary conditions.
- Demonstrate different aspects of plane wave in dielectric and conducting media
- Acquire skills to examine technical issues related to electromagnetic fields.

CONTENTS**1. REVIEW OF VECTOR ANALYSIS**

Vector Analysis, Physical Interpretation of Gradient, Divergence and Curl; Vector Relations in Other Coordinate Systems, Integral Theorems: Divergence Theorem, Stoke's Theorem, Green's Theorem and Helmholtz Theorem.

2. ELECTROSTATIC FIELD AND APPLICATIONS

Introduction, Coulomb's Law, Charge Distribution, Gauss's Law (Integral & Differential Form) and its Applications; Potential Function; Field due to Continuous distribution of charges; Equipotential Surfaces; Poisson's and Laplace's Equation, Capacitors and its applications, Energy Stored in a Capacitor, Electric Dipole, Dielectric Constant and Dielectric Strength, Polarization Density, Electrostatic Energy, Uniqueness Theorem, Boundary Conditions between Dielectrics Interface.

3. MAGNETOSTATIC FIELD AND APPLICATIONS

Biot-Savart's Law, Faraday's Laws of Electromagnetic Induction; Magnetic Flux Density; Magnetic Field Strength and Magnetomotive Force; Ampere's Work Law in the differential vector form; Permeability; Energy Stored in a Magnetic Field ; Ampere's Force Law; Magnetic Vector Potential, Analogies between Electric and Magnetic Fields, Magnetic Boundary Conditions.

4. TIME VARYING FIELD AND MAXWELL'S EQUATIONS

Equation of Continuity for Time Varying and Steady Fields, Maxwell's Equations in Integral and Differential form for Static and Time Varying Fields, Conditions at a Boundary Surface, Poynting Theorem and Physical Interpretation of $\mathbf{E} \times \mathbf{H}$.

5. ELECTROMAGNETIC WAVES

Solutions for Free-Space Conditions; Uniform Plane Wave Propagation; Wave Equations for a Conducting Medium; Sinusoidal Time Variations; Polarization; Conductors and Dielectrics; Direction Cosines; Reflection by Perfect Conductor -Normal and Oblique Incidence, Perfect Dielectric-Normal Incidence, Perfect Insulator –Oblique Incidence; Brewster Angle, Reflection at a Surface of Conductive Medium, Surface Impedance.

BOOKS RECOMMENDED

1. William Hayt, *Engineering Electromagnetics*, McGraw Hill, 7th edition, 2005.
2. Halliday D., Resnick R. and K. S. Krane, *Engineering Electromagnetics*, Volume II, Wiley-Hayt, TMH.
3. Edward C. Jordan and Keith G Balmain, *Electromagnetic Waves and Radiating Systems*, Prentice- Hall Inc.
4. Kraus John D., *Electromagnetics*, McGraw-Hill Publishers.
5. Edminister Joseph A., Schaum's, *Theory and Problems of Electromagnetics*, McGraw-Hill.
6. David J Griffiths, *Introduction to Electrodynamics*, PHI, 3rd edition, 2008.

EE-14404 POWER SYSTEM - I (Transmission & Distribution)

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Calculate and justify the economical size of conductor to be used in power system.
- Distinguish and propose the types of transmission lines on the basis of tower and conductor configuration.
- Evaluate surge impedance loading and string efficiency of insulators.
- Construct the circle diagram of long transmission line based on ABCD constants.
- Compare the different types of underground cables and perform tests on these cables.
- Understand line parameters of transmission lines and judge its effects on efficiency of transmission line

CONTENTS**1. POWERSUPPLY SYSTEM**

Introduction to Transmission and Distribution systems, Comparison between DC and AC systems for Transmission and Distribution, comparison of cost of conductors, choice of working voltage for transmission and distribution, economic size of conductors - Kelvin's law, Radial and mesh distribution networks, Voltage regulation.

2. TRANSMISSION LINE CONSTRUCTION

Conductor materials; solid, stranded, ACSR, hollow and bundle conductors. Different types of supporting structures for overhead lines, Elementary ideas about transmission line construction and erection, Stringing of conductors, spacing, sag and clearance from ground, overhead line insulators, concept of string efficiency.

3. TRANSMISSION LINE PARAMETERS

Introduction to line parameters, Resistance of transmission line, inductance of single phase two wire line, concept of G.M.D., Inductance of three phase line, Use of bundled conductor, transposition of power lines, capacitance of 1-phase and 3-phase lines, effect of earth on capacitance of conductors.

4. PERFORMANCE OF TRANSMISSION LINES

Representation of short transmission line, medium length line (nominal T & π circuits), long length line by hyperbolic equations and equivalent T & π circuits, Power flow through transmission lines, ABCD constants, Voltage regulation.

5. CIRCLE DIAGRAM AND LINE COMPENSATION

Receiving end circle diagram for long transmission lines based on ABCD constants, equivalent-T circuits, power loci, surge impedance loading, reactive power requirement of system series and shunt compensation, Synchronous phase modifiers, rating of phase modifiers.

6. UNDERGROUND CABLES

Classification of cables based upon voltage and dielectric material, insulation resistance and capacitance of single core cable, dielectric stress, Capacitance of 3 core cables, methods of laying, testing of cables, heating effect, Maximum current carrying capacity, causes of failure, comparison with overhead transmission lines.

BOOKS RECOMMENDED

1. Elgerd O. I., *Electrical Energy System Theory - An introduction*, Tata McGraw-Hill Publication.
2. Gupta B.R., *Power System Analysis & Design*, Wheeler Publishing.
3. Nagrath I.J. and Kothari D.P., *Power System Analysis*, Tata McGraw-Hill Publication.
4. Stevenson Jr. W.D., *Elements of Power System Analysis*, Tata McGraw-Hill Publication.
5. Wadhwa C.L., *Course in Electrical Power*, New Age International (P) Ltd.

EE-14405 DIGITAL ELECTRONICS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the difference between analog and digital systems.
- Retrieve different laws and rules of Boolean algebra.
- Analyze the steps involved in designing digital systems which involve combinational, sequential and state machines.
- Acquire programming skills in VHDL.
- Create different digital to analog and analog to digital Converter.
- Understand the concept of semiconductor memories and create digital specific application based working projects.

CONTENTS**1. NUMBER SYSTEM & CODES**

Review of numbers system and conversions, BCD Code, Gray code, signed & unsigned binary numbers, 1's & 2's complement of a number, different types of codes, Binary operations- addition, subtraction, multiplication, division, Parity for error detection, Check sum and Hamming Code for error detection and correction.

2. COMBINATIONAL CIRCUITS

Review of Logic gates, Concept of positive and negative logic, Introduction to Boolean operations and expressions, Laws and rules of Boolean algebra and De-Morgan's Theorem, Standard forms of Boolean expressions, Duality, Minimization of logical functions using Karnaugh maps. Combinational Logic Analysis Basic combinational logic circuits, Universal property of NAND and NOR gates, adders, comparators, decoders, encoders, code converters, multiplexers, demultiplexers, parity generators and parity checkers.

3. SEQUENTIAL LOGIC CIRCUITS

Latches, Edge triggered and clocked flip-flops (SR, D, JK and T), Flip-Flop operating characteristics and applications. Analysis of Synchronous & Asynchronous circuits, Counters: Synchronous & Asynchronous counters, Up and Down counters. Design of synchronous counters and counter applications. Registers: Series and Parallel registers. Bidirectional shift registers and shift register applications.

4. INTRODUCTION TO VHDL

Overview of digital design with very-high-speed integrated circuits (VHSIC) hardware description language (VHDL), HDL format and Syntax, entity, Data representation in VHDL, Truth table using VHDL, Decision Control structure and Sequential Circuit using VHDL.

5. DIGITAL TO ANALOG (D/A) AND ANALOG TO DIGITAL (A/D) CONVERTERS

Introduction, weighted register *D/A* converter, binary ladder, *D/A* converter, specifications for *D/A* converters, parallel *A/D* converter, successive approximation *A/D* converter single & dual slope *A/D* converter, *A/D* converter using voltage to frequency conversion, *A/D* converter using voltage to time conversion, countertype *A/D* converters.

6. SEMICONDUCTOR MEMORY

Basics of semiconductor memories, Random-Access memories (RAM), Read Only Memories (ROM), Programmable ROM's and Flash Memories. Programmable Logic Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Complex programmable logic devices (CPLD), Field Programmable Gate Array (FPGA).

BOOKS RECOMMENDED

1. Floyd Thomas S., *Digital Fundamentals*, Pearson Education.
2. Jain R.P., *Modern Digital Electronics*, Tata McGraw Hill.
3. Kumar Anand, *Fundamentals of Digital Circuits*, Prentice Hall of India.
4. Malvino Albert Paul, *Principles of Digital Electronics*, Tata McGraw Hill.
5. Mano Morris, *Digital Logic and Computer Design*, Prentice Hall of India.
6. Tocci Ronald J. Widmer Neal S. and Moss Gregory L., *Digital Systems: Principles and Applications*, Prentice Hall of India.

EE-14406 OBJECT ORIENTED PROGRAMMING

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Compare the features of procedural-programming and object-oriented programming paradigms.
- Explore the control structures of C++ for looping and decision making applications.
- Explore the concept of classes and objects for constructing programs for simple applications.
- Explore alternative and efficient ways to do experimentation with pointers in C++.
- Apply features of object-oriented programming for developing simple C++ programs.
- Explore and incorporate exception and file handling features of C++ programs.

CONTENTS**1. OBJECT-ORIENTED PROGRAMMING CONCEPTS**

Introduction, Comparison between procedural programming paradigm and object-oriented programming paradigm, Basic data types, Derived data types, Constants, Tokens, Keywords, Identifiers and variables, Concepts of an object and a class, Abstraction, Encapsulation, Data hiding, Inheritance, Overloading, Polymorphism, Messaging.

2. CONTROL STRUCTURES

Input and Output statements in C++, Various operators, Operator precedence, if statement, Switch-case, break, go-to, continue, for, while and do-while loops, Dynamic initialization, Type modifiers, Type casting.

3. CLASSES, OBJECTS, FUNCTIONS AND ARRAYS

Implementation of a class, Operations on objects, Relationship among objects, Specifying a class, Creating class objects, Accessing class members, Access specifiers, Static members, Empty classes, Nested classes, Local classes, Abstract classes, Container classes, Bit fields and Classes. Function components, Passing parameters, Call by reference, Call by value, Return by reference, Inline functions, Default arguments, Function prototyping, Overloaded function, Recursion, Array of objects, Dynamic allocation operators, Dynamic objects.

4. DYNAMIC MEMORY MANAGEMENT USING POINTERS

Declaring and initializing pointers, Accessing data through pointers, Pointer arithmetic, Memory allocation (static and dynamic), Dynamic memory management using new and delete operators, Pointer to an object, this pointer, Pointer related problems - dangling/wild pointers, Null pointer assignment, Memory leak and Allocation failures.

5. CONSTRUCTORS, DESTRUCTORS AND OPERATOR OVERLOADING

Need for constructors and destructors, Copy constructor, Dynamic constructors, Explicit constructors, Destructors, Constructors and destructors with static members,_INITIALIZER lists, Order of execution of constructors and destructors. Overloading operators, Rules for overloading operators, Overloading of various operators, Type conversion - basic type to class type, class type to basic type, class type to another class type.

6. INHERITANCE, VIRTUAL FUNCTIONS AND POLYMORPHISM

Introduction, Defining derived classes, Forms of inheritance, Ambiguity in multiple and multipath inheritance, Virtual base class, Objects slicing, overriding member functions, Object composition and delegation. Concept of binding - early binding and late binding, Virtual functions, Pure virtual functions, Abstract classes, Virtual destructors, Function overloading, Friend function.

7. EXCEPTIONS AND FILE HANDLING

Review of traditional error handling, Basics of exception handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an exception, Specifying exceptions. Files Handling: File streams, Hierarchy of file stream classes, Error handling during file operations, Reading/writing of files, Accessing records randomly, Updating files.

BOOKS RECOMMENDED

1. Lafore R., *Object Oriented Programming in C++*, Waite Group.
2. Balagurusamy E., *Object Oriented Programming with C++*, Tata McGraw Hill.
3. Kanetkar Yashwant P., *Let Us C++*, BPB Publications.
4. Bjarne Stroustrup, *The C++ Programming Language*, Addison Wesley.
5. Herbert Schildt, *The Complete Reference to C++ Language*, McGraw Hill-Osborne.
6. Lippman F. B, *C++ Primer*, Addison Wesley.
7. Farrell, *Object Oriented using C++*, Cengage Learning.

EE-14407 LABORATORY-IV: CONTROL SYSTEMS

Internal Marks	: 30	L	T	P	C
External Marks	: 20	0	0	2	1
Total Marks	: 50				

COURSE OUTCOMES

After studying this course, the students will

- Evaluate and imply basic control hardware models in software based approach.
- Check the time domain response and obtain performance parameters of a first order and second order systems.
- Compare linear and nonlinear control characteristics with their applications.
- Analyze errors of physical system models from an electrical equivalent.
- Analyze and explore the applications & characteristics of servo motors.
- Evaluate the concept of stability and able to apply various techniques to find out stability.

LIST OF EXPERIMENTS

- To verify the control action of P, PI and PID controllers and their applications.
- To verify the characteristics of potentiometers and to use two potentiometers as an error detector in a control system.
- To determine the time domain response of a first order and second order system for step input and obtain performance parameters.
- To verify the characteristics of synchro transmitter-receiver set and to use it as an error detector.
- To draw the speed-torque characteristics of a DC servo motor and to explore its applications.
- To draw the speed-torque characteristics of an AC servo motor and explore its applications.
- To verify the variations of time lag by changing the time constant using control engineering trainer.
- To obtain the transfer function of a D.C. motor – D.C. generator set using transfer function trainer.
- To design a Lag compensator and test its performance characteristics.
- To design a Lead-compensator and test its performance characteristics.
- To design a Lead-Lag compensator and test its performance characteristics.
- Design of PID controller using MATLAB/SIMULINK.
- Application of MATLAB to draw a) Root Locus b) Bode plot c) Nyquist Plots for a given control system and predict its stability.

EE-14408 LABORATORY-V: DIGITAL ELECTRONICS

Internal Marks	: 30	L	T	P	C
External Marks	: 20	0	0	2	1
Total Marks	: 50				

COURSE OUTCOMES

After studying this course, the students will

- Identify different types of digital IC's, read their specification sheets and the way to handle these.
- Verify the truth tables of various gates and different laws and rules of Boolean Algebra.
- Design and test different types of combinational and sequential circuits.
- Analyze different types of DAC, ADC and memory devices.
- Create and troubleshoot working projects using digital logic.
- Evaluate performance of digital specific application based working projects.

LIST OF EXPERIMENTS

- Verification of the truth tables of TTL gates viz: 7400, 7402, 7404, 7408, 7432, 7486.
- Design and realization of all gates using NAND/NOR gates.
- Verification of theorems and laws using gates.
- Design and verification of the truth tables of Half-Adder using different gates and Full Adder circuit using 7483 IC.
- Design and verification of the truth table of four bit subtractor using 7483 and 7486 IC's.
- Design and verification of binary to gray code converter or vice-versa.
- Verification of truth table of Multiplexer (74150)/Demultiplexer(74154).
- Design, fabrication and testing of Mon-stable multivibrator of $t = 0.1\text{ms}$ approx. using 74121/123IC. Testing for both positive and negative edge triggering, variation in pulse width and retriggering.
- Design and test S-R flip-flop using NOR/NAND gates.
- Design, fabricate and test a switch debouncer using 7400.
- Verify the truth table of a JK flip flop using IC 7476.
- Verify the truth table of a D flip flop using IC 7474 and study its operation in the toggle and asynchronous mode.
- Operate the counters 7490, 7493 and 74193(Up/Down counting mode). Verify the frequency division at each stage. Using a frequency clock (say 1 Hz) display the count of LED's.
- Verify the truth table of decoder driver 7447/7448. Hence operate a 7 segment LED display through a counter using a low frequency clock. Repeat the above with the BCD to Decimal decoder 7442.

EE-14409 LABORATORY-VI: OBJECT ORIENTED PROGRAMMING

Internal Marks: 30	L	T	P	C
External Marks: 20	0	0	2	1
Total Marks: 50				

COURSE OUTCOMES

After studying this course, the students will

- Perform experimentation for comparing features of procedural-programming and object-oriented programming paradigms.
- Develop C++ programs for simple applications.
- Explore looping and decision making in C++ programs.
- Perform matrix operations in C++.
- Explore alternative and efficient ways to do experimentation with pointers in C++.
- Explore and incorporate exception and file handling features of C++ programs.

LIST OF EXPERIMENTS

- Program to find the area and circumference of the circle
- Program to interchange the values of two numbers.

[Control statements]

- Program to find all roots of quadratic equations.
- 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C++ program to find the 2's complement of a binary number.
- Program to reverse an integer number.
- Write a program that will read the value of x and evaluate the following function: $Y = 2$ for $x > 0$, $Y = 0$ for $x = 0$. Use nested statements with the conditional control statement.
- Program to display the different colors using the switch statement.

[Arrays and Strings]

- Program to find the minimum and maximum element of an array and to do bubble sorting
- Program to perform different operations on matrices including – addition, subtraction, multiplication, transpose.

[Classes and Objects]

- Program to illustrate the concept of classes and object.
- Program to illustrate the concept of nesting of member functions.
- Program to illustrate the concept of inline function within a class.
- Program to show the working of static members in a class.

[Constructors and Destructors]

- Program to illustrate the concept of default constructor, parameterized constructor and copy constructor.

15. Program to illustrate the concept of destructors.

[Overloading and Type Conversions]

16. Program to overload the unary operator and binary operator.
17. Program to illustrate the concept of type conversions basic to class type, class to basic type, class to class type.

[Inheritance]

18. Program to illustrate the concept of inheritance.
19. Program to illustrate the concept of ambiguity in multiple inheritance.
20. Program to illustrate the concept of virtual base class in inheritance.
21. Program to illustrate the order of execution of constructors and destructors in inheritance.

[Polymorphism]

22. Program to illustrate the concept of overloaded function having different number of arguments in the different overloaded forms.
23. Program to illustrate the concept of virtual functions and pure virtual functions.

[File handling]

24. Program to illustrate the concept of file pointers.
25. Program to perform read and write operations on a file.

EE-14501 SYNCHRONOUS MACHINES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the principle, construction and analyze the operation of synchronous machine as an alternator, synchronous motor and compensator.
- Evaluate different methods of voltage regulation and analyze the performance of synchronous machines for drawing the various associated phasor diagrams.
- Understand parallel operation of alternators with infinite bus with study of load sharing.
- Identify, formulate and solve synchronous machine related problems.
- Evaluate the starting methods of synchronous motor.
- Comprehend industrial problems associated with synchronous machines.

CONTENTS**1. INTRODUCTION**

Construction and Working Principle of Synchronous Machines, Excitation Systems, Production of Sinusoidal Electromotive Force (EMF), Flux and Magneto Motive Force (MMF) Phasors in Synchronous Machines, Cylindrical and Salient Pole Rotors, Classification of Windings, Pitch Factor, Distribution Factor, Electromagnetic Force Equation.

2. ALTERNATORS

Construction, Phasor Diagram of Cylindrical Rotor Alternator, Ratings, Nature of Armature Reaction, Determination of Synchronous Reactance, Open-Circuit Characteristics, Short-Circuit Characteristics, Short-Circuit Ratio, Short-Circuit Loss, Effect of Variation of Power Factor on Voltage. Determination of Voltage Regulation: EMF Method, MMF Method, Zero Power Factor (Z.P.F) Method, Alternator on Infinite Bus Bar, Operation at Constant Load and Variable Excitation, Power Flow through Inductive Impedance, Power-Angle Characteristics of Synchronous Machines - Cylindrical and Salient Pole, Two Reaction Theory of Salient Pole Machines, Power Factor Control.

3. PARALLEL OPERATION OF ALTERNATORS

Conditions for Proper Synchronizing for Single Phase and Three Phase Alternators, Conditions for Parallel Operation, Synchronizing Power, Current and Torque, Effect of Increasing Excitation of one of the Alternators, Effect of Change of Speed of one of the Alternators, Effect of unequal Voltages, Load Sharing.

4. TRANSIENTS

Transient Reactance's and Time Constants from Equivalent Circuits, Synchronous Machine Reactance's and their Determination, Short Circuit Oscillogram, Synchronization with the Grid System, Qualitative Introduction to the Transient Stability of the Synchronous Machines.

5. SYNCHRONOUS MOTORS

Operating Characteristics, Power-Angle Characteristics, Conditions for Maximum Power Developed, V-Curves and Inverted V-Curves, Methods of Starting, Synchronous Motors Applications, Synchronous Condensers, Hunting and Damper Windings, Single Phase Synchronous Motors: Reluctance and Hysteresis Motors.

BOOKS RECOMMENDED

1. Bimbhra P.S., *Electrical Machinery*, Khanna Publishers.
2. Fitzgerald A.E., Kingsley C. and Umans S.D., *Electric Machinery*, 6th Edition, McGraw Hill.
3. Langsdorff E.H., *Principles of D.C. machines*, McGraw Hill.
4. Nagrath I.J. and Kothari D.P., *Electrical Machines*, 4th Edition, Tata McGraw Hill.
5. Say M G, *Alternating Current Machines*, 5th Edition, Sir Isaac Pitman and Sons Ltd.

EE-14502 NUMERICAL & STATISTICAL TECHNIQUES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Apply the knowledge gained from numerical techniques in solving engineering and research problems.
- Evaluate Linear & Non Linear equations via methods of convergence.
- Create the suitable numerical and statistical technique for better and faster solutions.
- Evaluate Differentiation and Integration problems using iteration approach.
- Apply the gained knowledge for application in probabilistic approach.
- Create and evaluate Sampling Distribution problems.

CONTENTS**1. FLOATING POINT NUMBERS & CURVE FITTING**

Floating-Point Representation, Rounding, Chopping, Error Analysis, Condition and Instability, Method of Least Squares, Fitting of Simple Curves using Least Squares Method, Regression and Correlation(Two Variables Case Only).

2. LINEAR & NON-LINEAR EQUATIONS

Gauss-Elimination Method (using Pivoting Strategies) and Gauss-Seidel Iteration Method, Rayleigh's Power Method for Eigen-Values and Eigen-Vectors, Bisection, Fixed-Point Iteration and Newton-Raphson Methods, Order of Convergence.

3. NUMERICAL DIFFERENTIATION & INTEGRATION

Solution of Initial Value Problem using Taylor Series, Euler's and Runge-Kutta (up to fourth order) Methods, Statistical Methods, Newton-Cote's Quadrature Formula (With Error) and Gauss-Legendre Quadrature Formula, Interpolation: Lagrange's Formula with Error, Divided Difference, Newton's Divided Difference Formula, Finite Difference Time Domain (FDTD), Boundary Element Method (BEM), Methods of Moments, Finite Element Methods (FEM), Applications in electromagnetic field problems.

4. RANDOM VARIABLES, SPECIAL PROBABILITY & SAMPLING DISTRIBUTION

Definition, Probability Distribution, Distribution Functions, Probability Distribution Function and Cumulative Distribution Function, Expectation and Variance, Binomial, Poisson, Geometric and Exponential Distributions, Population and Samples, Concept of Sampling Distributions, Sampling Distribution of Mean, Chi-Square, T and F Distributions, Tests of Hypotheses: Basic Ideas, Important Tests based on Normal, Chi-Square, T and F Distribution.

BOOKS RECOMMENDED

1. Kendall Atkinson, *An Introduction to Numerical Methods and Analysis*, 2nd edition, Wiley Publishers.
2. Conte, S.D and Carl D. Boor, *Elementary Numerical Analysis: An Algorithmic Approach*, Tata McGraw Hill, New York.
3. Benoîte de Saporta, Francois Dufour, Huilong Zhang, *Numerical Methods for Simulation & Optimization Piecewise Deterministic Processes Markov*, Wiley, 2015.
4. Johnson, R., Miller, I. and Freunds J., *Probability and Statistics for Engineers*, 7th edition, Pearson Education.
5. Mathew, J.H., *Numerical Methods for Mathematics, Science and Engineering*, Prentice Hall Inc.J.
6. Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L. and, Keying Ye, *Probability and Statistics for Engineers and Scientists*, 8th edition, Pearson Education.
7. Sastry S.S., *Introductory Methods of Numerical Analysis*, 3rd edition, Prentice Hall India.

EE-14503 INDUSTRIAL ELECTRONICS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Acquire knowledge about fundamental concepts of industrial electronics.
- Analyze various thyristor commutation techniques used in industrial electronics.
- Comprehend different single phase and three phase power converter circuits.
- Understand categorization of chopper as per necessity of industrial electronics application.
- Develop skills to propose cycloconverter circuits for various applications.
- Foster ability to understand the use of inverters in commercial and industrial applications.

CONTENTS**1. THYRISTORS AND THEIR CHARACTERISTICS**

Introduction to Thyristor Family, V-I Characteristics of SCR, SUS, GTO, LASCR, DIAC, TRIAC, Principle of Operation of SCR, Turn on Methods of a Thyristor, Switching Characteristics of Thyristors during Turn-on and Turn-off, Gate Characteristics, Firing of Thyristors, Series and Parallel Operation of SCR, Protection of SCR from Over Voltage and Over Current.

2. THYRISTOR COMMUTATION TECHNIQUES

Load Commutation (Class A), Resonant-Pulse Commutation (Class B), Complementary Commutation (Class C), Impulse Commutation (Class D), External Pulse Commutation (Class E), Line commutation (Class F).

3. PHASE CONTROLLED TECHNIQUES

Introduction to Phase angle Control, Single Phase Half Wave Controlled Rectifiers, Single Phase Half Controlled and Full Controlled Bridge Rectifiers with RL Load, Three Phase Full Controlled Bridge Rectifiers with R and RL Load. Basic Circuit and Principle of Operation of Dual Converter with Circulating and Non-Circulating Current mode of operation, Applications of Rectifiers and Dual Converters to Control the Speed of DC Motors.

4. CHOPPERS

Introduction and Principle of Chopper Operations, Control strategies, Chopper Configurations, Regenerative Chopper, Voltage Commutated Chopper, Current Commutated Chopper, Load Commutated Chopper.

5. CYCLOCONVERTERS

Basic Circuit and Operation of Single Phase Cycloconverter, Single Phase Bridge Cycloconverter, Three Phase to Single Phase Cycloconverter, Advantages and Disadvantages of Cycloconverter.

6. INVERTERS

Introduction, Operating Principle of Single Phase Inverter, Three Phase Bridge Inverter, VSI, CSI, Voltage Control (PWM Control) and Reduction of Harmonics in the Inverter Output Voltage.

BOOKS RECOMMENDED

1. Bimbhra P.S., *Power Electronics*, Khanna Publishers.
2. Singh M.D. and Khanchandani K.B., *Power Electronics*, Tata McGraw Hill Publishing Company Limited.
3. Rashid M.H., *Power Electronics*, PHI.
4. Sen P.C., *Power Electronics*, Tata McGraw Hill Publishing Company Limited.

EE-14504 INSTRUMENTATION ENGINEERING

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Demonstrate different types of electronic instruments and their usages.
- Identify the use of CRO and DSO.
- Understand the principle of various digital instruments.
- Identify different types of transducers.
- Apply knowledge of transducers for measurement of various parameters.
- Demonstrate the techniques related to end devices.

CONTENTS**1. ELECTRONIC INSTRUMENTS**

Electronic Voltmeter and Current Probes, Tuned Type and Sampling type Voltmeter, Current Probes for D.C. and A.C. Measurements, Electronic Multimeter - Construction, Measurement of D.C. and A.C. Voltage and Current, Measurement of Resistance. CRO- Construction, Synchronization, Measurement of Voltage, Current, Phase and Frequency, DSO- Working and Operation.

2. DIGITAL INSTRUMENTS

Comparison of Analog and Digital Instruments, Digital Voltmeter, Multimeter and Frequency Meter.

3. TRANSDUCERS

Block Diagram Representation of Instrumentation System, Terminology and Definition, Classification, Transducing Principles and Elements, Ultrasonic, Optical and Infrared Sensors, Inductive, Capacitive and Resistive Transducers for Measurements of Length, Thickness, Displacement, Velocity, Torque, Level, Pressure, Temperature, Flow, Humidity, Moisture and pH.

4. END DEVICES

Recorders: X-Y Recorders, Strip-Chart Recorder, Magnetic and Potentiometric Recorder, Digital Displays- LED and LCD, Introduction to Data Acquisition Systems.

BOOKS RECOMMENDED

- Golding Edward William and Widdis Frederick Charles, *Electrical Measurements and Measuring instruments*, Wheelers India
- Bell David A., *Electronics Instrumentation and Measurements*, Prentice Hall, India

3. Reissl and Martin V, *Electrical Measurements Fundamentals, Concepts, Applications*, Wiley Eastern Limited, New Delhi.
4. Sawhney A.K., *A course in Electrical & Electronic Instrumentation*, Dhanpat Rai and Sons.
5. Norton H.N., *Handbook of Transducer for Electronic Measuring system*, Prentice Hall.
6. Mani & Sharma, *Instrumentation Devices & Systems*, Rangon, McGraw Hill.

EE-14505 LABORATORY-VII: ASYNCHRONOUS & SYNCHRONOUS MACHINES

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- a. Construct equivalent circuits for single phase and three phase induction motor by performing no-load and blocked rotor test.
- b. Comprehend the requirement of starting and speed control methods of induction motors in the various applications of industry.
- c. Construct equivalent circuits of synchronous generator and motor.
- d. Apply knowledge to show utility of alternator, synchronous motors and synchronous condenser for various applications in power system.
- e. Construct characteristic curves for induction motors and synchronous machines.
- f. Compare various methods of parallel operation of three phase alternators.

LIST OF EXPERIMENTS

1. To perform no-load and blocked-rotor test on three-phase induction motor and to obtain equivalent circuit parameters.
2. To perform load-test on three-phase induction motor and to plot torque versus speed characteristics.
3. To perform no-load and blocked-rotor test on single-phase induction motor and to determine the parameters of equivalent circuit.
4. To perform load-test on single-phase induction motor and to plot torque-speed characteristics.
5. To perform the speed control methods of three-phase induction motor by a) Kramer's method b) Cascading method.
6. To start the three-phase induction motor using star- delta and DOL starters.
7. To perform no load and short circuit test on three-phase alternator and to draw open circuit & short circuit characteristics.
8. To analyze the effect of variation of field current on the stator current and power factor with synchronous motor running at no load and to draw V-curves & inverted V-curves.
9. To perform parallel operation of three phase alternators using dark lamp method, two-bright and one dark lamp method.
10. To perform parallel operation of three-phase alternators using synchroscope.
11. Application of MATLAB software for solution of problems regarding induction motors and synchronous machines.

EE-14506 LABORATORY-VIII: INDUSTRIAL ELECTRONICS

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Understand the properties and characteristics of thyristors.
- Evaluate and analyze the use of thyristors for different applications like phase control, speed control circuits.
- Acquire fault finding skills in thyristor based circuits.
- Develop thyristor based circuits for industrial use like understanding speed control of motors.
- Understand the different types of waveforms of inverter and chopper circuits
- Design of power saving variable D.C. sources.

LIST OF EXPERIMENTS

- To plot V-I characteristics and study the effect of gate triggering on turning on of SCR.
- To draw V-I characteristics of an UJT and to use UJT as relaxation oscillator.
- To study the effect of free-wheeling diode on power factor for single phase half-wave rectifier with R-L load.
- To plot waveforms for output voltage and current, for single phase full-wave, fully controlled bridge rectifier, for resistive and resistive cum inductive loads.
- To study three phase fully controlled bridge converter and plot waveforms of output voltage, for different firing angles.
- Study of Jones chopper or any chopper circuit to check the performance.
- Thyristorised speed control of a D.C. Motor.
- Speed Control of induction motor using thyristors.
- Demonstration of series inverter circuit.
- Demonstration of commutation circuit.
- Study of a single-phase cycloconverter.

EE-14507 LABORATORY-IX: INSTRUMENTATION & MEASURING DEVICES

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- a. Evaluate the values of power factor, pH
- b. Evaluate the value of frequency
- c. Evaluate the effect of displacement on voltage using a transducer.
- d. Analyze characteristics of thermistor
- e. Evaluate the value of earth resistance
- f. Apply various transducers to measure different physical quantities.

LIST OF EXPERIMENTS

1. To analyze the input-output characteristics of a potentiometer and to use a potentiometer as an error detector.
2. Determination of frequency and phase angle using CRO.
3. To measure insulation resistance by Megger.
4. To measure earth resistance by Earth Tester.
5. To observe phase sequence of three phase circuit using rotating type phase sequence indicator measurement of resistance using wheatstone bridge.
6. To measure frequency of A.C. supply using Weston Frequency Meter.
7. To measure power factor of single phase and three phase load by PF Meter and verifying through current, voltage and power measurement.
8. To measure circuit parameters and three phase load by PF Meter and LCR Meter.
9. Measurement of displacement using LVDT.
10. Temperature measurement using temperature sensor (RTD).
11. Light measurement using LDR and photo cell sensor.
12. Water level measurement using capacitance transducer.
13. Velocity measurement using air flow transducer.
14. RPM measurement using electromagnetic transducers.
15. Analyze the characteristics of a Thermistor.
16. Study of the characteristics of an Electromagnetic Flow meter.
17. To plot the characteristics of a Photo reflective sensor.

EE-14508 LABORATORY-X: NUMERICAL & STATISTICAL TECHNIQUES

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Create programs in C/C++/MATLAB software for practical understanding of numerical methods.
- Evaluate various iterative techniques for finding real roots of an equation.
- Hypothesize and validate interpolation methods.
- Design coding for solving simultaneous linear algebraic equations.
- Analyze the techniques of numerical integration & differentiation.
- Apply the knowledge gained for evaluating numerical & statistical problems.

LIST OF EXPERIMENTS

To develop algorithms/programs in C/ C++/MATLAB language for the following methods

- Bisection method for finding a real root of an equation.
- Newton Raphson method for finding a real root of an equation.
- Iteration method for finding a real root of an equation.
- Gauss elimination method for solving simultaneous linear algebraic equations.
- Gauss Jordan method for solving simultaneous linear algebraic equations.
- Simpson's 1/3rd rule for numerical integration.
- Simpson's 3/8th rule for numerical integration.
- Trapezoidal Rule for numerical integration
- Newton's forward interpolation formula.
- Lagrange's method for interpolation.
- Euler's method for solving ordinary differential equations.
- Modified Euler's method for solving ordinary differential equations
- R-K method for solving ordinary differential equations.
- Electrostatic and Magneto-static problems based on PDE MATLAB.

DEEE-14501RENEWABLE ENERGY RESOURCES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Judge the importance of renewable sources of energy
- Evaluate the effect of non judicious use of conventional sources on environment.
- Analyze the advantages and disadvantages of various schemes for harnessing energy from renewable sources.
- Analyze to compare economics of harnessing power from renewable sources.
- Analyze the solar energy prospectus in India.
- Evaluate the energy harnessing from biomass.

CONTENTS**1. ENERGY RESOURCES**

Renewable Energy Sources, Energy and Global Climatic Change and its Effect on Environment, Environmental Consequences on Society and the Political Responses at National and International Levels.

2. SOLAR, WIND AND GEOTHERMAL ENERGY

Solar Radiation and its Measurement, Solar Thermal Energy Collectors, Solar Thermal Energy Conversion Systems, Solar Photovoltaic System. Wind Systems in India, Wind Turbines and Rotors, Estimation of Wind Energy Potential, Wind Energy Conversion Systems (WECS). Geothermal Sites, Geothermal Field, Geothermal Resources, Geothermal Electric Power Plant.

3. FUEL CELLS AND BIOMASS

Principle of Operation of Fuel Cell, Fuel Processor, Fuel Cell Types, Energy Output of a Fuel Cell, Efficiency, and EMF of a Fuel Cell, Operating Characteristics of Fuel Cells, Thermal Efficiency of a Fuel Cell, Introduction to Biomass as Energy Source, Biodiesel.

4. HYBRID ENERGY SYSTEMS

Hybrid Energy Systems and its types, Hybrid Vehicles, Hydrogen-Powered Vehicles.

5. GREEN ENERGY

Introduction to Green Energy, Concept of Green Buildings and Waste Management, Micro-Mini Hydro Power Systems.

BOOKS RECOMMENDED

1. Kothari DP, Singal KC and Ranjan Rakesh, *Renewable energy sources and emerging technologies*, Prentice Hall ,2nd edition.
2. G.D. Rai, *Non-Conventional Sources of Energy*, Khanna Publishers
3. Bansal N.K., M. Kleemann, M. Heliss, *Renewable energy sources and conversion technology*, Tata McGraw Hill.
4. Abbasi SA, Abbasi N, *Renewable energy sources and their environmental impact*, PHI.
5. Mittal KM, *Renewable energy Systems*, Wheelar Publishing, New Delhi.
6. Mukherjee D, *Renewable energy Systems*, New Age International, New Delhi.

DEEE-14502 ELECTRICAL DESIGN & ILLUMINATION ENGINEERING

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Be able to analyze and evaluate the various types of light sources available.
- Analyze various parameters required for good lighting design.
- Create a general lighting scheme.
- Evaluate the various lighting controls and their applications.
- Understand and apply the various lighting design techniques to create lighting design for various utilities.
- Evaluate the properties of various light sources and hence recommend their installation.

CONTENTS**1. LIGHTING & ITS IMPORTANCE**

Optical Systems of Human Eye, Dependence of Human Activities on Light, Performance Characteristics of Human Visual System, External Factors of Vision-Visual Acuity, Contrast, Sensitivity, Time Illuminance, Color, Visual Perception, Optical Radiation Hazards, Good and Bad Effects of Lighting and Perfect Level of Illumination, Artificial Lighting as substitute to Natural Light, Ability to Control Natural Light, Production of Light, Physics of Generation of Light, Properties of Light, Quantification and Measurement of Light.

2. ILLUMINATION

The Nature of Radiation, Polar Curve, Law of Illumination, Photometry (Photovoltaic Cell, Distribution Photometry, Integrating Sphere, Brightness Measurement), Types of Lamps: Conventional and Energy Efficient, Basic Principle of Light Control, Different Lighting Scheme and their Design Methods, Flood and Street Lighting.

3. LAMP, ACCESSORIES & LUMINARIES

Light Production by Gas Discharge, Fluorescence, Incandescence, Daylight Principle of Operation, Light Efficacy, Color, Electrical Characteristics, Typical Applications, Dimming Condition of GLS Filament, Tungsten Halogen Lamps, Fluorescent Tubes, Compact Fluorescent Lamp (CFL), Low and High Pressure Sodium Lamps, High Pressure Mercury Lamp, Metal Halide Lamp, Functions of Luminaries, Classification, Materials used in Luminaries Manufacturing, Reflection, Refraction, Diffusion, Polarization and Optical Design, Photometric Measurements, LED: Its Use, Ballasts: Types and Applications, Ignitors and their uses.

4. LIGHTING CONTROL

Types of Lighting Controls, Strategy for Selection, Benefits of Lighting Control, Electric Distribution System for Lighting, Maintenance Strategies, Group Replacement Schedule, Techniques of Achieving Energy Efficient Lighting Design, Role of Computers in Lighting Design, Advantages and Limitations of Computer Aided Lighting Design.

5. ILLUMINATION ENGINEERING AND DESIGN

Basics of Lighting Design, Illumination Levels Required as per Standards, Task and Ambient Lighting, Facade Lighting, Lighting Design for a Study Room/Lecture Hall, Introduction to Lighting Design Software's viz. Digilux, Cglux.

BOOKS RECOMMENDED

1. Mamak H.S., *Book on Lighting*, Publisher International lighting Academy.
2. Joseph B. Murdoch, *Illumination Engineering from Edison's Lamp to Lasers*, Visions Communications, 1994.
3. Cayless M.A., A. M. Marsden, *Lamps and Lighting*, Butterworth-Heinemann.

DEEE-14503 ELECTRICAL ENGINEERING MATERIALS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze the different types of chemical bonds.
- Analyze qualitatively the bonding scheme and its general physical properties.
- Analyze the characteristics of different types of materials and calculate its dielectric losses
- Justify the selection of suitable material for manufacturing of carbon brushes , cores and insulating material
- Analyze the classification and applications for magnetic and special materials.
- Create awareness of recent developments in material science and engineering.

CONTENTS**1. INTRODUCTION TO DIELECTRIC MATERIALS**

Static Dielectric Constant, Polarization, Atomic Interpretation of the Dielectric Constant of Mono-Atomic and Poly Atomic Gases, Internal Fields in the Solids and Liquids, Static Dielectric Constants of Solids, Ferroelectric Materials and Spontaneous Polarization, Piezo-Electricity, Frequency dependence of Electronic, Ionic and Orientation Polarization, Complex Dielectric Constant and Dielectric Losses.

2. CONDUCTIVITY OF METALS

Ohm Law and Relaxation Time of Electrons, Collision Time and Mean Free Path, Electron Scattering and Resistivity of Metals, Heat developed in Current Carrying Conductor, Thermal Conductivity of Metals.

3. MAGNETIC MATERIALS

Magnetisation from Microscopic view point, Orbital Magnetic Dipole Movement and Angular Momentum Materials, Diamagnetism, Origin of Permanent Magnetic Dipoles in Material, Paramagnetic Spin Systems.

4. PROPERTIES OF FERROMAGNETIC MATERIALS

Spontaneous Magnetisation and the Curie-Weils Law, Ferromagnetic domains and coercive force, Antiferromagnetic and Ferromagnetic Materials, Magnetic materials for electrical devices, Introduction to Permanent Magnets.

5. SPECIAL PURPOSE MATERIALS

Superconductivity and Nano Materials, Refractory Materials, Structural Materials, Radioactive Materials, Materials used for the Fuses and Carbon Brushes.

BOOKS RECOMMENDED

1. Dekker A.J., *Electrical Engineering materials*, Prentice-Hall.
2. Chalotra G.P., *Electrical Engineering Materials*, Khanna publishers.
3. Seth S.P. and Gupta P.V., *Electrical Engineering materials*, Dhanpat Rai & co.

DEEE-14504 ENERGY AUDITING & MANAGEMENT

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the need, comparison and use of various type of electrical energy resources.
- Understand and compare the basic energy audit report
- Comprehend various energy management standards and justify its implementation
- Acquire the knowledge to use various instruments for energy audit
- Understand the environmental effects and various international protocols
- Analyze the pollution situation and understand clean development mechanism.

CONTENTS**1. ENERGY SOURCES**

Types of Energy, Conventional Sources of Energy, Non-Conventional Sources of Energy, Commercial Energy Production, Current Scenario of Energy in India and World, Need for Energy Conservation.

2. ENERGY AUDIT

Definition, Need, Types of Audit, Preparing an Energy Audit Report, Benchmarking, Sankey Diagram, Calculation of Payback Period.

3. ENERGY MANAGEMENT

Definition, Need, Standards for Energy Management ISO Standards 14001, 50001, Energy Conservation Act 2003, Designated Consumers, Energy Substitution.

4. INSTRUMENTATION

Instruments used for Energy Audit: Power Analyzer, Thermal Analyzer, General Instruments and their use, SCADA, Maximum Demand Controllers, Automatic Power Factor Controllers, Energy Efficient Motors, Soft Starters with Energy Saver, Variable Speed Drives, Energy Efficient Transformers, Electronic Ballast, Occupancy Sensors, Energy Efficient Lighting Controls, Energy Saving Potential of Each Technology.

5. ENERGY AND CLIMATE CHANGE

Energy and Environment, Air Pollution, Climate Change, United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, Clean Development Mechanism (CDM), CDM Methodology and Procedures, Sustainable Development.

BOOKS RECOMMENDED

1. Beggs Clives, *Energy Management Supply and Conservation*, Butterworth Heinemann.
2. Albert Thumann& Paul Mehta, *Handbook of Energy Engineering*, The Fairmont Press, INC.
3. Albert, *Plant Engineers & Manager Guide to Energy Conservation*, Kindle edition.
4. Wayne C, *Energy Management Handbook*, John Willey and Sons.

DEEE-14505 SOLAR TECHNOLOGIES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the basics of solar energy conversion and utilization processes.
- Retrieve knowledge of semiconductors, optical system, energy storage related to photovoltaic system.
- Comprehend the challenges of sustainable energy, processes, designing of photovoltaic systems
- Comprehend and justify the different applications of solar technologies in domestic, commercial and industrial sectors.
- Understand the manufacturing processes involving environmental challenges for gaining carbon credits.
- Plan and evaluate the standalone and grid connected PV system.

CONTENTS**1. SOLAR RADIATION**

Sustainable Sun's Energy in India, advantages and challenges, The Sun-Earth movement and its various angles, Solar Radiation, Measurement of Solar Radiation.

2. EMERGING SOLAR TECHNOLOGIES AND ITS CONCEPTS

Organic Solar Cell, Dye-sensitized Solar Cell (DSC), Thermo-Photovoltaics (TPV) and its material properties and structures.

3. SOLAR PHOTOVOLTAICS MODULES

Solar PV Modules, Series and Parallel Connection of Cells, Design, Structure and Rating of PV Modules, I-V Equation of PV Modules, Effect of Temperature and Solar Irradiation.

4. SOLAR COLLECTORS

Flat-Plate Collectors, Evacuated Tube Collectors, Concentrated photovoltaic collectors (CPC), Parabolic Troughs, Fresnel reflectors, Parabolic and Scheffler dishes, Solar towers.

5. PHOTOVOLTAIC SYSTEM AND APPLICATIONS

Stand-alone PV system configurations, Grid connected PV system, Wire sizing in PV system, Hybrid PV system, Batteries for PV system.

BOOKS RECOMMENDED

1. Solanki C.Singh, *Solar Photovoltaics*, 3rd Edition PHI.
2. Rai, G.D., *Non- Conventional Energy Sources*, Khanna Publishers.
3. Kothari D.P., Singal K.C. and Ranjan R., *Renewable Energy Sources and Emerging Technologies*, Prentice Hall (India).
4. Simon, Christopher A., *Alternate Source of Energy*, Rowman and Little Field Publishers Inc.
5. Rao, S. and Parulekar, B.B., *Energy Technology: Non-Conventional, Renewable and Conventional*, Khanna Publishers.

DEEE-14506 ANALOG INTEGRATED CIRCUITS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand differential and operational amplifiers.
- Understand and read specifications sheets of different types of Op-Amps, 555 timer and other analog IC's.
- Analyze different operations using Op-Amps.
- Evaluate the performance of different operations using Op-amps, 555 timers.
- Apply Op-Amps for different applications and understand the implications of different waveform generators and special function IC's.
- Create and trouble shoot small working projects using Op-amp and other special function IC's.

CONTENTS**1. DIFFERENTIAL AMPLIFIERS**

Single Ended Input, Double ended (Differential) Input, Double ended Output, Common-Mode Operation and Common Mode Rejection, Differential Amplifier Circuit, DC Bias, AC Operation of Circuit, Common Mode Operation of Circuit, Use of Constant Current Source, Current Mirror.

2. OPERATIONAL AMPLIFIERS

Block Diagram of a Typical Op-Amp, Schematic Symbol, Integrated Circuits and their types, IC Package Types, Pin Identification and Temperature Range, Interpretation of Data Sheets, Overview of Typical Sets of Data Sheets, Characteristics and Performance Parameters, Ideal Op-Amp, Equivalent Circuit of Op-Amp, Ideal Voltage Transfer Curve.

3. APPLICATIONS OF OP-AMP

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I And I-to-V Converters, Adder, Subtractor, Instrumentation Amplifier, Integrator, Differentiator, Logarithmic Amplifier, Anti-Logarithmic Amplifier, Comparator, Schmitt Trigger, Precision Rectifier, Peak Detector, Clipper and Clamper, Low Pass, High Pass and Band Pass Butterworth Filter.

4. WAVEFORM GENERATORS AND SPECIAL FUNCTION IC'S

Oscillators, Phase Shift Oscillators, Wein Bridge Oscillator, Square Wave Generator, Triangular Wave Generator, Saw Tooth Generator, Voltage Controlled Oscillator, Timer IC 555, Fixed and

Adjustable Voltage Regulators, IC 723 General Purpose Regulator, Monolithic Switching Regulator, Switched Capacitor Filter, IC MF10, Frequency-to-Voltage and Voltage-to-Frequency Converters.

BOOKS RECOMMENDED

1. Ramakant A. Gayakwad, *Op-Amps and Linear Integrated Circuits*, 3rd Edition, Prentice Hall India.
2. Robert L. Boylestad, Nashelsky Louis, *Electronic devices and Circuit Theory*, 9th Edition, Pearson Education.
3. Robert L. Coughlin, *Op-Amps and Linear Integrated Circuits* 5th Edition.

EE-14601 POWER SYSTEM-II (SWITCH GEAR & PROTECTION)

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze the principle of operation of different types of relays.
- Analyze different types of faults occur in the generator, transformers and transmission line.
- Demonstrate the knowledge for various components used in the relays.
- Evaluate the arc quenching mechanism used in different circuit breakers.
- Design the relay setting for over-current and earth fault relays.
- Create the basic knowledge of power system protection concepts.

CONTENTS**1. SUB-STATION**

Types, Main equipment in substation, substation layout, busbar-arrangements.

2. FUSES

Fuse-types, rating, selection, theory and characteristics, applications.

3. ISOLATOR AND CIRCUIT BREAKERS

Isolating switches functions, types, rating and operation, need for Circuit Breakers, arc phenomenon, theory of Arc Interruption, Recovery Voltage and Restriking Voltage, various types of Circuit Breakers. Principles and constructional details of ACB, Air blast, Minimum Oil, bulk oil, Vacuum Circuit, SF6 Breakers. Different type of operating mechanism and construction of arcing chutes.

4. PROTECTIVE RELAYS

Introduction, classification, constructional features and characteristics of Electromagnetic, Induction, Thermal, Overcurrent, Directional, Distance, Differential, Translay, Negative Sequence. Introduction to Digital and Microprocessor based relays.

5. PROTECTION OF FEEDERS

Time graded protection, Differential and Distance protection of feeders, choice between Impedance, Reactance and Mho relays. Elementary idea about carrier current protection of lines.

6. PROTECTION OF GENERATORS AND TRANSFORMERS

Types of faults on alternator, stator and rotor protection, negative sequence protection, loss of

excitation and overload protection. Types of fault on transformers, percentage differential protection, Gas relays.

7. PROTECTION AGAINST OVER VOLTAGE AND EARTHING

Ground wires, rod gap, impulse gap, valve type and metal oxide arresters, line Arrester/ surge absorber, grounded and ungrounded neutral system, different types of earthing.

BOOKS RECOMMENDED

1. Rao S., *Switchgear and Protection*, Khanna Publishers
2. Chakrabarti A., Soni, M.L. Gupta P.V. and Bhatnagar U.S., *A Textbook on Power System Engineering*, Dhanpat Rai and Co.
3. Wadhawa C.L., *A Course in Electrical Power*, New Age international Pvt. Ltd
4. Badri Ram and Vishwakarma D.N., *Power system Protection and Switchgear*, Tata McGraw Hill
5. Deshpande M.V., *Switchgears and Protection*, Tata McGraw Hill

EE-14602 ELECTRICAL DRIVES & UTILIZATION

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze different motor applications.
- Design various illumination systems.
- Evaluate different heating schemes for a given application.
- Understand process of electroplating.
- Understand technology used in refrigeration and air conditioning.
- Understand different schemes of electric traction and its main components.

CONTENTS**1. ELECTRIC DRIVES**

Electrical drives & Mechanical drives, Concept of electrical drives, Basic features of industrial drives, review of operating and starting characteristics of different types of electric motors for various drives (AC and DC motors). Power semiconductor based drives. Estimation of rating and heating of motors, Load equalization (Fly wheel effect), Drives for particular services.

2. ELECTRIC TRACTION

Introduction to Indian railways system , Electric Locomotive Classes, Various types of Traction system, single phase feeding arrangement prevalent in India. Substation Arrangements, Different Types of Catenary construction and line insulation, Span and Dropper design Calculations.

3. ELECTRIC HEATING

Methods of electric heating, types of electric heating, constructional details and performance of resistance heating furnace. Dielectric heating, Induction heating, Infra-red heating and its applications, Microwave heating.

4. ILLUMINATION

Production of light by different methods, terms used, laws of illumination, Different Artificial light sources, their construction and operating principles, Design of lighting schemes and equipment used for indoor, industrial and flood lighting, LED Lighting, Illumination drivers.

5. REFRIGERATION AND AIR CONDITIONING

Refrigeration system, Domestic refrigeration, Air conditioner, Comfort Air-conditioning, Effective temperature, Concept of Heat Ventilation and Air Conditioning System, Inverter Technology Based Air Conditioning.

6. ELECTROLYSIS

Laws of Electrolysis, Process voltage, current, energy, efficiency, Applications of electrolysis, Electroplating on non-conducting materials.

BOOKS RECOMMENDED

1. Partab H., *Modern Electric Traction*, Dhanpat Rai publications
2. De N.K. and Sen P.K., *Electric Drives*, PHI publication.
3. Berde M.S., *Electric Motor Drives*, Khanna Publishers.
4. Gupta J.B., *Utilization of Electric Power and Electric Traction*, S.K. Kataria and Sons
5. Tripathy S. C., *Electric Energy Utilization and Conservation*, Tata McGraw Hill
6. Taylor E.O., *Utilization of Electric Energy*, Orient Blackswan
7. Hughes Austin, *Electric Motors and Drives: Fundamentals, Types and Applications*, Newnes, (2005)

EE-14603 ELECTRICAL GENERATION & ECONOMICS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Evaluate and compare the performance of conventional and non-conventional energy sources.
- Analyze the load curves and related factors for determining power generation needs.
- Carry out economic analysis of different electric energy generation techniques.
- Evaluate cogeneration plants.
- Plan optimal method of loading turbo generator.
- Justify the need of hydro thermal coordination.

CONTENTS**1. CONVENTIONAL RESOURCES OF ELECTRIC ENERGY GENERATION**

Thermal, Nuclear, Hydro, Gas and Diesel power plants, their layout and components. Selection of power plants: site, number and capacity of units. Types of turbines, introduction to governor & speed regulation, pumped storage, small scale Hydro-Electric plants (mini and micro), Base and Peak load plants.

2. NON-CONVENTIONAL RESOURCES OF ELECTRIC ENERGY GENERATION AND COGENERATION

Drawbacks of conventional energy resources, need and growth of non-conventional and renewable energy resources. Introduction to Magneto Hydro Dynamic system, photo voltaic effect and solar energy, wind energy, geothermal power plants and biomass based electric energy generation, Cogeneration: Definition and scope, Topping and Bottoming Cycles, Benefits, Cogeneration technologies.

3. LOADS AND LOAD CURVES

Types of loads, connected load, maximum demand, demand factor, group and peak diversity factors, chronological load curve, load duration curve, mass curve, load factor, capacity factor, utilization factor, load forecasting.

4. ECONOMICS OF ELECTRIC ENERGY GENERATION

Capital cost of power plants, annual fixed and operating costs, unit cost of electrical energy, and effect of load factor on unit cost, depreciation, objectives and types of electricity tariff, determination of most economic power factor.

5. ECONOMIC OPERATION OF STEAM POWER PLANTS AND HYDRO-THERMAL SCHEDULING

Methods of loading turbo-generators, Input- output curve, Heat rate curve, Incremental cost curves, Method of Lagrangian multiplier, Effect of transmission losses, Co-ordination equations, Iterative procedure to solve co-ordination equations, Advantages of combined operation of plants, Optimal scheduling of hydro-thermal system.

BOOKS RECOMMENDED

1. Deshpande, M.V., *Power plant engineering*, Tata McGraw Hill.
2. Gupta, B.R., *Generation of electric energy*, S. Chand.
3. Nagrath, I.J. and D.P. Kothari, *Power system engineering*, Tata McGraw-Hill Education.
4. Nag, P.K. *Power plant engineering*, Tata McGraw-Hill Education.
5. Wood, A. J. and B. F. Woolenberg, *Power Generation Operation & Control*, Wiley India.
6. Godfrey Boyle, *Renewable energy-power for a sustainable future*, Oxford University Press.
7. Rai, G.D, *Non-conventional energy sources*, Khanna Publishers.

EE-14604 MICROCONTROLLER & PROGRAMMABLE LOGIC CONTROLLERS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- a. Comprehend the importance of 8051 microcontroller and understand its internal architecture.
- b. Acquire programming skills in assembly and C language.
- c. Acquire skill in interfacing peripherals with 8051 microcontroller.
- d. Create and troubleshoot the circuits involving interfacing of 8051 with real world.
- e. Create and troubleshoot simple controllers employing 8051 microcontroller.
- f. Evaluate the performance of 8051 controller and PLC based practical circuits.

CONTENTS

1. INTRODUCTION

Microprocessor, microcontroller and their comparison, The 8051 Architecture: Introduction, 8051 micro-controller hardware, input/output, pins, ports and circuits.

2.8051 ASSEMBLY LANGUAGE PROGRAMMING

The mechanics of programming, assembly language programming process, programming tools and techniques, instruction set (data moving, logical operations, arithmetic operations, jump and call instructions).

3. 8051 PROGRAMMING AND C

Data types and time delay, I/O programming, logic operations, data conversion, accessing code ROM space, data serialization.

4.8051 TIMER AND SERIAL PORT PROGRAMMING

8051 timer, counter and programming Timer 0 &1, introduction to serial communication, connect port RS232 and serial port programming in C.

5.8051 INTERRUPT PROGRAMMING

Programming timer interrupts, external hardware interrupts, serial communication interrupt, interrupt priority.

6. MICROCONTROLLER APPLICATIONS

Interfacing keyboards, LCD displays, Digital-to-Analog (D/A) and Analog-to-Digital (A/D), sensor interfacing and signal conditioning.

7. PROGRAMMABLE LOGIC CONTROLLERS (PLC)

Introduction, operation of PLC, difference between PLC and Hardwired system, difference between PLC and Computer, relay logic and ladder logic, ladder commands and examples of PLC ladder diagram realization, PLC timers, PLC counters, PLC classification.

RECOMMENDED BOOKS:

1. Kenneth J Ayala, *The 8051 Micro Controller-Architecture, Programming and Application*, Penram International Publication.
2. Mazidi M.A. and Mazidi J. G., *The 8051 Microcontroller and Embedded Systems*, Pearson Education.
3. Otter, Job Dan, *Programmable Logic Controller*, P.H. International, Inc, USA.
4. Dunning Gary, *Introduction to PLC's*, Tata McGraw Hill.
5. Kumar Rajesh, *Module on PLCs and their Applications*, NITTR Chandigarh.

EE-14605 LABORATORY-XI: POWER SYSTEM

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Plot characteristics of various transmission lines
- Understand concept of relays and circuit breakers.
- Analyze various protection schemes in power system.
- Plot characteristics of different types of relays.
- Measure the resistance of earth.
- Demonstrate the operation of a circuit breaker.

LIST OF EXPERIMENTS

- To find the ABCD parameters of a Transmission line.
- To obtain the Characteristics of over current and earth fault protection relay.
- To find the operating characteristics of fuse. (HRC or open type)
- To find the earth resistance using three electrodes.
- To draw the characteristics of over current static relay.
- To simulate the different types of faults on transmission line using MiPower software.
- To obtain the characteristics of under voltage and over voltage numeric relay.
- To find the characteristics of bimetallic Relay.
- To draw the characteristics of high speed impedance Relay.
- To find the breakdown strength of transformer oil.
- To find the resistivity of earth using four electrode method.
- To demonstrate the operation of a Circuit breaker.

EE-14606 LABORATORY-XII: ELECTRIC DRIVES

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- Analyze speed and direction control of single phase and three phase electric motors using ac and dc drive.
- Analyze speed control of stepper motor using drives.
- Evaluate methods of speed control of servo motor using drives.
- Conduct and analyze PLC based ac/dc motor control operation.
- Design a set up for microcontroller based speed control of stepper motor and dc motor.
- Understand regenerative/dynamic braking operation of ac motor and dc motor.

LIST OF EXPERIMENTS

- To start and stop the single phase and three phase induction motors using single phase and three phase AC drives.
- To forward and reverse the direction of single phase and three phase induction motors using single phase and three phase AC drives.
- Speed control of DC motor using PWM.
- Speed control of BLDC motor.
- Demonstration of BLDC motor.
- Speed control of stepper motor using drives
- Speed control of induction motor using V/F drives.
- Speed control of servo motor using servo drive.
- PLC based AC/DC motor control operation.
- Microcontroller based speed control of stepper motor.
- Microcontroller based speed control of DC motor.
- Regenerative/ dynamic braking operation of DC motor.
- Regenerative/ dynamic braking operation of AC motor.
- To demonstrate thyristor controlled DC drive.

EE-14607 LABORATORY-XIII: MICROCONTROLLER & PROGRAMMABLE LOGIC CONTROLLERS

Internal Marks : 30	L	T	P	C
External Marks : 20	0	0	2	1
Total Marks : 50				

COURSE OUTCOMES

After studying this course, the students will

- a. Comprehend the importance of 8051 microcontroller, PLC and understand their internal architecture.
- b. Acquire programming, simulation and testing skills in assembly and C language.
- c. Acquire skill in interfacing peripherals, relays, LED, LCD, Keyboard and sensors with 8051 microcontroller.
- d. Create and troubleshoot the circuits involving interfacing of 8051 and PLC with real world.
- e. Create and troubleshoot automatic controllers employing 8051 microcontroller.
- f. Evaluate the performance of 8051 controller and PLC based practical circuits.

LIST OF EXPERIMENTS

1. Demonstration of MCS51 family.
2. Write a program to add and multiply two numbers lying at two memory locations and display the result.
3. Write a program of flashing LED connected to port 1 of the micro-controller.
4. Write a program to show the use of INT0 and INT1.
5. Write a program to control the speed of DC motor.
6. Write a program to control a stepper motor in direction, speed and number of steps
7. Write a program to demonstrate jump, loop and call instruction in microcontroller.
8. Write a program to generate a square wave of different duty cycle in microcontroller
9. Write a program to demonstrate different addressing modes in microcontroller
10. Implementation of different gates using PLC.
11. Implementation of DOL and star delta starter using PLC.
12. Implement basic logic operations, motor start and stop operation using
(i) Timers (ii) Counters
13. Motor forward and reverse direction control using PLC.
14. Make a PLC based control system for conveyor belt.
15. Implement a PLC based traffic light control.
16. PID control using PLC.
17. Temperature and Pressure control using PLC
18. Pneumatic / hydraulic control using PLC

DEEE-14601 POWER SYSTEM OPERATION & CONTROL

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Retrieve characteristic features of power generation in steam units, co-generation plants and hydro-electric units.
- Understand economic dispatch problem.
- Evaluate unit commitment problem and apply various solution methods.
- Understand optimal power flow problem and find its solutions.
- Understand hydro-thermal co-ordination.
- Retrieve the techniques of automatic generation control.

CONTENTS**1. CHARACTERISTICS OF POWER GENERATION UNITS**

Characteristics of Steam Units, Cogeneration Plants and Hydro-Electric Units.

2. ECONOMIC DISPATCH OF THERMAL UNITS

Economic Dispatch Problem, Thermal Dispatching with Network Losses Considered, Penalty Factor, Lambda Iteration method, Gradient method, Newton's method, Base point and Participation factors. Economic Dispatch v/s Unit Commitment, Constraints in Unit Commitment, MATLAB program for the solution of Economic Dispatch Problem

3. OPTIMAL POWER FLOW

Mathematical formulation of OPF Problem, Solution of Optimal Power Flow by Gradient, Newton, LPOPF and Interior Point Methods, MATLAB program for the solution of OPF

4. HYDRO THERMAL CO-ORDINATION

Introduction to Long Range and Short Range Hydro Scheduling, Types of Short Range Scheduling problem, Scheduling energy, the Short term Hydro-Thermal Scheduling problem and its solution by Lambda-Gamma Iteration method and Gradient method, MATLAB program for the solution of short term hydro-thermal scheduling problem.

5. GENERATION CONTROL

Automatic Load Frequency Control, Load Frequency and Economic Dispatch Control, Automatic Voltage Control, Decentralized Control, SIMULINK model of ALFC

BOOKS RECOMMENDED

1. Wood Allen J. and Brace F. Woollenberg, *Power Generation Operation and Control*, John Willey & Sons.
2. Kothari D.P. and J .S. Dhillon, *Power System Optimization*, Prentice-Hall of India, Pvt. Ltd, New Delhi
3. Kirchmayer L.K., *Economic Operation of Power Systems*, John Willey & Sons, N.Y.
4. Kothari D. P. and I. J. Nagrath, *Modern Power System Analysis*, Tata McGraw- Hill Publishing Company Ltd., New Delhi.
5. Sttphen J. Chapman, *MATLAB[®] Programming for Engineers*, THOMSON.

DEEE-14602 COMPUTER AIDED ELECTRICAL MACHINE DESIGN

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the general concepts of electrical machine design.
- Acquire knowledge about various insulating materials used in electrical machine design.
- Alleviate the problems of electric machine design by using different design techniques.
- Understand the different ways of cooling and ventilation of electric machine.
- Calculate the heat losses and efficiency in the electric machines.
- Analyze, design, model and synthesize of Transformers and Induction motors.

CONTENTS**1. GENERAL CONCEPTS OF ELECTRICAL MACHINE DESIGN**

Basic considerations & Limitations in design, specific magnetic and electric loadings, output, real and apparent flux densities, separation of main dimensions for D.C., induction and synchronous machines. Review of different types of insulating materials used in electrical machines.

2. HEATING, COOLING AND VENTILATION

Introduction, Modes of heat transfer, Temperature rise calculation, continuous, short time and intermittent ratings, methods of ventilation and cooling.

3. DESIGN OF TRANSFORMERS

General considerations, output equation, main dimensions, leakage reactance, winding design, tank and cooling tubes, calculation of magnetizing current, losses, efficiency and regulation. Recent advances in design of transformer.

4. DESIGN OF THREE-PHASE INDUCTION MOTORS

General considerations, output equation, choice of specific electric and magnetic loadings, No. of slots in stator and rotor, elimination of harmonic torques, design of stator and rotor windings, leakage reactance, equivalent resistance of squirrel cage rotor, magnetizing current, temperature rise and efficiency. Recent advances in the design of induction motors.

BOOKS RECOMMENDED

- Sawhney A. K., *A Course in Electrical Machine Design*, Dhanpat Rai.
- Aggarwal R. K., *Principles of Electrical Machine Design*, S. K. Kataria & Sons.
- Juha Pyrhonen, Tapani Jokinen and Valeria Hrabovcova, *Design of Rotating Electrical Machines*, Wiley Publication.

4. Fitzgerald A.E., Charles Kingsley, Jr, and Stephan D, Umanx, *Electric Machinery*, Tata McGraw Hill.

DEEE-14603 OPTIMIZATION TECHNIQUES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOME

After studying this course, the students will

- Develop mathematical modeling of operation research problems.
- Solve linear programming problems using graphical, simplex, Big M and two-phase simplex methods.
- Understand basic concept of duality of linear programming.
- Perform sensitivity analysis of linear programming problems.
- Develop mathematical model and solution of transportation and assignment problems.
- Understand and apply integer programming to the mixed-integer problems

CONTENTS**1. INTRODUCTION**

Definition of operation research, models in operation research, general methods for solving O.R. models Elementary theory of convex sets, Linear programming problems, examples of LPPs, mathematical formulation of the mathematical programming problems, Graphical solution of the problem, Simplex method, Big M method, Two Phase method, problem of degeneracy.

2. DUALITY IN LINEAR PROGRAMMING

Concept of duality, fundamental properties of duality, duality theorems, complementary slackness theorem, duality and simplex method, dual simplex method.

3. SENSITIVITY ANALYSIS

Discrete changes in the cost vector, in the requirement vector and in the co-efficient matrix.

4. TRANSPORTATION PROBLEM

Introduction, mathematical formulation of the problem, initial basic feasible solution, optimum solution, degeneracy in transportation problems, transportation algorithm, unbalanced transportation problems.

5. ASSIGNMENT PROBLEMS

Introduction, mathematical formulation of an assignment problem, assignment algorithm, unbalanced assignment problems.

6. INTEGER PROGRAMMING

Introduction, Gomory's all-IPP method, Gomory's mixed-integer method, Branch and Bound method. Games and Strategies : Introduction, Two person zero sum games, Maximum,

Minimum, Principle; Games without saddle points, Mixed Strategies, Graphical solution, Dominance property, Reducing the game problem to a LPP.

RECOMMENDED BOOKS

1. Swarup Kanti, *Operations Research*, Sultan Chand and Sons, New Delhi, P. K. Gupta and Man Mohan
2. Mohan Chander and Kusum Deep, *Optimization Techniques*, New Age International, 2009.
3. G. Hadley, *Linear Programming*, Addison-Wesley

DEEE-14604 ENERGY CONVERSION

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOME

After studying this course, the students will

- Understand and retrieve fundamentals of electrical engineering.
- Understand the different energy conversation techniques.
- Prepare the different techniques of conversion and its application.
- Evaluate the performance of pumps and flow control strategies.
- Understand and justify the choices of luminance requirements.
- Carry out the process of selecting diesel generating system.

CONTENTS**1. BASICS OF ELECTRICAL ENGINEERING**

Fundamentals of Electricity: Concepts of different electrical parameters like voltage, current, frequency, D.C and A.C circuits, Electrical power and energy. Transformers, Generators, Alternators, Conversion of Thermal, Chemical, Electromagnetic and Mechanical energy into Electrical energy.

2. ELECTRICAL ENERGY SOURCES

Importance of Electrical energy in modern industrial society, Production of electricity using coal, oil, natural gas, nuclear fuels and hydel-its relative advantages and disadvantages (i.e. conversion of Thermal, Nuclear, hydel energy into electric energy),Electricity generation using Renewable Energy Sources: Basic Principles and Applications. (Conversion of Electromagnetic energy and natural energy sources like solar radiation, Wind, Ocean waves, Solid waste etc. to electricity),Conversion of chemical energy into electrical energy (fuel cell),Thermal power plant, nuclear power plants and hydroelectric power plant, Transmission and distribution of electricity, Villages electrification program and problems in India.

3. ELECTRICAL AND MECHANICAL ENERGY UTILITY SYSTEMS

Conversion of Electrical Energy to Mechanical Energy (Electric Motors).Electric Motors: Types, Losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, Energy efficient motors. Compressed Air System: Types of air compressors, compressors efficiency, efficient compressors operation, Compressed air system components, capacity assessment, and leakage test, factors affecting the performance. Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies. Pumps and Pumping Systems: Types, performance evaluation, efficient system operation, flow control strategies, variable speed drives. Cooling Towers: Types and

performance evaluation, efficient system operations, flow control strategies, assessment of saving opportunities. Illumination / Lighting Systems: Light source, choice of lighting, luminance requirements, electronic ballast, occupancy sensors, energy efficient lighting control. Diesel generating systems: Factors affecting selection, energy performance assessment of diesel conservation avenues.

BOOKS RECOMMENDED

1. Archie W. Culp, *Principles of energy conversion*, McGrawHill, 1979.
2. Kettani M. Ali, *Direct energy conversion*, Addison-Wesley Pub. Co., 1970
3. Desai B.V., *Alternative Liquid fuels*, New Age International.
4. Hogde B.K, *Analysis and design of Energy Systems*, Prentice hall 1988.

DEEE-14605 ROBOTIC CONTROL SYSTEM

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand basic terminologies of Robotics.
- Implement elements of robotics practically.
- Understand differential motion planning and robot control system.
- Paraphrase kinematics and robotic controls.
- Recognize dynamic modelling.
- Understand robotics control dynamics.

CONTENTS**1. INTRODUCTION AND TERMINOLOGIES**

Definition and Origin of Robotics, Classification of Robotics, Various Generations of Robotics, Degrees of Freedom, Science and Technology of Robotics.

2. ELEMENTS OF ROBOTS -- JOINTS, LINKS, ACTUATORS, AND SENSORS

Position and Orientation of a Rigid Body, Homogeneous Transformations, Representation of Joints, Link Representation using D-H parameters, Examples of D-H parameters and Link Transforms, Different kinds of Actuators – Stepper, DC servo and Brushless Motors, Model of a DC Servo Motor, Types of Transmissions, Purpose of Sensors, Internal and External Sensors, Common Sensors – Encoders, Tachometers, Strain Gauge based Force-Torque Sensors, Proximity and Distance measuring Sensors

3. KINEMATICS OF ROBOTS

Mechanism Matrix representation, Modeling Kinematic chains, Robot joints, Co-ordinates, reference frame-workspace Robots, Direct and Inverse Kinematics problems-solution, Degeneracy and Dexterity

4. DIFFERENTIAL MOTION PLANNING AND ROBOT CONTROL SYSTEM

Joint and Cartesian Space Trajectory Planning and Generation, Classical Control concepts using the example of Control of a Single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and Experimental case studies on Serial and Parallel Manipulators, Control of Constrained Manipulators, Cartesian control, Force control and Hybrid position/force control, Advanced topics in Non-Linear control of Manipulators.

5. DYNAMIC MODELING

Models of Flexible links and joints, Kinematic modeling of multi-link Flexible Robots, Dynamics and Control of Flexible link Manipulators, Introduction to some well-known Wheeled Mobile Robots (WMR), Two and Three Wheeled WMR on flat surfaces, Slip and its modeling

BOOKS RECOMMENDED

1. Mittal R.K and I. J. Nagrath, *Robotics And Control*, Tata Mac Graw Hill.
2. Saeed B. Niku, *Introduction to Robotics*, Pearson Education.
3. Klafter R.D, T.A. Chmielewski and Michael Negin, *Robotic Engineering-An integrated approach*, Prentice Hall of India.
4. Reza N. Jazar, *Theory of Applied Robotics Kinematics, Dynamics and Control*, Springer.

DEEE-14606 PROCESS DYNAMICS AND CONTROL

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Create procedure models of different processes.
- Analyse the performance of Single Loop Regulatory Control.
- Evaluate & deconstruct controller tuning.
- Evaluate Model Based Control Schemes.
- Create and design controllers for interacting multivariable systems.
- Interpolate Optimal Control Systems.

CONTENTS**1. PROCESS DYNAMICS AND CONTROL ELEMENTS**

Need for Process Control, Mathematical models of various control systems, Continuous and batch processes, Self-regulation, Servo and Regulatory Operations, Lumped and Distributed parameter models, Linearization of non-linear systems. I/P converters, pneumatic and electrical actuators, valve positioner, Selection Criterion, Cavitation and Flashing, Introduction to Multivariable control, multivariable PID controller, Predictive PID control, Control Schemes for Distillation Column, CSTR (Continuous stirred tank reactors).

2. CONTROL ACTIONS AND SINGLE LOOP REGULATORY CONTROL

Characteristics of Proportional Derivative and Integral Controllers, Introduction to Tuning and Evaluation Criteria's, Process Reaction Curve method, Z-N and Cohen Coon methods, Continuous Cycling and Damped Oscillations method

3. MODEL BASED CONTROL SCHEMES

Cascade control, Split Range control, Feed Forward control, Ratio control, Inferential control, Override control, Smith Predictor control scheme, Internal model controller, IMC PID controller, Single Loop Dynamic Matrix Control, Generalized Predictive control.

4. MULTIVARIABLE SYSTEM AND MULTILoop REGULATORY

Multivariable systems, Transfer Matrix representation, Poles and Zeros of MIMO systems, Multi loop control- introduction, process interaction, Pairing of inputs and outputs, Relative Gain Array (RGA)- properties and application, Multi-loop PID Controller, Decoupling Control.

5. OPTIMAL CONTROL SYSTEMS

Parameter optimization, Servo mechanism, Regulators, Optimal Control problems, Transfer Function approach, State Variable approach, State Regulator problem, Infinite Time Regulator

problem, Output Regulator and Tracking problems- LQR(Linear quadratic regulation) & LQG(Linear quadratic gaussian).

BOOKS RECOMMENDED

1. Coughanour D.R., *Process Systems analysis and Control*, 2nd Edition, McGraw-Hill.
2. Smith C.A. and A.B. Corripio, *Principle and Practice of Automatic Process Control*, 3rd ed., John Wiley and Sons, 2005
3. Seborg E., T.F. Edgar, and D.A. Millichamp, *Process Dynamics and Control*, 2nd Edition, John Wiley and Sons, 2004.

OEEE-14601 NON-CONVENTIONAL ENERGY SOURCES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	0	0	3
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze the global and national energy scenario as regards to energy crisis.
- Evaluate the economic aspects of MHD generation.
- Analyze the available solar potential in India.
- Evaluate the various technologies for harnessing solar energy.
- Evaluate the application of fuel cell in diverse fields.
- Evaluate the energy harnessing from biomass, wind, geothermal, tidal and other non conventional sources of energy.

CONTENTS**1. INTRODUCTION**

Global and National energy scenarios, Limitation of conventional energy sources, need and growth of alternative energy source, Energy-Environment interaction, basic scheme and application of direct energy conservation.

2. MHD GENERATORS

Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of Magneto-Hydro-Dynamic (MHD) generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.

3. SOLAR ENERGY AND PHOTOVOLTAIC EFFECT

Solar energy in India, Solar radiation analysis, diode equivalent circuit of PV cell, solar collectors, Applications of solar energy viz solar furnace, Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency.

4. FUEL CELLS

Principle of Operation of Fuel Cell, Gibb's free energy, general description of fuel cells types, construction, operational characteristics and applications.

5. MISCELLANEOUS SOURCES

Geothermal system, hydro-electric plants, wind power, tidal energy, Bio-mass energy, biodiesel, thermo-electric generator

BOOKS RECOMMENDED

1. Gupta B. R., *Generation of Electrical Energy*, S. Chand.
2. Rai G.D., *Non-Conventional Energy Sources*, Khanna Publishers (2005).
3. Rao, S. and Parulekar, B.B., *Energy Technology: Non-Conventional, Renewable and Conventional*, Khanna Publishers (2005).
4. Wadhwa, C.L., *Generation Distribution and Utilization of Electric Energy*, New Age International (P) Limited, Publishers (2007).
5. Simon, Christopher A., *Alternate Source of Energy*, Rowman and Little Field Publishers Inc.(2007).
6. Venikov, V.A. and Putyain, E.V., *Introduction to Energy Technology*, Mir Publishers (1990).
7. Chakrabarti A., Soni M. L., Gupta P. V. and Bhatnagar U. S., *Power System Engineering*, DhanpatRai and Co.
8. Kothari D.P., Singal K.C. and Ranjan R., *Renewable Energy Sources and Emerging Technologies*, Prentice Hall (India)

OEEE-14602 ENERGY AUDITING AND MANAGEMENT

Internal Marks : 40	L	T	P	C
External Marks : 60	3	0	0	3
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the need, comparison and use of various type of electrical energy resources.
- Understand and compare the basic energy audit report
- Comprehend various energy management standards and justify its implementation
- Acquire the knowledge to use various instruments for energy audit
- Understand the environmental effects and various international protocols
- Explain and analyze the pollution situation and understand clean development mechanism.

CONTENTS**1. ENERGY SOURCES**

Types of Energy, Conventional Sources of Energy, Non-Conventional Sources of Energy, Commercial energy production, current scenario of energy in India & World, Need for energy conservation

2. ENERGY AUDIT

Definition, Need, Types of Audit, Preparing an energy audit report, benchmarking, Sankey diagram, calculation of payback period.

3. ENERGY MANAGEMENT

Definition, need, Standards for energy management ISO standards 14001, 50001, Energy conservation act 2003, designated consumers, energy substitution.

4. INSTRUMENTATION

Instruments used for energy audit: power analyser, thermal analyser, general instruments and their use, SCADA, Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls, Energy saving potential of each technology

5. ENERGY & CLIMATE CHANGE

Energy and environment, Air pollution, Climate change, United Nations Framework Convention on climate change (UNFCCC), Kyoto Protocol, Clean Development Mechanism (CDM), CDM Methodology and Procedures, Sustainable development

BOOKS RECOMMENDED

1. Dr. Clive Beggs, *Energy Management Supply and Conservation*, Butterworth- Heinemann, 2002 .
2. Thumann Albert & Paul Mehta, *Handbook of Energy Engineering*, The Fairmont Press, INC.
3. Wayne C, *Energy Management Handbook*, John Willey and Sons.

EE-14801 COMPUTER AIDED POWER SYSTEM ANALYSIS

Internal Marks :40	L	T	P	C
External Marks :60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Develop per unit system models of synchronous machine, transformer, transmission line and static loads for power system studies.
- Construct Bus Admittance Matrix and Bus Impedance Matrix for power system studies.
- Investigate the state of power system by performing load flow analysis.
- Compare features of Gauss-Siedel, Newton-Raphson and Fast decoupled methods of load flow analysis.
- Analyze the effect of symmetrical and unsymmetrical faults on power system.
- Analyze the effect of small and large disturbances on power system stability.

CONTENTS**1. SYSTEM MODELING**

System modeling of synchronous machines, transformers, transmission lines and loads, Per Unit (p.u.) representation of power system, Single line diagram of electrical networks, p.u. single phase impedance diagrams corresponding to single line diagram. Formulation of Bus Admittance Matrix and Bus Impedance Matrix for power system studies.

2. LOAD FLOW STUDIES

Data for the load flow studies, Bus types, Formulation of power flow equations, Iterative solutions of load flow equations by the Gauss-Seidel and Newton-Raphson methods, Algorithms and flow charts of these methods, Line flows and line losses calculations. Introduction to Decoupled and Fast Decoupled method.

3. FAULT ANALYSIS

Transients on transmission line, Short circuit of synchronous machine, Selection of circuit breakers, Symmetrical fault analysis using Thevenin's theorem. Symmetrical Component Transformation, Construction of sequence networks of power systems. Analysis of Unsymmetrical LG (line to ground), LL (line to line), LLG (line line ground) faults using symmetrical components, Symmetrical and unsymmetrical faults analysis using Bus Impedance Matrix with algorithm and flow chart.

4. POWER SYSTEM STABILITY

Steady state stability, Dynamics of a synchronous machine, Power angle equation, Transient stability, Equal area criterion, Numerical solution of swing equation, Factors effecting transient stability.

BOOKS RECOMMENDED

1. Elgerd O.I., *Electric Energy Systems Theory*, Tata McGraw-Hill.
2. Stevenson W.D., *Elements of Power System Analysis*, Tata McGraw-Hill.
3. Nagrath I.J. and Kothari D.P., *Power System Engineering*, Tata McGraw-Hill.
4. Arrillaga J. and Arnold C.P., *Computer Aided Power System*, Wiley.
5. Glenn W. Stagg. & El-abiad, *Computer methods in power system analysis*, Tata McGraw-Hill.
6. Kusic, *Computer Aided Power System Analysis*, Taylors and Francis group.
7. Nagsarkar T.K. and Sukhija M.S., *Power System Analysis*, Oxford University Press, 2016.
8. D.P. Kothari & J.S. Dhillon, *Power System Optimization*, Prentice-Hall of India.

EE- 14802 DIGITAL CONTROL SYSTEMS

Internal Marks :40	L	T	P	C
External Marks :60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Create the state models of different physical and electrical systems.
- Analyze the stability of a given control system.
- Evaluate discrete time signals analytically and visualize them in the time and frequency domain.
- Analyze sampled data control systems by using z transformation.
- Analyze the nonlinear system behavior by phase plane and describing function methods and learn about the stability of linear and nonlinear systems by lyapunov method.
- Design and analyze optimal control schemes.

CONTENTS**1. STATE VARIABLE ANALYSIS**

Introduction, concepts of State, State Variables and State Model, State Models for Linear Continuous Time Systems, State Variables and Linear Discrete Time Systems, Diagonalization, Solution of State Equations, Concepts of Controllability and Observability.

2. INTRODUCTION OF DIGITAL CONTROL

Digital control systems: advantages and disadvantages of digital control, Representation of sampled process and quantization, Z Transform, Z transfer function, Inverse Z Transform and response of linear discrete systems, Z Transform analysis of sampled data control systems, Z and s domain relationship, Solution of difference equations, Stability definition, Jury's test of stability, Extension of Routh-Hurwitz criterion to discrete time systems.

3. NON LINEAR SYSTEM ANALYSIS

Types of non linearities, Phenomenon related to nonlinear systems, Analysis of nonlinear systems: Describing function analysis, Phase plane analysis, Lyapunov stability analysis.

4. OPTIMAL CONTROL

Introduction, Formation of optimal control problem, Calculus of variations, Minimization of functions, Constrained Optimization, Linear quadratic problem, Hamilton Jacobi Equation, Riccati equation and its solution.

BOOKS RECOMMENDED

- Gopal M., *Modern Control System Theory*, 3rd edition, New Age Intl. Pvt. Ltd.
- Gopal M., *Digital Control and State Variable Methods*, 2012, 4th edition, Tata McGraw-Hill Education Pvt. Ltd.

3. Ogata K., *Modern Control Engineering*, 5th edition, 2010, Pearson.
4. Ogata K., *Discrete Time Control Systems*, 5th edition, 2013, PHI
5. Kuo B.C., *Automatic Control System*, 2000, 7th edition, PHI.
6. <https://archive.org/details/AutomaticControlSystems>.
7. <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=87>.

EE-14803 HIGH VOLTAGE ENGINEERING

Internal Marks :40	L	T	P	C
External Marks :60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Elucidate breakdown phenomenon and concept of high voltage power apparatus.
- Understand applications of various insulating materials.
- Design, generate and measure high voltage & current circuits.
- Evaluate corona loss and compensation requirement in EHVAC transmission line.
- Employ concept of insulation coordination, insulating material and radio interference in power system.
- Understand the concept of high voltage DC transmission and its merits.

CONTENTS**1. DIELECTRIC BREAKDOWN**

Gases: - Ionization process, Townsend's current growth equations, 1st and 2nd ionization coefficients, Townsend's criterion for breakdown, Streamer theory of breakdown, Paschen's law of Gases, Gases used in practice, Partial Discharge measurements.

Liquids: - Conduction and breakdown in pure and commercial liquids, Suspended particle theory, Cavitation and Bubble theory, Stressed oil volume theory, Liquids used in practice.

Solids: - Intrinsic, Electromechanical and Thermal breakdown composite dielectrics, Solid dielectrics used in practice.

2. INSULATING MATERIALS FOR HIGH VOLTAGE

Applications of insulating materials used in power transformers, rotating machines, circuit breakers, cables and power capacitors.

3. GENERATION OF HIGH VOLTAGES

High Voltage Direct Current (HVDC), High Voltage Alternating Current (HVAC), Power frequency and High frequency: Impulse voltage and impulse current generation, Tripping and contact of Impulse Generator, Measurement of voltage and current: High voltage direct current, Alternating current and Impulse voltage and currents.

4. EXTRA HIGH VOLTAGE (EHV) TRANSMISSION AND CORONA LOSS

Need for EHV Transmission, Use of bundled conductors, Corona characteristics of smooth bundled conductors with different configurations, Corona loss, Factors affecting the corona loss, Radio Interference due to corona, Shunt and series compensation in EHV lines, Tuned power lines, Insulation Co-ordination.

5. HIGH VOLTAGE DIRECT CURRENT (HVDC) TRANSMISSION

Advantages, disadvantages and economics of HVDC Transmission system, Types of Direct Current (DC) links, Converter station equipment and their characteristics.

BOOKS RECOMMENDED

1. Bagamudre R.D., *Extra High Voltage A.C. Transmission Engineering*, New Age International Publishers.
2. Kimbark E.W., *High Voltage Direct Current Transmission*, Wiley-Interscience.
3. Kamaraju V. and Naidu M.S., *High Voltage Engineering*, Tata McGraw-Hill Education.
4. Kuffel, E. and Abdullah, M., *High Voltage Engineering*, Pergamon Press.
5. Wadhwa C. L., *High Voltage Engineering*, New Age Publications.
6. Padiyar, K.R., *HVDC Power Transmission Systems: Technology and System Interactions*, New Age International.
7. www.cpri.in.
8. [https:// onlinecourses.nptel.ac.in](https://onlinecourses.nptel.ac.in).

EE-14804 LABORATORY-XIV Computer Aided Power System Analysis

Internal Marks	:30	L	T	P	C
External Marks	:20	0	0	2	1
Total Marks	:50				

COURSE OUTCOMES

After studying this course, the students will

- Acquire the skill of using computer packages with the help of high level programming language and software tools in power system studies.
- Acquire the skill of using power system related tools for power system studies.
- Develop computer program for load flow analysis.
- Understand the procedure and steps needed to perform short circuit analysis.
- Carry out stability studies of power system.
- Simulate load frequency control of single area system.

LIST OF EXPERIMENTS

- Introduction to mathematical/programming/software tools for power system studies like Mi Power and high level programming language (MATLAB, C++ etc).
- To develop a program for formation of Bus Admittance Matrices.
- To develop a program for formation of Bus Impedance Matrix using building algorithm method.
- To develop a program for load flow analysis using Gauss-Seidel Method.
- To develop a program for load flow analysis using Newton-Rapson.
- Use of software tools for load flow analysis.
- Fault analysis using software tools.
- Use of software tools for Load Frequency Control without and with PI Controller.
- Program for Economic Load Dispatching of power systems.
- Use of Software tools for stability studies.

EE-14805 LABORATORY-XV High Voltage Engineering

Internal Marks :30	L	T	P	C
External Marks :20	0	0	2	1
Total Marks :50				

COURSE OUTCOMES

After studying this course, the students will

- Develop ability to estimate and analyze over voltages in power system.
- Comprehend basic gaseous dielectrics, their properties and behavior under high voltage-stresses.
- Inculcate skill to conduct dielectric tests as per standards.
- Identify high voltage testing equipment and testing procedures as per standards.
- Aware of high voltage application in power system and industry.
- Acquire knowledge to inspect high voltage equipment and to detect potential risks from malfunction of dielectric materials.

LIST OF EXPERIMENTS

- Study of high voltage equipment installed in the laboratory.
- Determine the flashover voltage of a pin type insulator.
- Determine the flashover voltage of suspension type insulator and to observe the corona effects.
- To find the dielectric strength of the given transformer oil sample.
- To find impulse spark over voltage of a) Needle-Plane gap, b) Rod-Rod gap.
- Determine the flashover voltage of Sphere-Sphere gap.
- To find cable insulation fault by using Cable Tester.
- Compare the flashover voltages wet and dry for a typical outdoor insulator.
- To measure Capacitance and Dielectric Loss of an insulating material by using High Voltage Schering Bridge.
- To capture Thermal Image of Corona Discharge by using Thermal Imager.
- To measure breakdown strength of solid insulating materials and strength of liquid insulating materials.
- To find out the viscosity of liquid insulating materials.

EE-14806 SEMINAR

Internal Marks :100	L	T	P	C	
External Marks : -		0	0	2	2
Total Marks :100					

COURSE OUTCOME

After studying this course, the students will

- Explore and analyze new areas of research related to electrical engineering
- Evaluate the effect of newer technologies to our lives.
- Create power point presentations.
- Acquire ability for public speaking and giving lecture/presentation.
- Analyze various new technologies with existing technologies.
- Evaluate the environmental effects of introducing new technologies.

CONTENTS

Students have to study from National/International Journals, Internet and books etc. related to latest topics and developments in the area of Electrical Engineering and deliver a seminar individually for 25-30 minutes along with Seminar Report.

PREE-14701 MAJOR PROJECT

Internal Marks	:120	L	T	P	C
External Marks	:80	0	0	3	3
Total Marks	:200				

COURSE OUTCOMES

After studying this course, the students will

- Acquire ability to work in team.
- Evaluate application of a particular tool/ component for specific application.
- Acquire ability to apply thinking and problem solving skills.
- Develop habit of responsibility sharing.
- Apply knowledge gained for analysis and design of circuits.
- Learn about their social responsibility.

CONTENTS

The students are required to work in team and to formulate software/hardware based projects showing applications of the knowledge gained during the course work. The students should be able to find out the ratings/ suitability of various components/software in their project work.

DEEE-14801 FUZZY LOGICS AND SYSTEMS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Represent the various forms of fuzzy system.
- Perform fuzzification and defuzzification of a given situation/process.
- Develop fuzzy rules for a fuzzy system.
- Understand basic steps involved to design a Fuzzy-Logic controller.
- Use software tool for designing fuzzy logic based controllers.
- Apply fuzzy logics for simple managerial and engineering applications.

CONTENTS**1. INTRODUCTION**

Crisp and Fuzzy Sets- Definition, Representation, Operations and Properties; Classical Relations and Fuzzy Relations-Cardinality, Operations and Properties; Fuzzy Cartesian Product and Composition.

2. FUZZIFICATION AND DEFUZZIFICATION

Fuzzy Membership Function-Features and Forms; Fuzzification-Definition, Need and Method; Fuzzy Linguistic Variables and Defuzzification-Definition, Need and Methods; Lambda Cut for Fuzzy Sets and Relations.

3. FUZZY RULE BASED SYSTEM

Formation of Fuzzy Rules, Approximate Reasoning, Canonical Rule Forms, Decomposition Of Compound Rules, Aggregation and Properties of Fuzzy Rules, Fuzzy Inference System, Graphical Techniques of Inference.

4. FUZZY LOGIC APPLICATIONS

Review of Conventional Control Systems Theory, Fuzzy Logic Control-Need, Design Steps and Models, Design of a Fuzzy Controller for Automatic Generation Control by using software tools, Applications of Fuzzy Logics in the Fields of Managerial Decision Making, Optimization and Pattern Recognition.

BOOKS RECOMMENDED

- Timothy J. Ross, *Fuzzy logic with Engineering Applications*, McGraw Hill, 1995
- Klir. G, Yuan B.B., *Fuzzy sets and Fuzzy Logic*, Prentice Hall of India Private Limited, 1997.
- Yen John, Langari Reza, *Fuzzy Logic: Intelligence, Control, and Information*, PHI, 1998.

4. Padhy N.P., *Artificial Intelligence and Intelligent Systems*, Oxford University Press, 2005.
5. Bojadziev George and Bojadziev Maria, *Advances in Fuzzy Systems —Applications and Theory: Volume 5(Fuzzy Sets, Fuzzy Logic, Applications)*, world scientific.

DEEE-14802 POWER SYSTEM PLANNING

Internal Marks :40	L	T	P	C
External Marks :60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Understand the objectives of national and regional planning strategies of electric power.
- Acquire knowledge about the concept of load forecasting.
- Apply the concept of generation, transmission and distribution planning in power system.
- Evaluate loss of energy indices.
- Calculate voltage and power loss.
- Make selection of sizes and location of generating stations and substations.

CONTENTS**1. INTRODUCTION OF POWER SYSTEM PLANNING**

Objectives, National and Regional Planning, Long and Short Term Planning, Structure of Power System, Planning Methods, Electricity Regulation, Load Forecasting: Characteristics of Loads, Methodology of Forecasting, Energy Forecasting, Peak Demand Forecasting, Total Forecasting, Annual and Monthly Peak Demand Forecasting.

2. GENERATION SYSTEM PLANNING

Probabilistic Generation and Load Models- Determination of Loss of Load Probability and Expected Value of Demand not Served, Outage Performance and System Evaluation of Loss of Load and Loss of Energy Indices, Power Supply Availability Assessment.

3. TRANSMISSION SYSTEM PLANNING

Overview of Transmission Planning, Necessity of Probabilistic Transmission Planning, Probabilistic Planning Criteria, Procedure of Probabilistic Planning, Network Reconfiguration.

4. DISTRIBUTION SYSTEM PLANNING

Design of Sub Transmission Lines and Distribution Substations, Design Considerations of Primary and Secondary Distribution Systems, Voltage Drop and Power Loss Calculations.

BOOKS RECOMMENDED

- Wallach Y., *Power System Planning*, McGraw Hill International.
- Sullivan P., *Power System Planning*, McGraw Hill International.
- Dasari, S., *Electric Power System Planning*, IBT Publishers, New Delhi.
- McDonald J.R., *Modern Power System Planning*, McGraw Hill International.
- <http://nrlcdc.in/>.

6. <http://ieeexplore.ieee.org/document/194918/>.
7. www.theiet.org/sectors/energy/documents/modelling-5.cfm?type=pdf
8. Central Electricity Regulatory Commission, Regulations and Orders - www.cercind.org.
9. Electricity Act 2003 and National Policies – www.powermin.nic.

DEEE-14803 POWER SYSTEM RESTRUCTURING & DEREGULATION

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Understand present scenarios of national and international power sector regimes.
- Investigate the challenges of competitive electricity markets.
- Perform modeling of power system operation in deregulated environment.
- Apply congestion management methodologies in deregulated power system networks.
- Evaluate available transfer capability of transmission system.
- Apply internet technology for power system monitoring and trading.

CONTENTS**1. INTRODUCTION**

Basic Concept and Definitions, Privatization, Restructuring, Transmission Open Access, Wheeling, Components of Deregulated Power System, Advantages of Competitive Environment in Power System, Power System Restructuring: Overview of Restructured Power System, Difference between Vertically Integrated and Restructured Power Systems, Explanations with Suitable Practical Examples.

2. DEREGULATION MODELS

Pool Model, Pool and Bilateral/ Multilateral Trade Model, Competitive Electricity Market, Independent System Operator Activities in Pool Model, Wholesale Electricity Market Characteristics, Central Auction, Single Auction Power Pool, Double Auction Power Pool, Market Clearing and Pricing, Market Power And Its Mitigation Techniques, Ancillary Services, Transmission Pricing.

3. CONGESTION MANAGEMENT

Transmission Congestion and its Management in Normal Operation, Explanation with Suitable Example, Total Transfer Capability (TTC), Available Transfer Capability (ATC), Transmission Reliability Margin (TRM), Capacity Benefit Margin (CBM), Existing Transmission Commitments (ETC).

4. INTERNET APPLICATIONS

Working of Internet, Usability of Internet, Internet Technology and Programming Languages, Web Pages, XML, Internet Applications for Power System Monitoring and Trading.

BOOKS RECOMMENDED

1. Loi Lei Lai, *Power system restructuring and deregulation*, John Wiley & Sons Ltd.
2. Shahidehpour M. and Alomoush M., *Restructured Electrical Power Systems: Operation, Trading and Volatility*, Marcel Dekker, New York
3. Khaparde S.A. and Abhyankar A. R., *Restructured Power Systems*, Alpha Science, India
4. Venkatesh P., Manikandan B.V., Charles Raja S., and Srinivasan A., *Electric Power Systems, Analysis, Security and Deregulation*, PHI Learning Pvt. Ltd., New Delhi.
5. Philipson Lorrin and Willis H. Lee, Marcel Dekker, *Understanding Electric Utilities and Deregulation*, New York, CRC Press, 2005.
6. Ilic Marija, Galiana Francisco and Fink Lestor, *Power System Restructuring Engineering & Economics*, Kulwer Academic Publisher, USA-2000.
7. Surya Santoso, Wayne Beaty H., Dugan Roger C., Mc Granaghan Mark F., *Electric Power System Quality*, McGraw Hills, 2002.

DEEE-14804 SYSTEM ENGINEERING AND RELIABILITY

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Retrieve basic concept of system engineering and reliability.
- Comprehend different reliability functions.
- Analyze the failure data and component reliability.
- Evaluate the reliability of engineering systems using different techniques.
- Understand the qualitative concept of availability and maintainability.
- Analyze improvement of availability and reliability of any system.

CONTENTS**1. BASIC CONCEPTS OF SYSTEM ENGINEERING AND RELIABILITY**

Introduction to System Engineering, Reliability and Quality, History of Reliability, Failure Modes, Causes of Failure (Unreliable Systems)

2. RELIABILITY DESIGN AND ANALYSIS

Reliability and Cost, Failure Data Analysis, Failure Density, Failure Rate, Component Reliability, Mean Time to Failure(MTTF), Mean Time Between Failure(MTBF), Markov's Model of Reliability Function.

3. SYSTEM RELIABILITY MODELS

Introduction, System with Series and Parallel Components, k out of m Systems, Fault Tree Analysis (FTA), Reliability evaluation from Fault Tree.

4. MAINTAINABILITY AND AVAILABILITY CONCEPTS

Concept of Maintainability, Qualitative aspect of Availability, Availability Function, Concept of Preventive Maintenance.

5. RELIABILITY MANAGEMENT

Economic Issues Manufacture and Customer Cost, Reliability Achievement Cost Model, Reliability Management Policies, Objectives, Reliability Data Acquisition, Managing People for Reliability.

BOOKS RECOMMENDED

- Shooman M.L., *Probabilistic Reliability: An Engineering Approach*, Mc-Graw-Hill.
- Balaguruswamy E., *Reliability Engineering*, Mc-GrawHill International
- Srinath. L.S., *Reliability Engineering*, East-West Press Private Ltd.

4. Ramakumar R., *Engineering Reliability*, Prentice Hall, NJ.
5. Billinton R., *Power System Reliability Calculation*, MIT Press, USA
6. Endreyni, *Reliability Modeling in Electric Power System*, John Wiley, New York
7. [https:// en.m.wikipedia.org/reliability engineering](https://en.m.wikipedia.org/reliability_engineering).
8. <https://onlinecourses.nptel.ac.in>

DEEE-14805 ADVANCED MICROPROCESSOR

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks : 100				

COURSE OUTCOMES

After studying this course, the students will

- Retrieve the basic concepts of 8086/8088 microprocessor architectures, pin diagram and assembly language programming.
- Develop assembly level programs and understanding the basics of the processors.
- Analyze interfacing of external devices to the processor or according to the user requirements to create novel products and solutions for the real time problems.
- Understand RISC based microcontroller and different communication modes
- Apply embedded systems utilizing microprocessors.
- Test and evaluate the performance of microprocessor based applications.

CONTENTS**1. MICROPROCESSOR 8086/8088 AND ITS ARCHITECTURE**

Internal 8086/8088 Microprocessor Architecture, Real Mode Memory Addressing, Addressing Modes. Data Movement Instructions, Arithmetic and Logic Instructions, Program Control Instructions, String Instruction, Assembly Language Programming, Assembler Directives, Program Development Tools.

2. 8086 HARDWARE SPECIFICATIONS AND BASIC INTERRUPT PROCESSING

8086 Pin-Outs And Pin Functions, Clock Generator, Bus Buffering and Latching, Bus Timings, Ready and Wait State, Minimum/Maximum Mode Operation, Memory Interfacing with 8086, Address Decoding, Introduction to Basic I/O Interface, I/O Port Address Decoding, The Purpose of Interrupts, Interrupts, Interrupt Instructions, The Operation of a Real Mode Interrupt, Interrupt Flag Bits, Storing an Interrupt Vector in the Vector Table. Hardware Interrupts: INTR and INTA.

3. INTERFACING WITH ADVANCED DEVICES

Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine, Introduction to DOS and BIOS Interrupts, Interfacing Interrupt Controller 8259 DMA Controller 8257 to 8086.

4. COMMUNICATION INTERFACE

Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing, RS-232, IEEE-488, Prototyping and Trouble Shooting.

BOOKS RECOMMENDED

1. Ray, K. and Bhurchandani, K.M., *Advanced Microprocessors And Peripherals*, Tata McGraw Hill, 2nd edition, 2006.
2. Barry B. Brey, *The Intel Microprocessors*, PHI/Pearson Ed. Asia.
3. Hall, Douglas V., *Microprocessor and Interfacing*, 3e.
4. <http://computer.howstuffworks.com/microprocessor.html>
5. www.nptel.iitm.ac.in

DEEE-14806 DIGITAL SIGNAL PROCESSING

Internal Marks	:40	L	T	P	C
External Marks	:60	3	1	0	4
Total Marks	:100				

COURSE OUTCOMES

After studying this course, the students will

- Analyze discrete signals and systems.
- Evaluate discrete Fourier transform using fast Fourier transform algorithms.
- Create describing equation for digital filter structure.
- Design and analyze digital filters.
- Design and analyze filters using pole-zero combination.
- Design and analyze DSP processor.

CONTENTS**1. INTRODUCTION**

Representations of Discrete Signals and Systems and Basic Operators, Z-Transforms, Causality and Stability in terms of Z-Transform, Bilateral Z-Transform, Computation of Z-Transform.

2. DISCRETE FOURIER TRANSFORM (DFT) & FAST FOURIER TRANSFORM (FFT)

Discrete Fourier Series, Discrete Fourier Transform and its Properties, Efficient Computation of DFT Using FFT Algorithms, Linear Filtering approach to Computation of DFT.

3. DIGITAL FILTER STRUCTURE

Describing Equation, Structures for Finite Impulse Response Systems and Structure for Infinite Impulse Response Systems, Representation of Structures using Signal Flow Graph.

4. DESIGN OF DIGITAL FILTERS

Introduction, Difference Between Analog Filters and Digital Filters, Implementation of Digital Filter, Types of Filters, Linear Time Invariant Systems as Filters, Design of Infinite Impulse Response Filters from Analog Filters, Infinite Impulse Response Filter Design using Butterworth Approximation, Frequency Transformation, Finite Impulse Response Filters Design, Least Square Filter Design, Designing Digital Filter From Pole-Zero Placement, Butterworth Filter Design using Bilinear Transformation, Finite Impulse Response Filter Design using Windows, Design of Filters using Pole-Zero Combination.

5. HARDWARE ARCHITECTURE OF DSP PROCESSOR

Introduction, Desirable Features of DSP Processors, Types of Architectures, Internal Architecture of ADSP-21xx Family, Features of ADSP-21xx Family Processors, System

Interface, Instruction Set of ADSP–21xx, ADSP–21xx Development Tools, ADSP–210x Processors, Time Multiplier System DSP Processor.

BOOKS RECOMMENDED

1. Helmut, U. and Willibald, W., *Protection Techniques in Electrical Engg. Systems*, Marcel Dekker Inc. (2001).
2. Proakis, J.G. and Manolakis, D.G., *Digital Signal Processing*, Prentice–Hall of India Private Limited (1996).
3. Rabiner, C.R. and Gold, B., *Theory and Applications of Digital Signal Processing*, Prentice–Hall of India Private Limited (2000).
4. Antonion, A., *Digital Filters: Analysis Design and Application*, Prentice–Hall of India Private Limited (1999).
5. Oppenheim, A.V. and Schafer, R.W., *Digital Signal Processing*, Prentice–Hall of India Private Limited (1998).
6. <http://nptel.ac.in/courses/117102060/>
7. https://www.tutorialspoint.com/digital_signal_processing/index.htm

DEEE 14807 SIGNALS AND SYSTEMS

Internal Marks :40	L	T	P	C
External Marks :60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Evaluate continuous and discrete signals.
- Be able to analyze the response of a system to various test signals.
- Evaluate the Laplace transform of various signals.
- Create signals from samples.
- Create system models based on equations.
- Evaluate region of convergence.

CONTENTS**1. INTRODUCTION TO SIGNALS AND SYSTEMS**

The Black-Box Approach, Physical Instances and their Adaptation in the Framework, Formal Definition of 'Signal' And 'System', The Domain and Range Variables, Continuous and Discrete Signals and Continuous and Discrete Systems, Continuous/Discrete vs. Analog/Digital, Periodic and Aperiodic Signals, Even and Odd Signals, Deterministic and Random Signals, Complex Exponential and Sinusoidal Signals, Unit Step, Unit Ramp, Unit Impulse, Domain and Range Operations and Transformations, and their Effects upon Signals, Characterization of Systems: Memory, Linearity, Causality, Time-Invariance, Stability, Examples and Counterexamples, Classification of Systems: Continuous Time Systems and Discrete Time Systems, Linear System, Time Invariant System, Causal System, Bounded Input Bounded Output System, Systems With and Without Memory, Linear Time Invariant System.

2. CONTINUOUS TIME SIGNALS

Laplace Transform: Recapitulation, Analysis and Characterization of Linear Time Invariant Systems using Laplace Transform, Computation of Impulse Response and Transfer Function using Laplace Transform, Fourier Transform: Representation of Continuous Time Signals, Properties of Continuous Time Fourier Transform, Energy Density Spectrum.

3. SAMPLING THEOREM

Representation of Continuous Time Signals by its Sample, Types of Sampling, Sampling Theorem, Reconstruction of a Signal from its Samples, Aliasing, Sampling of Band Pass Signals.

4. LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEM

System Modeling: Differential Equation, Impulse Response, Frequency Response, Convolution, Analysis and Characterization of Linear Time Invariant System using Fourier Methods and Laplace Transform.

5. Z-TRANSFORMS

Basic Principles of Z-Transform, Z-Transform Definition, Relationship between Z-Transform and Fourier Transform, Region of Convergence, Properties of Z-Transform, Poles and Zeros, Inverse Z-Transform using Contour Integration, Residue Theorem, Power Series Expansion and Partial Fraction Expansion.

BOOKS RECOMMENDED

1. Oppenheim, Alan V., and A. S. Willsk, *Signals and Systems*, Prentice Hall, 1982.
2. Smith W.A., *The Scientists and Engineers Guide to Digital Signal Processing*, California Technical Publication.
3. Rawat T., *Signals and Systems*, Oxford University Press.
4. Nagoorkani A., *Signals and Systems*, TMH publications.
5. www.nptel.ac.in/courses/117104074.

DEEE-14808 FLEXIBLE AC TRANSMISSION SYSTEMS

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Retrieve the basics of Power Transmission System.
- Understand the need and principle of operation of FACTS devices in Power System.
- Understand the need of Series and Shunt Compensation.
- Apply FACTS devices for Power System Transmission capability enhancement.
- Design of AC and DC filters for harmonics mitigation.
- Understand modeling and control of FACTS controllers.

CONTENTS**1. INTRODUCTION**

Basic Issues in Bulk Power Transmission, Review of Basics of Power Transmission System, Lossless Transmission Lines, Maximum Power Flow, Line Load Ability, Control of Power Flow in AC Transmission Line, Conventional Control Mechanisms, FACTS – Introduction, Need and Application in Emerging Transmission Networks.

2. STATIC SHUNT COMPENSATORS: SVC AND STATCOM THEIR APPLICATION

Principle, Configuration and Control of Static Var Compensator (SVC) and Static Synchronous Compensator (STATCOM), Applications- Enhancement of Steady-State, Transient and Voltage Stability, Controlling of Power System Damping.

3. STATIC SERIES COMPENSATORS AND THEIR APPLICATION

Objective of Series Compensation, Variable Impedance type Series Compensators, Switching Converter type Series Compensators, Different Modes of Operation and Modeling of Thyristor Controlled Switch Capacitor for Stability Studies.

4. STATIC PHASE SHIFTER AND EMERGING FACTS CONTROLLER Principle of Operation, Steady State Model of Static Phase Shifter (SPS), Operating Characteristics of SPS, Unified Power Flow Controllers (UPFC): Basic Operating Principles and Characteristics, UPFC Model for Power Flow Studies.

5. APPLICATION OF FACTS CONTROLLER AND HARMONICS FILTERS

Reactive Power Control by FACTS Controller, Congestion Management on Transmission Lines using FACT Controller, Principle of Transmission System Compensation, Comparison between Series and Shunt Compensation, Generation of Harmonics, Carrier Frequency and Radio Interference Noise, Design of AC and DC Filters.

BOOKS RECOMMENDED

1. Mohan Mathur, R., Rajiv. K. Varma, *Thyristor Based Facts Controllers for Electrical Transmission Systems*, IEEE press and John Wiley & Sons, Inc.
2. Hingorani, N.G. and Gyragyi, L., *Understanding FACTS: Concepts and Technology of Flexible AC Transmission System*, Standard Publishers and Distributors, 2005.
3. Sang, Y.H. and John, A.T., *Flexible AC Transmission Systems*, IEEE Press, 2006.
4. K.R. Padiyar, *FACTS Controllers in Power Transmission and Distribution*, New Age International Publisher, 2007.
5. Ghosh,A. and Ledwich, G., *Power Quality Enhancement Using Custom Power Devices*, Kluwer Academic Publishers, 2005.
6. Miller T.J.E., *Reactive Power Control in Electric Systems*, John Wiley.

DEEE-14809 NEURAL NETWORKS

Internal Marks	:40	L	T	P	C
External Marks	:60	3	1	0	4
Total Marks	:100				

COURSE OUTCOMES

After studying this course, the students will

- Acquire a thorough knowledge on biological neurons and artificial neurons, comparative analysis between human and computer, artificial neural network models, characteristics of ANN's.
- Learn different types of activation functions, learning strategies, learning rules, perceptron models, single and multi-layer feed-forward and feed-back Neural Networks.
- Learn various algorithms including back propagation algorithm, Kolmogorov Theorem.
- Learn different types of associative memories and basics of Fuzzy Logic.
- Apply concept of classical and Fuzzy Sets, Fuzzy Logic System components fuzzification and defuzzification.
- Apply the neural network conceptual knowledge to real-world electrical problems and applications.

CONTENTS**1. INTRODUCTION & ESSENTIALS TO NEURAL NETWORKS**

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate and Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, Historical Developments, Potential Applications of ANN. Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

2. SINGLE & MULTI-LAYER FEED FORWARD NEURAL NETWORKS Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence Theorem, Limitations of the Perceptron Model, Applications, Credit Assignment Problem, Generalized Delta Rule and Derivation of Back-Propagation (BP) Training, Summary of Back-Propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

3. ASSOCIATIVE MEMORIES-I

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory.

4. ASSOCIATIVE MEMORIES-II

Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms, Storage And Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem, Architecture of Hopfield, Network: Discrete and Continuous Versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

5. FUZZY LOGIC

Classical and Fuzzy Sets, Introduction to Classical Sets – Properties, Operations And Relations, Fuzzy Sets, Membership, Uncertainty, Operations, Properties, Fuzzy Relations, Cardinalities, Membership Functions, Fuzzy Logic System Components: Fuzzification, Membership Value Assignment, Development of Rule Base and Decision Making System, De-Fuzzification to Crisp Sets, De-Fuzzification Methods.

BOOKS RECOMMENDED

1. Rajasekharan and Pal, *Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications*, Prentice Hall India.
2. Naga Bhaskar C., Vijay Kumar G., *Neural Networks and Fuzzy Logics*, B S Publication.
3. Philip D. Wasserman, *Neural Computing & Practice*, scholarly articles.
4. Yegnanarayana B., *Artificial Neural Networks*, Prentice Hall India.
5. Zaruda, *Artificial Neural Networks*, Prentice Hall India.
6. Kosko B., *Neural Networks and Fuzzy Logic System*, Prentice Hall India.
7. Amirthavalli M., *Fuzzy Logic and Neural Networks*, Scitech Publications India Pvt. Ltd.
8. Freeman J.A., Skapura D., *Neural Networks*, Pearson Education.
9. Kumar S., *Neural Networks*, CIVIC, 2004.
10. Simon Hakins, *Neural Networks*, Pearson Education.
11. Eliasmith C. and Anderson C.H., *Neural Engineering*, Prentice Hall India.
12. Web sources: IEEE explore, IET.

DEEE-14810 ENERGY EFFICIENT MACHINES

Internal Marks : 40	L	T	P	C
External Marks : 60	3	1	0	4
Total Marks :100				

COURSE OUTCOMES

After studying this course, the students will

- Understand importance of energy management and audit.
- Apply energy conservation measures in industrial and agriculture sector.
- Understand the concept of maximum demand control.
- Understand concept of harmonics and performance assessment of capacitors.
- Evaluate motor efficiency and selection of drive for industrial use.
- Analyze the payback period of energy efficient motors.

CONTENTS**1. ENERGY MANAGEMENT AND AUDIT**

Introduction to Energy Management, Energy Audit and its Need, Types of Energy Audit, Energy Conservation: Industrial and Agricultural Sector, Bench Marking, Energy Audit Instruments.

2. ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS

Electricity Billing, Electrical Load Management and Maximum Demand Control, Methods of Power Factor Improvement and its Benefits, Selection and Location of Capacitors, Performance Assessment of Power Factor Correction Capacitors, Power Factor with Non-Linear Loads, Harmonics and the Power Factor.

3. ENERGY EFFICIENT MOTORS AND DRIVES

Difference Between Standard Motors and Energy Efficient Motors, NEMA Design A, B, C, D, Wound Rotor, Multispeed Motors, Motor Efficiency Determination Methods: Direct Measurement Method, Loss Segregation Method, Motor Efficiency Labeling, Factors for Selection of Energy Efficient Motors, Over-Motoring, Eddy Current Adjustable Speed Drives, AC Variable Frequency Drives, Wound Rotor Motor Drives with Slip Loss Recovery (Static Kramer Drives).

4. ECONOMICS OF ENERGY EFFICIENT MOTORS AND SYSTEMS

Motor Life Cycle Cost, Direct Saving and Payback Analysis, Present Worth Method with Constant Power Costs, Present Worth Method with Increasing Power Costs, Net Present Worth Method.

BOOKS RECOMMENDED:

1. Andreas John C., *Energy Efficient Electric Motors*, Marcel Dekker Inc. 1992.
2. Albert T., *Introduction to Efficient Electric System Design*, The Fairmount Press Prentice Hall.
3. Tripathi S.C., *Electric Energy Utilization and Conservation*, Tata McGraw Hill 1991.
4. Charles B., *Handbook of Modern Electronics and Electrical Engineering*, John Wiley & Sons.
5. NEMA <https://www.nema.org>.
6. BEE web-link <https://www.beeindia.gov.in>.

DEPARTMENT OF ELECTRICAL ENGINEERING

Syllabus Scheme for Batch 2018 onwards (3rd - 8th semester)

BACHELOR OF TECHNOLOGY IN ELECTRICAL ENGINEERING

SEMESTER - 3 RD											
S. No.	Course Type	Course Code	Course Title	Subject Type	Hours per week			Internal Marks	External Marks	Total	Credits
					L	T	P				
1.	Basic Science	BSEE-101	Engineering Mathematics-III (Probability and Statistics)	Theory	3	0	0	40	60	100	3
2.	Humanities/ Social Sciences/ Management	HSMEE-101	Education, Technology and Society	Theory	3	0	0	40	60	100	3
3.	Professional Core	PCEE-101	Electrical Circuit Analysis	Theory	3	1	0	40	60	100	4
4.	Professional Core	PCEE-102	Analog Electronics	Theory	3	1	0	40	60	100	4
5.	Professional Core	PCEE-103	Electrical Machines-I (Transformer and DC Machines)	Theory	3	1	0	40	60	100	4
6.	Professional Core	PCEE-104	Electromagnetic Fields	Theory	3	0	0	40	60	100	3
7.	Professional Core	LPCEE-101	Analog Electronics Laboratory	Practical	0	0	2	30	20	50	1
8.	Professional Core	LPCEE-102	Electrical Machines Laboratory-I	Practical	0	0	2	30	20	50	1
9.	Training*	TR-101	Training-I	Practical	-	-	-	60	40	100	1
TOTAL					18	3	4+1 [#]	360	440	800	24

NOTE:

* Institutional/Industrial Training of Four weeks shall be held in summer vacation after 2nd semester and marks/credit shall be awarded in 3rd semester itself.

There will be one period per week for Mentoring and Professional Development, final evaluation of this course will be done based on the combined assessment of Odd and Even semester of respective year of study

SEMESTER - 4 TH											
S. No.	Course Type	Course Code	Course Title	Subject Type	Hours per week			Internal Marks	External Marks	Total	Credits
					L	T	P				
1.	Professional Core	PCEE-105	Digital Electronics	Theory	3	1	0	40	60	100	4
2.	Professional Core	PCEE-106	Electrical Machines-II (Asynchronous and Synchronous Machines)	Theory	3	1	0	40	60	100	4
3.	Professional Core	PCEE-107	Power Electronics	Theory	3	1	0	40	60	100	4
4.	Professional Core	PCEE-108	Signals and Systems	Theory	3	1	0	40	60	100	4
5.	Professional Core	LPCEE-103	Digital Electronics Laboratory	Practical	0	0	2	30	20	50	1
6.	Professional Core	LPCEE-104	Electrical Machines Laboratory-II	Practical	0	0	2	30	20	50	1
7.	Professional Core	LPCEE-105	Power Electronics Laboratory	Practical	0	0	2	30	20	50	1
8.	Seminar	PREE-101	Seminar and Technical Report Writing	Practical	0	0	2	50	0	50	1
9.	Mandatory Course ^s	MCEE-101	Environmental Science	Theory	2	0	0	50	0	50	S/US
10.	Mentoring	MPD-102	Mentoring and Professional Development	Practical	0	0	1	100	0	100	1
TOTAL					14	4	9	450	300	750	21

NOTE:

§ Marks of non-credit courses are excluded from total and minimum 40% score required to pass.

SEMESTER - 5 TH											
S. No.	Course Type	Course Code	Course Title	Subject Type	Hours per week			Internal Marks	External Marks	Total	Credits
					L	T	P				
1.	Professional Core	PCEE-109	Power Systems – I (Apparatus and Modelling)	Theory	3	1	0	40	60	100	4
2.	Professional Core	PCEE-110	Control Systems	Theory	3	1	0	40	60	100	4
3.	Professional Core	PCEE-111	Microprocessors and Microcontrollers	Theory	3	1	0	40	60	100	4
4.	Professional Core	PCEE-112	Measurements and Instrumentation	Theory	3	1	0	40	60	100	4
5.	Professional Core	PCEE-113	Electric Generation and Economics	Theory	3	1	0	40	60	100	4
6.	Professional Core	LPCEE-106	Power Systems Laboratory-I	Practical	0	0	2	30	20	50	1
7.	Professional Core	LPCEE-107	Control Systems Laboratory	Practical	0	0	2	30	20	50	1
8.	Professional Core	LPCEE-108	Microprocessors and Microcontrollers Laboratory	Practical	0	0	2	30	20	50	1
9.	Training*	TR-102	Training-II	Practical	-	-	-	60	40	100	1
10.	Mandatory Course ^s	MCI-102	Constitution of India	Theory	2	0	0	50	0	50	S/US
TOTAL					17	5	6+1 [#]	400	400	800	24

NOTE:

* Industrial/Institutional Training of Four weeks shall be held in summer vacation after 4th semester and marks/credit shall be awarded in 5th semester itself.

\$ Marks of non-credit courses are excluded from total and minimum 40% score required to pass.

There will be one period per week for Mentoring and Professional Development, final evaluation of this course will be done based on the combined assessment of Odd and Even semester of respective year of study.

SEMESTER - 6 TH											
S. No.	Course Type	Course Code	Course Title	Subject Type	Hours per week			Internal Marks	External Marks	Total	Credits
					L	T	P				
1.	Professional Core	PCEE-114	Power Systems – II (Operation and Control)	Theory	3	1	0	40	60	100	4
2.	Professional Core	PCEE-115	Industrial Drives and Control	Theory	3	0	0	40	60	100	3
3.	Professional Elective	PEEE-XXX	Elective-I	Theory	3	1	0	40	60	100	4
4.	Professional Elective	PEEE-XXX	Elective-II	Theory	3	1	0	40	60	100	4
5.	Open Elective	OEXX-XXX	Open Elective-I	Theory	3	0	0	40	60	100	3
6.	Professional Core	LPCEE-109	Power Systems Laboratory-II	Practical	0	0	2	30	20	50	1
7.	Professional Core	LPCEE-110	Measurements and Instrumentation Laboratory	Practical	0	0	2	30	20	50	1
8.	Professional Core	LPCEE-111	Industrial Drives and Control Laboratory	Practical	0	0	2	30	20	50	1
9.	Project	PREE-102	Minor Project	Practical	0	0	2	50	50	100	1
10.	Mentoring	MPD-103	Mentoring and Professional Development	Practical	0	0	1	100	0	100	1
TOTAL					15	3	9	440	410	850	23

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

SEMESTER - 7 TH											
S. No.	Course Type	Course Code	Course Title	Subject Type	Hours per week			Internal Marks	External Marks	Total	Credits
					L	T	P				
1.	Professional Elective	PEEE-XXX	Elective-III	Theory	3	1	0	40	60	100	4
2.	Professional Elective	PEEE-XXX	Elective-IV	Theory	3	1	0	40	60	100	4
3.	Open Elective	OEXX-XXX	Open Elective-II	Theory	3	0	0	40	60	100	3
4.	Project	PREE-103	Project-I	Practical	0	0	6	50	50	100	3
5.	Training [*]	TR-103	Training-III	Practical	-	-	-	100	50	150	2
6.	Mandatory Course ^{\$}	MCI-103	Organisational Behavior	Theory	2	0	0	50	0	50	S/US
TOTAL					11	2	6+1 [#]	320	280	600	16

NOTE:

* Institutional/Industrial Training of Six weeks shall be held in summer vacation after 6th semester and marks/credit shall be awarded in 7th semester itself.

\$ Marks of non-credit courses are excluded from total and minimum 40% score required to pass.

There will be one period per week for Mentoring and Professional Development, final evaluation of this course will be done based on the combined assessment of Odd and Even semester of respective year of study.

SEMESTER - 8 TH											
S. No.	Course Type	Course Code	Course Title	Subject Type	Hours per week			Internal Marks	External Marks	Total	Credits
					L	T	P				
1.	Professional Elective	PEEE-XXX	Elective-V	Theory	3	1	0	40	60	100	4
2.	Professional Elective	PEEE-XXX	Elective-VI	Theory	3	1	0	40	60	100	4
3.	Open Elective	OEXX-XXX	Open Elective-III	Theory	3	0	0	40	60	100	3
4.	Project	PREE-104	Project-II	Practical	0	0	6	50	50	100	3
5.	Mentoring	MPD-104	Mentoring and Professional Development	Practical	0	0	1	100	0	100	1
TOTAL					9	2	7	270	230	500	15

List of Professional Elective Courses (TRACK-I)

ENERGY CONVERSION AND POWER SYSTEMS			
S. No.	Professional Elective Course	Course code	Course Name
1.	Elective –I	PEEE-101	Renewable Energy Sources
2.		PEEE-103	Solar and Wind Energy
3.	Elective –II	PEEE-105	Energy Efficient Machines
4.		PEEE-107	Computer Aided Electrical Machine Design
5.	Elective –III	PEEE-109	Power System Reliability
6.		PEEE-111	Power System Planning
7.	Elective –IV	PEEE-113	Sub-Station Automation
8.		PEEE-115	Smart Grids
9.	Elective –V	PEEE-117	High Voltage Engineering
10.		PEEE-119	High Voltage Transmission
11.	Elective –VI	PEEE-121	Power Quality Improvement
12.		PEEE-123	Digital Protection of Power system

List of Professional Elective Courses (TRACK-II)

INSTRUMENTATION AND CONTROL SYSTEMS			
S. No.	Professional Elective Course	Course code	Course Name
1.	Elective –I	PEEE-102	Embedded Systems and PLC
2.		PEEE-104	Automatic Control and Robotics
3.	Elective –II	PEEE-106	Digital Control System
4.		PEEE-108	Process Dynamics and Control
5.	Elective –III	PEEE-110	Optimization Techniques
6.		PEEE-112	Artificial Intelligence Techniques
7.	Elective –IV	PEEE-114	Digital Signal Processing
8.		PEEE-116	Biomedical Signals and Instrumentation
9.	Elective –V	PEEE-118	SCADA and Distributed Control System
10.		PEEE-120	Data Communication and Networking
11.	Elective –VI	PEEE-122	Virtual Instrumentation
12.		PEEE-124	Fuzzy Expert Systems

List of Open Elective subject offered by Electrical Engineering Department to all other Departments.

S. No.	Open Elective Course	Course code	Course Name
1.	Open Elective –I	OPEE-101	Energy Auditing and Management
2.		OPEE-102	Elements of Power System
3.	Open Elective –II	OPEE-103	Non-Conventional Energy Sources
4.		OPEE-104	Automation Control and Robotics
5.	Open Elective –III	OPEE-105	Soft Optimization Techniques
6.		OPEE-106	Smart Electrical Machines

Minor Specialization Course for Electrical Engineering

S. No.	Course code	Course Name	Hours Per week			Internal awards	External Awards	Total	Credits
			L	T	P				
1.	MnPCEE-101	Electrical Machines	3	0	0	40	60	100	3
2.	MnPCEE-102	Electrical Measurement and Instrumentation	2	0	0	40	60	100	2
3.	MnPCEE-103	Power Generation, Transmission and Utilization	3	0	0	40	60	100	3
4.	MnPCEE-101	Renewable Energy Systems	3	0	0	40	60	100	3
5.	MnLPCEE-101	Electrical Machines Laboratory	0	0	2	30	20	50	1

Guru Nanak Dev Engineering College, Ludhiana
Department of Electronics and Communication Engineering

No. ECE/847

Dated: 07.04.14

MINUTES OF MEETING

Minutes of 1st meeting of Board of Studies held on 07 - 04 - 2014 at 11 AM in committee room

The following persons were present:-

1. Pf. Nirmla Singh Grewal
2. Dr. Ajay Kumar Sharma
3. Dr. S. Bansal
4. Dr. Sandeep Singh Gill
5. Pf. Kanwaljit Singh
6. Pf. Ameeta Sehra
7. Pf. Balwinder Singh Dhaliwal
8. Dr. Munish Rattan

The meeting started with welcome by Chairman BOS for the 1st Board of Studies Meeting to the present members.

Following decisions were taken:-

Item No. 1 Apprising the members of Board of Studies about Outcome Based Education (OBE) Model adopted by the department and discussion on attainment of Program Educational Objectives (PEO) through Program Outcomes (PO) and in turn through courses.

Action Taken: Approved with the following modification in Vision:

"So that they possess" is to be replaced with "to make them competent globally with"

Item No. 2 To Ratify the PTU syllabus of B. Tech. (ECE) as adopted by Guru Nanak Dev Engineering College for admission batches up to 2013.

Action Taken: Ratified

58

76

Item No 3 To discuss and finalize the Curriculum Design Process

Action Taken: *Approved*

Item No. 4 Revision of syllabus of Upcoming Batches

Sub Item 4.1 Revision of syllabus of B. Tech (ECE) for 2014 admission batch

Action Taken: The Board of Studies considered the proposal and authorized Chairman (Board of Studies) to propose new Syllabus and Scheme in next meeting. The following subjects are proposed to be included:

Business Intelligence/ Analytics, Sound/ Acoustic Engineering

Sub Item 4.2 Introduction of Credit based System

Action Taken: *Approved*

Sub Item 4.3 Program Specific Criteria

Action Taken: *Approved*

Sub Item 4.4 Revision of syllabus of M. Tech (ECE) 2014 admission batch

Action Taken:

The Board of Studies considered the proposal and authorized Chairman (Board of Studies) to present new scheme & syllabus in next meeting. The following subjects are proposed to be included:

- (i) Digital System Design
- (ii) Wireless Sensor Networks
- (iii) Advanced Wireless & Mobile Communication
- (iv) Cloud Computing & Communication
- (v) Technical Writing may be made part of Project/ Seminar credits.

Sub Item 4.5 Bifurcation of BEEE (Theory and Lab) subject of first year into two subjects i.e. (i) Basic Electrical Engg., and (ii) Basic Electronics Engg.

Action Taken:

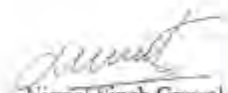
The Board is of the view that in almost all reputed institutes, the Basic Electronics Engineering is taught separately as an important subject for all branches. So recommended to academic council for necessary action in the 1st year scheme for 2014 batch.

Item 5 Question Paper Setting

Action Taken:

1. The present system may be persisted with for the time being with progressive movement towards internal system after devising proper checks and balances.
2. Detailed guidelines may be prepared for question paper setting and faculty advised accordingly.

The meeting ended with vote of thanks.


Nirmal Singh Grewal
Chairman
Board of Studies

Distribution:

1. Director, GNDEC, Ludhiana for kind information.
2. All members of Board of Studies (ECE). 
3. Dean Academics, GNDEC, Ludhiana.
4. BOS file.

No. ECE/ 45

Date: 18.01.16

MINUTES OF MEETING

Minutes of the 4th meeting of Board of Studies of Department of Electronics & Communication Engineering held on 18.01.2016 at 11.00 AM in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill (Chairman)
2. Pf. Ameeta Seehra
3. Pf. Narwant Singh Grewal
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Baljeet Kaur
7. Dr. Ajay Kumar Sharma
8. Pf. Nirmal Singh Grewal
9. Dr. Rajeevan Chandel

Received
Hans.
22/3/2016

The meeting started with the Chairman BOS welcoming the members to the 4th Board of Studies Meeting.

Following decisions were taken: -

Item No. 1 **Confirmation of minutes of 3rd meeting of Board of Studies held on 27.01.2015.**

Action Taken: Minutes of 3rd meeting confirmed.

Item No. 2 **Approval of syllabus of subjects of B.Tech. (ECE) 2014 admission batch onwards upto 5th semester.**

Action Taken: **Approved with following modifications:**

- i. For each subject, text books, and reference books should be separately specified.

Page 1 of 3

Minutes of 4th Meeting of BOS on 18.01.2016 (Department of Electronics & Communication Engineering)

- ii. In place of "minimum numerical contents," the term should be "Numerical/Design Problem contents" and a range should be specified for the same.
- iii. There should be 12-13 experiments in all lab subjects and hardware experimental results should be validated using simulation softwares/MATLAB wherever possible.
- iv. Reference Books / In-house manuals should be specified in the syllabus of lab subjects.

Numerous other suggestions were given by the BOS members regarding course contents, addition / deletion of certain topics, addition / deletion of reference books, standardisation of syntax for syllabus of all subjects, etc. All the suggestions have been incorporated in the syllabus and the final syllabus is attached at Annexure-I.

Item No. 3

Syllabus of remaining subjects of M.Tech. (ECE) 2014 admission batch.

Action Taken:

Approved with the following modifications: -

- (i) The title of "Digital VLSI Design" subject should be changed "VLSI Design Verification & Testing" and that of "Advanced Error Control Codes" should be changed to "Error Control Coding Techniques".
- (ii) The subject of "Data Mining & Cloud Computing" should be separated into two subjects namely
 - Databases and Data Mining
 - Cloud Computing

As for B.Tech syllabus, many suggestions were given by the BOS members regarding the addition / deletion of topics, books, etc. All the suggestions have been incorporated in the syllabus. The final study scheme and syllabus is attached at Annexure-II.

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Item No. 4 **Approval of panel of external paper setters for B.Tech (ECE) & M.Tech.**

Action Taken: Approved as proposed. The approved list attached at annexure III.

The meeting ended with the vote of thanks by chairman BOS.



Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

Encl:-

- i. Annexure I
- ii. Annexure II
- iii. Annexure III

2/4

GURU NANAK DEV ENGINEERING COLLEGE LUDHIANA
(Department of Electronics & Communication Engineering)
(An Autonomous College under UGC Act)

No ECE-178)

Date: 03/04/17

MINUTES OF MEETING

Minutes of the 7th meeting of Board of Studies of Department of Electronics & Communication Engineering held on 11/03/2017 at 02:30 PM in BOS office.

The following members were present in the meeting: -

1. Dr. Sandeep Singh Gill, Chairman, BOS
2. Pt. Arveta Saini, Member, Member
3. Pt. Navneet Singh Grewal, Member
4. Dr. Balwinder Singh Dhillon
5. Dr. Manish Rattia, Member

Item No. 1: Approval of 6th semester syllabus of B.Tech (ECE).

The following modifications are suggested in syllabus: -

1. The latest topics needs to be added in subject of Microwave and Radar Engineering (EC-14602). Also the experiment on transmission line needs to be replaced with experiment on measurement of return loss of patch antenna using VNA.

2. Distribution of contents in chapters needs to be uniform in the subject Microelectronics (EC-14605).

3. Three experiments need to be added related to Texas Instruments lab in the lab subject of Microcontroller and Embedded System (EC-14611). Also, latest microcontrollers need to be added in theory subject: Microcontrollers & Embedded system (EC-14604).

4. Following matter to be added in note contents of each lab "All the students shall design and implement a small project related to lab".

After the modification, all the contents will be circulated to all BOS members for comments. If no further suggestions received, then syllabus is approved.


Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

2/3

ANAK DEV ENGINEERING COLLEGE LUDHIANA
(Department of Electronics & Communication Engineering)
(An Autonomous College under UGC Act.)

Date: 01.09/16

No. ECE/ 852/1

MINUTES OF MEETING

Minutes of the 5th meeting of Board of Studies of Department of Electronics & Communication Engineering held on 01.09.2016 at 12:00 PM in HOD office.

The following members were present in the meeting:-

1. Dr. Sandeep Singh Gill, Chairman, BOS
2. Pf. Ameeta Seehra, Member
3. Pf. Narwant Singh Grewal, Member
4. Dr. Munish Rattan, Member
5. Dr. Baljeet Kaur, Member
6. Pf. Nirmal Singh Grewal, Member

Item No. 1 Revision of B.Tech (ECE) study scheme as per directions received vide letter no. SS/24/776 dated 22.08.2016 and letter no. SS/24/782 dated 24.08.2016.

Action Taken:-

The B.Tech (ECE) study scheme is revised as per instructions received from Dean Academic through above Letters and the revised B.Tech (ECE) scheme (upto 5th semester) and syllabus of new subject (i.e. IPR) is attached at Annexure - I. The scheme for 6th to 8th semester shall be revised in next BOS meeting.

Item No. 2 Revision of M.Tech (ECE) scheme as per letter no. M.Tech/01/2461 dated 05.06.2016.

Action Taken:-

The credits of pre-thesis seminar and pre-thesis project are revised as per directions and rest of structure is already as per new requirements specified in letter no. M.Tech/01/2461 dated 05.06.2016. The revised M.Tech (ECE) study scheme is attached at Annexure - II.

Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

Encl:

1. Annexure - I
2. Annexure - II

(53)

GURU NANAK DEV ENGINEERING COLLEGE - DHIANA
(Department of Electronics & Communication Engineering)
(An Autonomous College under UGC Act.)

No.ECE/165

Date: 19.07.17

MINUTES OF MEETING

Minutes of the 8th meeting of Board of Studies of Department of Electronics & Communication Engineering held on 19.07.2017 at 11.00 AM in HOD office.

The following members were present in the meeting :-

1. Dr. Sandeep Singh Gill, Chairman, BOS
2. Pf. Ameeta Seehra, Member — *Ameeta Seehra*
3. Pf. Narwant Singh Grewal, Member — *Narwant Singh Grewal*
4. Dr. Balwinder Singh Dhaliwal, Member — *Balwinder Singh Dhaliwal*
5. Dr. Munish Rattan, Member — *Munish Rattan*
6. Dr. Baljeet Kaur, Member — *Baljeet Kaur*

The following decision were taken :-

1. The syllabus of the newly introduced course in the 2017 study scheme of Basics of Electronics Engineering (Theory & Lab) was discussed and finalized.
2. The syllabus of the 8th semester subjects under the 2014 study scheme was discussed and approved.

It was decided that as external members could not be called for the meeting due to shortage of time the syllabus of all these courses be circulated for their comments.

Sandeep Singh Gill
Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

GURU NANAK DEV ENGINEERING COLLEGE LUDHIANA
(Department of Electronics & Communication Engineering)
(An Autonomous College under UGC Act.)

No. ECE/326

Date: 28/2/2019

MINUTES OF MEETING

Minutes of 11th meeting of Board of Studies of Department of Electronics and Communication Engineering held on 25th Feb 2019 at 11:00 AM.

The following members were present in the meeting:

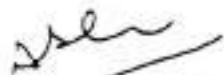
Sr. No.	Name of member and address	Designation
1	Dr. Sandeep Singh Gill Professor and Head, ECE Dept., GNDEC, Ludhiana	Chairman
2	Er. Ameeta Seehra Associate Professor, ECE Dept., GNDEC, Ludhiana	Member
3	Dr. Narwant Singh Grewal Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member
4	Dr. Balwinder Singh Dhaliwal Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member
5	Dr. Munish Rattan Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member
6	Dr. Baljeet Kaur Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member

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13/2

7	Dr. Amit Kumar Kohli Associate Professor, Electronics Department, Thapar University, Patiala	Member
8	Dean (Academics)/ Nominee	Member
9	COE/ Nominee	Member
10	Dean (T&P)/ Nominee	Member

The following decisions were taken:

The scheme and syllabus for 3rd and 4th semester, 2018 batch, was discussed. The suggestions by the members regarding the propose draft were incorporated and the final draft is attached at Annexure-I for approval by the Academic Council.


Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

MINUTES OF MEETING

Minutes of 15th meeting of Board of Studies of Department of Electronics and Communication Engineering held on 2nd Feb 2020 at 10.30 AM in the Committee Room of the Institute.

Following were the agenda points:

- To discuss and finalize the study scheme for 5th - 8th semester for ECE 2018 batch onwards.
- To discuss and finalize the syllabus of 5th semester for 2018 batch onwards.
- Ratification of minutes of internal BOS meeting held on 30.09.2019 and 12.12.2019.
- Any other item.

The following members were present in the meeting:

Sr. No.	Name of member and address	Designation
1.	Er. Amrita Seehra Associate Professor, ECE Dept., GNDEC, Ludhiana	Chairperson
2.	Dr. Narwant Singh Grewal Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member
3.	Dr. Munish Rattan Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member
4.	Dr. Baljeet Kaur Assistant Professor, ECE Dept., GNDEC, Ludhiana	Member
5.	Dr. Amit Kumar Kohli Associate Professor, Electronics Department, Thapar University, Patiala	Member
6.	Dr. Narwant Singh Grewal Dean (Academic) Nominee	Member
7.	Dr. Harmeet Singh Gill COE Nominee	Member
8.	Er. Gagandeep Singh Sodhi Dean (T&P)	Member

17/3/20

Following decisions were taken:

The study scheme for 5th - 8th semester and the syllabus of 5th semester for ECE 2018 batch onwards was discussed. The suggestions by the members were incorporated and the final draft is attached in Annexure-I for approval by the Academic Council.

As per the suggestion given by academic nominee the subject code of Mandatory non credit course (Environmental Science) of 3rd semester is changed from MCEC-101 to MCI-101 (attached in Annexure-II).

The Marks of the Mandatory course (Environmental Science- MCI-101) in 3rd semester scheme are excluded from the total marks of all subjects in that semester and minimum 40% score is required to achieve satisfactory level for that course (attached in Annexure-II).

The Mandatory course of "Mentoring and professional development" is added in the tabular form of the scheme for 3rd and 4th semesters (attached in Annexure-II).

Coverage hours of each theory course in 3rd and 4th semester are revised for ECE 2018 batch onwards (attached in Annexure-III).

Ratification of minutes of internal BOS meeting held on 30.09.2019 and 12.12.2019 (attached in Annexure-IV).

Ameeta Seehra

Ameeta Seehra
Chairperson
Board of Studies
Department of ECE

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Ref No: 27/10/15

Dated: 15th June, 2015

Minutes of 2nd meeting of Board of Studies of Information Technology department held on 15.06.2015 at 10:00 am in the college committee room.

The following persons were present:

1. Dr. Kulwinder Singh Mann, Associate Professor, Department of Information Technology, GNDEC, Ludhiana (Chairman)
2. Er. Akshay Girdhar, Associate Professor & Head, Department of Information Technology, GNDEC, Ludhiana (Member)
3. Dr. Manpreet Singh, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
4. Dr. Kiran Jyoti, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)

External Members

5. Dr. Savita Gupta, Professor, UIET, Panjab University Chandigarh (Member)
6. Dr. Amardeep Singh Professor, UCOE, Punjabi University, Patiala (Member)
7. Dr. Krishan Kumar Saluja, Associate Professor SUSCET, Ferozepur (Member) – could not attend the meeting.
8. Er. Nitish Mahajan, MD, Conjoinix Technology Private Limited, Sector 34-A, Chandigarh (Member)

The meeting started with welcome address by chairman BOS, and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Proceedings:

Agenda Item 1

1.1 Finalizing the new scheme for 3rd semester of B.Tech. Information Technology for batches 2014 & onwards

Approved

Dr. Savita Gupta

Dr. Kulwinder Singh Mann

Dr. Kiran Jyoti

Dr. Amardeep Singh

Er. Akshay Girdhar

Er. Nitish Mahajan

Dr. Manpreet Singh

Third Semester**B.Tech IT**

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BIT-301	IT Methodologies	3	1	-	40	60	100	4
BIT-305	Social and Professional aspects of IT	3	0	-	40	60	100	3
BIT-302	Data Structures and Programming Methodology	3	1	-	40	60	100	4
BTCSE-302	Digital Circuits and Logic Design	3	1	-	40	60	100	4
BTCSE-304	Object Oriented Programming using C++	4	1	-	40	60	100	5
BIT-303	IT Methodologies Lab	-	-	3	30	20	50	2
BIT-304	Data Structures and Programming Methodology Lab	-	-	4	30	20	50	2
BTCSE-305	Digital Circuits and Logic Design Lab	-	-	2	30	20	50	1
BTCSE-307	Object Oriented Programming using C++ Lab	-	-	4	30	20	50	2
BIT-306	Institutional Practical Training*-	-	-	-	60	40	100	1
Total		16	4	13	380	420	800	28
		Contact Hours= 33						

Agenda Item-2

2.1 Finalizing the syllabus of subjects of 3rd semester B.Tech IT for new scheme.

Approved

Committee approved the Subjects and syllabus of BIT-302, BTCSE-302, BTCSE-304, BIT-304, BTCSE-305, BTCSE-307, BIT-306.

The syllabus of new subject IT Methodologies (Theory and Lab) and Social and Professional aspects of IT will be prepared by internal BOS and will be sent through E-Mails to External BOS members for further suggestions and approval.

Dr. Savita Gupta

Dr. Kulwinder Singh Mann

Dr. Kiran Jyoti

Dr. Amardeep Singh

Er. Akshay Girdhar

Er. Nitish Mahajan

Dr. Manpreet Singh

THIRD SEMESTER		
Course Code	Course Name	Suggestions
BTAM-301	Mathematics-III	replaced with new subject Social and Professional aspects of IT with L-T-P as 3 -- with credits 3
BIT-301	Software Design Methodologies /Software Engineering-1	replaced by a subject IT Methodologies with L-T-P 3-1-0 with credits 4
BIT-302	Data Structures and Programming Methodology	
BTCSE-302	Digital Circuits and Logic Design	
BTCSE-304	Object Oriented Programming using C++	
BIT-303	Software Design Methodologies /Software Engineering-1 Lab	Replaced with IT Methodologies lab with L-T-P with 0-0-3 with credits 2
BIT-304	Data Structures and Programming Methodology Lab	
BTCSE-305	Digital Circuits and Logic Design lab	
BTCSE-307	Object Oriented Programming using C++ Lab	
	Institutional Practical Training	

Agenda Item 3

3.1 Approval of external question paper setters for end semester examinations of B.Tech. and M.Tech.

Approved

Agenda Item-4

4.1 Follow up of Agenda sub –item 4.2 of previous BOS meeting held on 18th March, 2014.

Approved

Dr. Savita Gupta

Dr. Kulwinder Singh Mann

Dr. Kiran Jyoti

Dr. Amardeep Singh

Er. Akshay Girdhar

Er. Nitish Mahajan

Dr. Manpreet Singh

Agenda Item-5

5.1 To discuss the new study scheme for B.Tech IT from 4th semester onwards

Scheme was discussed and will be finalized in next BOS Meeting.

Suggestions:

Institutional practical training should be diversified by including some vocational courses.

In 5th semester a subject related to module Maths and Statistics for IT will be introduced

Meeting ended with Vote of Thanks


15/6/15
HOD (IT) cum Chairman
Board of Studies

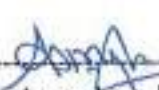
Distributions

1. Director, GND EC, Ludhiana for Kind Information
2. All members of BOS(IT)
3. Dean Academics, GND EC, Ludhiana.
4. BOS file
5. Faculty of the Department

Dr. Savita Gupta

Dr. Kulwinder Singh Mann

Dr. Kiran Jyoti


Dr. Amardeep Singh

Er. Akshay Girdhar

Er. Nitish Mahajan

Dr. Manpreet Singh

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Ref. No.: IT/100/1525

Dated: 23.12.15

Minutes of 3rd meeting of Board of Studies of Information Technology department held on 23.12.2015 at 9:30 am in the college committee room.

Following members were present:

1. Dr. Kulwinder Singh Mann, Associate Professor & Head, Department of Information Technology, GNDEC, Ludhiana (Chairman)
2. Dr. Akshay Girdhar, Associate Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
3. Dr. Manpreet Singh, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
4. Dr. Kiran Jyoti, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)

External Members

5. Dr. Savita Gupta, Professor, UIET, Panjab University Chandigarh (Member)
6. Dr. Amardeep Singh Professor, UCOE, Punjabi University, Patiala (Member)
7. Dr. Krishan Kumar Saluja, Associate Professor SUSCET, Ferozepur (Member)
8. Er. Nitish Mahajan, MD, Conjoinix Technology Private Limited, Sector 34-A, Chandigarh (Member) (not attended the meeting)

The meeting started with welcome address by chairman BOS, and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Proceedings:

Agenda-Item-1

1.1 Finalize New Scheme for 4th to 8th Semester of Information Technology for Batch 2014 onwards

After discussion and deliberation, necessary modifications have been incorporated in the proposed scheme of B.Tech. Information Technology for batch 2014 onwards



Committee approved the scheme-2014 and authorized Chairman BOS for further changes if required.

Approved

Fourth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14401	Database Management Systems	3	1	-	40	60	100	4
CS-14402	Operating Systems	3	1	-	40	60	100	4
IT-14403	Data Communication & Computer Networks	3	1	-	40	60	100	4
IT-14404	Web Technologies	3	1	-	40	60	100	4
IT-14405	Computer Architecture & Microprocessors	3	1	-	40	60	100	4
IT-14406	Database Management Systems Laboratory	-	-	4	30	20	50	2
CS-14406	Operating Systems Lab	-	-	2	30	20	50	1
IT-14407	Data Communication & Computer Networks Laboratory	-	-	2	30	20	50	1
IT-14408	Web Technologies Laboratory	-	-	3	30	20	50	2
IT-14409	Computer Architecture & Microprocessors Laboratory	-	-	2	30	20	50	1



IT-14410	General Fitness	-	-	-	100	-	100	-
Total		15	5	13	450	400	850	27
		Contact Hours= 33						

Fifth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14501	Discrete Mathematics	3	1	-	40	60	100	4
IT-14502	Programming in Java	3	1	-	40	60	100	4
IT-14503	Theory of Computation	4	1	-	40	60	100	5
IT-14504	Human Computer Interaction	3	1	-	40	60	100	4
IT-14xxx	Elective-I	3	1	-	40	60	100	4
IT-14505	Programming in Java Laboratory	-	-	4	30	20	50	2
IT-14506	Human Computer Interaction Laboratory	-	-	3	30	20	50	2
IT-14xxx	Elective-I Laboratory	-	-	2	30	20	50	1
IT-14507	Industrial Training-I*				60	40	100	2
Total		16	5	09	350	400	750	28
		Contact Hours= 30						



* 06 weeks Industrial Training-I will be after the end of 4th semester.

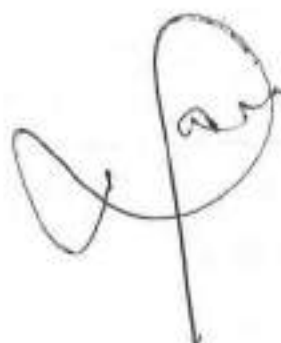
Sixth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14601	Information Assurance and Security	4	1	-	40	60	100	5
IT-14602	Software Engineering and Testing	4	1	-	40	60	100	5
IT-14xxx	Elective-II	3	1	-	40	60	100	4
IT-14xxx	Elective-III	3	1	-	40	60	100	4
IT-14603	Probability and Statistics	3	0	-	40	60	100	3
IT-14604	Software Engineering and Testing Laboratory	-	-	4	30	20	50	2
IT-14xxx	Elective-II Laboratory	-	-	4	30	20	50	2
IT-14605	Information Assurance and Security Laboratory	-	-	4	30	20	50	2
IT-14606	General Fitness		-	-	100	-	100	-
Total		17	4	12	390	360	750	27
		Contact Hours= 33						



Seventh Semester /Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14701	Business Enterprise Application	3	1	-	40	60	100	4
IT-14702	ICT in Agriculture and Rural Development	3	0	-	40	60	100	3
IT-14xxx	Elective-IV	3	1	-	40	60	100	4
IT-14703	Engineering Entrepreneurship	3	1	-	40	60	100	4
IT-14xxx	Open Elective	3	0	-	40	60	100	3
IT-14704	Major Project	-	-	5	100	100	200	5
IT-14705	Business Enterprise Application Laboratory	-	-	2	30	20	50	1
IT-14xxx	Elective-IV Laboratory	-	-	2	30	20	50	1
IT-14706	General Fitness		-	-	100	-	100	-
Total		15	03	09	460	440	900	25
		Contact Hours=27						



Seventh/Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14801	Industrial Training-II *	-	-	-	450	300	750	20

*In 4th year students will proceed for industrial training-II either in 7th or 8th semester as notified by the concerned department from time to time.

Elective-I

IT-14508 Advanced Computer Networks

IT-14509 Advanced Computer Networks Laboratory

IT-14510 Data Mining and Data Warehousing

IT-14511 Data Mining and Data Warehousing Laboratory

IT-14512 Digital Image Processing

IT-14513 Digital Image Processing Laboratory

IT-14514 .NET Technologies

IT-14515 .NET Technologies Laboratory

IT-14516 Advanced Web Technologies

IT-14517 Advanced Web Technologies Laboratory

IT-14518 Industry/Need based subject

IT-14519 Industry/Need based subject Laboratory

Elective-II

IT-14607 Advanced Java

IT-14608 Advanced Java Laboratory

IT-14609 Big Data Analytics

IT-14610 Big Data Analytics Laboratory

IT-14611 E-Commerce

IT-14612 E-Commerce Laboratory

IT-14613 Business Intelligence and its Applications
IT-14614 Business Intelligence and its Applications Laboratory
IT-14615 Information Storage and Management
IT-14616 Information Storage and Management Laboratory
IT-14617 Industry/Need based subject
IT-14618 Industry/Need based subject Laboratory

Elective-III

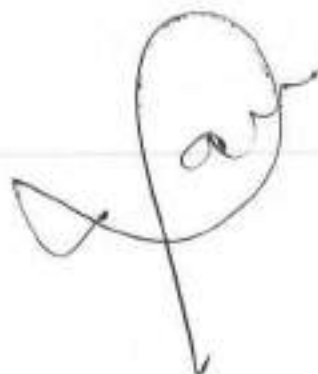
IT-14619 Compiler Design
IT-14620 IT in Forensic Science
IT-14621 Optimization Techniques
IT-14622 Multimedia Systems
IT-14623 Corporate IT Management
IT-14624 Research Methodologies

Elective-IV

IT-14707 Agile Software Development
IT-14708 Agile Software Development Laboratory
IT-14709 Bioinformatics
IT-14710 Bioinformatics Laboratory
IT-14711 Simulation and Modeling
IT-14712 Simulation and Modeling Laboratory
IT-14713 Mobile Application Development
IT-14714 Mobile Application Development Laboratory
IT-14715 Cloud Infrastructure and Services
IT-14716 Cloud Infrastructure and Services Laboratory
IT-14717 Industry/Need based subject
IT-14718 Industry/Need based subject Laboratory

Open Electives

IT-14719 IT enabled services



IT-14720 Corporate IT Management
IT-14721 Soft Computing
IT-14722 Management Information System
IT-14723 Object Oriented Analysis and Design
IT-14724 Digital Image Processing
IT-14725 IT Tools for Engineers

Agenda Item-2

2.1 Finalize syllabus of 4th semester for scheme-2014 for Batch 2014 onwards

After discussion and deliberation, necessary modifications have been incorporated in the proposed Syllabi of subjects of fourth semester of B.Tech. Information Technology.

Committee approved the Syllabus and authorized Chairman BOS for further changes if required.

Approved

Agenda Item 3

3.1 Introduction of new non credit subject Personality Development & Mentoring in each semester (except training semester of final year) from batch 2015 onwards and this course will be replacement of general fitness subject.

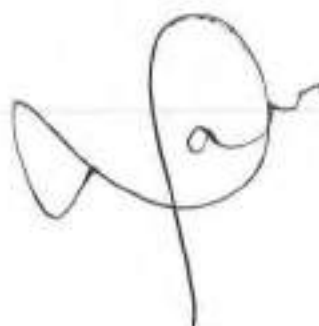
It is suggested by BOS members that Personality Development & Mentoring should be credit based course. It is further decided that it will be discussed in next BOS.

Agenda Item 4

4.1 Approval for panel of externals for B.Tech(IT) and M.Tech(IT) part-time.

Approved

Meeting ended with the vote of thanks





HOD (IT) cum Chairman
Board of Studies

Distributions:

1. Director, GNDEC, Ludhiana for kind information
2. All Members of BOS(IT)
3. Dean Academics, GNDEC, Ludhiana
4. BOS File
5. Faculty of the department

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Ref. No.: IT/30/2292

Dated: 30-09-2016

Minutes of 4th meeting of Board of Studies of Information Technology department held on 23.09.2016 at 9:00 am in the office of HOD (IT).

Following members were present:

1. Dr. Kulwinder Singh Mann, Professor & Head, Department of Information Technology, GNDEC, Ludhiana (Chairman)
2. Dr. Akshay Girdhar, Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
3. Dr. Manpreet Singh, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
4. Dr. Kiran Jyoti, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)

External Members

5. Dr. Savita Gupta, Professor, UJET, Panjab University Chandigarh (Member)
6. Dr. Amardeep Singh Professor, UCOE, Punjabi University, Patiala (Member)
7. Dr. Krishan Kumar Saluja, Professor, UIET, Panjab University Chandigarh (Member) (not attended the meeting)
8. Er. Nitish Mahajan, MD, Conjoinix Technology Private Limited, Sector 34-A, Chandigarh (Member) (not attended the meeting)

The meeting started with welcome address by chairman BOS, and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Proceedings:

Agenda-Item-1

1.1 Revision of Scheme 2014 of Department of Information Technology for batches 2014 onwards.

After discussion and deliberation, necessary modifications have been incorporated in the scheme 2014 of B.Tech. Information Technology for batch 2014 onwards

Committee approved the revised scheme-2014 and authorized Chairman BOS for further changes if required.

Approved

Third Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14301	IT Methodologies	3	1	-	40	60	100	4
IT-14302	Social and Professional aspects of IT	3	1	-	40	60	100	4
IT-14303	Data Structures and Programming Methodology	3	1	-	40	60	100	4
CS-14303	Digital Circuits and Logic Design	3	1	-	40	60	100	4
CS-14305	Object Oriented Programming using C++	3	1	-	40	60	100	4
IT-14304	IT Methodologies Lab	-	-	3	30	20	50	2
IT-14305	Data Structures and Programming Methodology Lab	-	-	4	30	20	50	2
CS-14306	Digital Circuits and Logic Design Lab	-	-	2	30	20	50	1
CS-14308	Object Oriented Programming using C++ Lab	-	-	4	30	20	50	2
TR-14301	Workshop Training*	-	-	-	60	40	100	2
Total		15	5	13	380	420	800	29
		Contact Hours= 33						

* Workshop Training will be imparted at the end of 2nd semester in the institute for four weeks in the college Central Workshop

Fourth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14401	Database Management Systems	3	1	-	40	60	100	4
CS-14402	Operating Systems	3	1	-	40	60	100	4
IT-14403	Data Communication & Computer Networks	3	1	-	40	60	100	4
IT-14404	Web Technologies	3	1	-	40	60	100	4
IT-14405	Computer Architecture & Microprocessors	3	1	-	40	60	100	4
IT-14406	Database Management Systems Laboratory	-	-	4	30	20	50	2
CS-14406	Operating Systems Lab	-	-	2	30	20	50	1
IT-14407	Data Communication & Computer Networks Laboratory	-	-	2	30	20	50	1
IT-14408	Web Technologies Laboratory	-	-	3	30	20	50	2
IT-14409	Computer Architecture & Microprocessors Laboratory	-	-	2	30	20	50	1
GF-14401	General Fitness	-	-	-	100	-	100	1
Total		15	5	13	450	400	850	28
		Contact Hours= 33						

G-

Fifth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14501	Discrete Mathematics	3	1	-	40	60	100	4
IT-14502	Programming in Java	3	1	-	40	60	100	4
IT-14503	Theory of Computation	3	1	-	40	60	100	4
IT-14504	Human Computer Interaction	3	1	-	40	60	100	4
DEIT-14xxx	Elective-I	3	1	-	40	60	100	4
IT-14505	Programming in Java Laboratory	-	-	4	30	20	50	2
IT-14506	Human Computer Interaction Laboratory	-	-	3	30	20	50	2
DEIT-14xxx	Elective-I Laboratory	-	-	2	30	20	50	1
TR-14501	Industrial Training-I*				60	40	100	2
Total		15	5	09	350	400	750	27
		Contact Hours=						
		29						

* 06 weeks Industrial Training-I will be after the end of 4th semester.



Sixth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14601	Information Assurance and Security	3	1	-	40	60	100	4
IT-14602	Software Engineering and Testing	3	1	-	40	60	100	4
DEIT-14xxx	Elective-II	3	1	-	40	60	100	4
OEIT-14xxx	Open Elective	3	0	-	40	60	100	3
IT-14603	Probability and Statistics	3	1	-	40	60	100	4
IT-14604	Software Engineering and Testing Laboratory	-	-	4	30	20	50	2
DEIT-14xxx	Elective-II Laboratory	-	-	2	30	20	50	1
IT-14605	Information Assurance and Security Laboratory	-	-	4	30	20	50	2
PRIT-14601	Minor Project	-	-	1	30	20	50	1
GF-14601	General Fitness	-	-	-	100	-	100	1
Total		15	4	11	420	380	800	26
		Contact Hours=						
		30						



Seventh Semester /Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14701	Business Enterprise Application	3	1	-	40	60	100	4
IT-14702	ICT in Agriculture and Rural Development	3	1	-	40	60	100	4
DEIT-14xxx	Elective-III	3	1	-	40	60	100	4
IT-14703	Engineering Entrepreneurship	3	1	-	40	60	100	4
DEIT-14xxx	Elective-IV	3	1	-	40	60	100	4
PRIT-14701	Major Project	-	-	4	100	100	200	4
IT-14705	Business Enterprise Application Laboratory	-	-	2	30	20	50	1
DEIT-14xxx	Elective-III Laboratory	-	-	2	30	20	50	1
GP-14701	General Fitness	-	-	-	100	-	100	1
Total		15	05	08	460	440	900	27
		Contact Hours=28						

Seventh/Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IR-14701	Industrial Training-II *	-	-	-	-	900	900	14
IR-14702	Industry Oriented Training	-	-	-	100	-	100	1
Total							1000	15

*In 4th year students will proceed for industrial training-II either in 7th or 8th semester as notified by the concerned department from time to time.

Elective-I

DEIT-14508 Advanced Computer Networks

DEIT-14509 Advanced Computer Networks Laboratory

DEIT-14510 Business Intelligence and its Applications

DEIT-14511 Business Intelligence and its Applications Laboratory

DEIT-14512 Digital Image Processing

DEIT-14513 Digital Image Processing Laboratory

DEIT-14514 .NET Technologies

DEIT-14515 .NET Technologies Laboratory

DEIT-14516 Advanced Web Technologies

DEIT-14517 Advanced Web Technologies Laboratory

DEIT-14518 Industry/Need based subject

DEIT-14519 Industry/Need based subject Laboratory

Elective-II

DEIT-14607 Advanced Java

DEIT-14608 Advanced Java Laboratory

DEIT-14609 Big Data Analytics

DEIT-14610 Big Data Analytics Laboratory

DEIT-14611 E-Commerce

DEIT-14612 E-Commerce Laboratory



DEIT-14613 Embedded Systems in C

DEIT-14614 Embedded Systems in C Laboratory

DEIT-14615 Information Storage and Management

DEIT-14616 Information Storage and Management Laboratory

DEIT-14617 Industry/Need based subject

DEIT-14618 Industry/Need based subject Laboratory

Elective-III

DEIT-14707 Agile Software Development

DEIT-14708 Agile Software Development Laboratory

DEIT-14709 Bioinformatics

DEIT-14710 Bioinformatics Laboratory

DEIT-14711 Simulation and Modeling

DEIT-14712 Simulation and Modeling Laboratory

DEIT-14713 Mobile Application Development

DEIT-14714 Mobile Application Development Laboratory

DEIT-14715 Cloud Infrastructure and Services

DEIT-14716 Cloud Infrastructure and Services Laboratory

DEIT-14717 Industry/Need based subject

DEIT-14718 Industry/Need based subject Laboratory

Elective-IV

DEIT-14719 Compiler Design

DEIT-14720 IT in Forensic Sciences

DEIT-14721 Optimization Techniques

DEIT-14722 Multimedia Systems

DEIT-14723 Corporate IT Management

DEIT-14724 Research Methodologies

Open Electives

OEIT-14601 IT enabled services

OEIT-14602 Management Information System

Agenda Item-2

2.1 Finalize syllabus of 5th semester for scheme-2014 for Batch 2014 onwards



After discussion and deliberation, necessary modifications have been incorporated in the proposed Syllabi of subjects of fifth semester of B.Tech. Information Technology.

Committee approved the Syllabus and authorized Chairman BOS for further changes if required.

Approved

2.2 Finalize syllabus of 6th semester for scheme-2014 for Batch 2014 onwards

After discussion and deliberation, necessary modifications have been incorporated in the proposed Syllabi of subjects of sixth semester of B.Tech. Information Technology.

Committee approved the Syllabus and authorized Chairman BOS for further changes if required.

Approved

Agenda Item 3

3.1 Approval for panel of externals for B.Tech(IT) and M.Tech(IT) part-time.

Approved

Meeting ended with the vote of thanks



**HOD (IT) cum Chairman
Board of Studies**

Distributions:

1. Director, GNDEC, Ludhiana for kind information
2. All Members of BOS(IT)
3. Dean Academics, GNDEC, Ludhiana
4. BOS File 5. Faculty of the department of IT

3/12/16 (Dashed line S.S.)
2



Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Ref. No. IT/30/2899

Dated: 08-08-2017

Minutes of 5th meeting of Board of Studies of Information Technology department held on August 08, 2017 at 10:00 am in the office of HOD (IT).

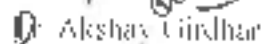
Following members were present:

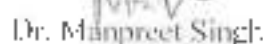
1. Dr. Kulvinder Singh Mann, Professor & Head, Department of Information Technology, GNDEC, Ludhiana (Chairman)
2. Dr. Akshay Girdhar, Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
3. Dr. Manpreet Singh, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
4. Dr. Kiran Jyoti, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)

External Members

5. Dr. Savita Gupta, Professor, UIET, Punjab University Chandigarh (Member)
6. Dr. Amardeep Singh, Professor, UCDE, Panjabi University, Patiala (Member)
7. Dr. Krishan Kumar Saluja, Professor, UIET, Punjab University Chandigarh (Member) Not a Head
8. Er. Harpreet Singh, MD, Harkash Technology Pvt. Ltd., Ludhiana (Member)

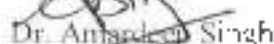

Dr. Kulvinder Singh Mann

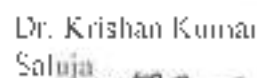

Dr. Akshay Girdhar


Dr. Manpreet Singh


Dr. Kiran Jyoti


Dr. Savita Gupta


Dr. Amardeep Singh


Dr. Krishan Kumar Saluja


Er. Harpreet Singh

Agenda Item-1**1.1 Amendments in Scheme 2014 of B.Tech Information Technology for Batch****2014 onwards for 7th /8th Semester****Third Semester**

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14301	IT Methodologies	3	1	-	40	60	100	4
IT-14302	Social and Professional aspects of IT	3	1	-	40	60	100	4
IT-14303	Data Structures and Programming Methodology	3	1	-	40	60	100	4
CS-14303	Digital Circuits and Logic Design	3	1	-	40	60	100	4
CS-14305	Object Oriented Programming using C++	3	1	-	40	60	100	4
IT-14304	IT Methodologies Lab	-	-	3	30	20	50	2
IT-14305	Data Structures and Programming Methodology Lab	-	-	4	30	20	50	2
CS-14306	Digital Circuits and Logic Design Lab	-	-	2	30	20	50	1
CS-14308	Object Oriented Programming using C++ Lab	-	-	4	30	20	50	2
TR-14301	Workshop Training*	-	-	-	60	40	100	2
Total		15	5	13	380	420	800	29
		Contact Hours= 33						

* Workshop Training will be imparted at the end of 2nd semester in the institute for four weeks in the college Central Workshop

Dr. Kulvinder Singh Mann

Dr. Kiran Dyer

Dr. Krishan Kumar
Saluja

Dr. Akshay Girdhar

Dr. Savita Gupta

Dr. Harpreet K. Gattar

Dr. Manpreet Singh

Dr. Amardeep Singh

Fourth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14401	Database Management Systems	3	1	-	40	60	100	4
CS-14402	Operating Systems	3	1	-	40	60	100	4
IT-14403	Data Communication & Computer Networks	3	1	-	40	60	100	4
IT-14404	Web Technologies	3	1	-	40	60	100	4
IT-14405	Computer Architecture & Microprocessors	3	1	-	40	60	100	4
IT-14406	Database Management Systems Laboratory	-	-	4	30	20	50	2
CS-14406	Operating Systems Lab	-	-	2	30	20	50	1
IT-14407	Data Communication & Computer Networks Laboratory	-	-	2	30	20	50	1
IT-14408	Web Technologies Laboratory	-	-	1	30	20	50	1
IT-14409	Computer Architecture & Microprocessors Laboratory	-	-	2	30	20	50	1

Dr. Kulwinder Singh Mann

Dr. Ashay Girdhar

Dr. Manpreet Singh

Dr. Kiran Tyoti

Dr. Savita Gupta

Dr. Amandeep Singh

Dr. Krishan Kumar Saluja

Er. Harpreet Khattar

GE-14431	General Fitness	-	-	-	100	-	100	1
Total		15	5	13	450	400	850	28
		Contact Hours-33						

Fifth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14501	Discrete Mathematics	3	1	-	40	60	100	4
IT-14502	Programming in Java	3	1	-	40	60	100	4
IT-14503	Theory of Computation	3	1	-	40	60	100	4
IT-14504	Human Computer Interaction	3	1	-	40	60	100	4
DEET-14xxx	Elective-I	3	1	-	40	60	100	4
IT-14505	Programming in Java Laboratory	-	-	4	30	20	50	2
IT-14506	Human Computer Interaction Laboratory	-	-	3	30	20	50	2
DEET-14xxx	Elective-I Laboratory	-	-	2	30	20	50	1

Dr. Kulwinder Singh Mann

Dr. Kiran Jyoti

Dr. Krishan Kumar Saluja

Dr. Akshay Girdhar

Dr. Savitri Gupta

Dr. Harpreet Khattar

Dr. Manpreet Singh

Dr. Amardeep Singh

ITR-14501	Industrial Training-I*				60	40	100	2
Total		15	5	09	350	400	750	27
		Contact Hours- 29						

* 06 weeks Industrial Training-I will be after the end of 4th semester.

Sixth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
IT-14601	Information Assurance and Security	3	1	-	40	60	100	4
IT-14602	Software Engineering and Testing	3	1	-	40	60	100	4
DEIT-14xxx	Elective-II	3	1	-	40	60	100	4
OEIT-14xxx	Open Elective	3	0	-	40	60	100	3
IT-14603	Probability and Statistics	3	1	-	40	60	100	4
IT-14604	Software Engineering and Testing Laboratory	-	-	4	30	20	50	2
DEIT-14xxx	Elective-II Laboratory	-	-	2	30	20	50	1
IT-14605	Information Assurance and Security	-	-	4	30	20	50	2

Dr. Kulwinder Singh Mann

Dr. Kiran Tyoti

Dr. Krishan Kumar

Dr. Akshay Girdhar

Dr. Savita Gupta

Dr. Harpreet Khatter

Dr. Manpreet Singh

Dr. Amardeep Singh

	Laboratory							
PRFI-14601	Minor Project	-	-	1	60	40	50	1
GE-14601	General Fitness		-	-	30	-	100	1
Total		15	4	11	450	400	850	26
		Contact Hours= 30						

Seventh Semester/Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
EE-14701	Business Enterprise Application	3	1	-	40	60	100	4
IT-14702	ICT in Agriculture and Rural Development	3	1	-	40	60	100	4
DEIT-14xxx	Elective-III	3	1	-	40	60	100	4
IE-14703	Engineering Entrepreneurship	3	1	-	40	60	100	4
DEIT-14xxx	Elective-IV	3	1	-	40	60	100	4
PRFI-14701	Major Project	-	-	3	120	80	200	3
IT-14704	Business Enterprise	-	-	3	30	20	50	2

Dr. Kulwinder Singh Mann

Dr. Kiran Tyoti

Dr. Krishan Kumar Saluja

Dr. Akshay Choudhary

Dr. Savita Gupta

Dr. Harpreet Khattar

Dr. Manpreet Singh

Dr. Amardeep Singh

	Application Laboratory							
DEIT-14xx3	Elective-III Laboratory	-	-	2	30	20	50	1
GE-14731	General Fitness				100	-	100	1
Total		15	05	08	480	420	900	27
		Contact Hours=28						

Seventh/Eighth Semester

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
TRIT-14701	Industrial Training-II *	-	-	-	450	350	800	13
TRIT-14702	Industry Oriented Training	-	-	-	200		200	2
Total					450	550	1000	15

*In 7th year students will proceed for industrial training-II either in 7th or 8th semester as notified by the concerned department from time to time.

This training is bifurcated in to two components. First component TRIT-14701 (Industrial Training-II) is of 800 marks and second component TRIT-14702 (Industry Oriented Training) will be of 200 marks. This training will be in college and it will be in the form of FDP, Workshop, STP etc. and it is of 2 weeks. Students will be evaluated after completing this training out of 200 marks. At the end of training, the total marks obtained from both components will be used for final computation.

Elective-I

Dr. Kulwinder Singh Mann

Dr. Kiran Jyoti

Dr. Krishan Kumar
Sainja

Dr. Akshay Girdhar

Dr. Savita Gupta

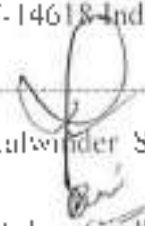
Dr. Harpreet Chatter

Dr. Manpreet Singh

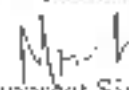
Dr. Amardeep Singh

DEIT-14508 Advanced Computer Networks
DEIT-14509 Advanced Computer Networks Laboratory
DEIT-14510 Business Intelligence and its Applications
DEIT-14511 Business Intelligence and its Applications Laboratory
DEIT-14512 Digital Image Processing
DEIT-14513 Digital Image Processing Laboratory
DEIT-14514 .NET Technologies
DEIT-14515 .NET Technologies Laboratory
DEIT-14516 Advanced Web Technologies
DEIT-14517 Advanced Web Technologies Laboratory
DEIT-14518 Industry/Need based subject
DEIT-14519 Industry/Need based subject Laboratory
Elective-II
DEIT-14607 Advanced Java
DEIT-14608 Advanced Java Laboratory
DEIT-14609 Big Data Analytics

DEIT-14610 Big Data Analytics Laboratory
DEIT-14611 E-Commerce
DEIT-14612 E-Commerce Laboratory
DEIT-14613 Embedded Systems in C
DEIT-14614 Embedded Systems in C Laboratory
DEIT-14615 Information Storage and Management
DEIT-14616 Information Storage and Management Laboratory
DEIT-14617 Industry/Need based subject
DEIT-14618 Industry/Need based subject Laboratory

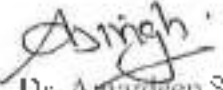

Dr. Kulwinder Singh Mann


Dr. Akshay Girdhar

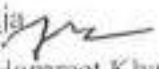

Dr. Manpreet Singh


Dr. Kiran Dhall


Dr. Savita Gupta


Dr. Amardeep Singh

Dr. Krishan Kumar
Sahuja


Dr. Harpreet Khattar

Elective-III

- DEIT-14705 Agile Software Development
- DEIT-14706 Agile Software Development Laboratory
- DEIT-14707 Bioinformatics
- DEIT-14708 Bioinformatics Laboratory
- DEIT-14709 Simulation and Modeling
- DEIT-14710 Simulation and Modeling Laboratory
- DEIT-14711 Mobile Application Development
- DEIT-14712 Mobile Application Development Laboratory
- DEIT-14713 Cloud Infrastructure and Services
- DEIT-14714 Cloud Infrastructure and Services Laboratory
- DEIT-14715 Industry/Need based subject
- DEIT-14716 Industry/Need based subject Laboratory

Elective-IV

- DEIT-14717 Compiler Design
- DEIT-14718 Computer Forensics
- DEIT-14719 Optimization Techniques
- DEIT-14720 Multimedia Systems
- DEIT-14721 Corporate IT Management
- DEIT-14722 Research Methodologies

Open Electives

- OEIT-14601 IT enabled services
- OEIT-14602 Management Information System

Approved

Agenda Item-2

2.1 Finalize the syllabus of 7th /8th Semester of B.Tech Information Technology for Batch

Dr. Kawinder Singh Mann

Dr. Kiran Jyoti

Dr. Krishan Kumar
Saluja

Dr. Akshay Girdhar

Dr. Savita Gupta

Er. Harpreet Khanna

Dr. Manpreet Singh

Dr. Amardeep Singh

2014 onwards.

After discussion and deliberation, necessary modifications have been incorporated in the proposed Syllabi of subjects of fifth semester of B.Tech Information Technology.

Committee approved the Syllabus and authorized Chairman BOS for further changes if required.

Approved

Agenda Item -3

3.1 Approval for panel of externals for B.Tech(IT) and M.Tech(IT) part-time.

Approved

Agenda Item -4

4.1 Discussion and Approval of Syllabus of FCPIT Theory and FCPIT Laboratory for 1st /2nd Semester for Batch 2017 onwards

After discussion and deliberation, necessary modifications have been incorporated in the proposed Syllabi of subjects of fifth semester of B.Tech Information Technology.

Committee approved the Syllabus and authorized Chairman BOS for further changes if required.

Approved

Meeting ended with the vote of thanks

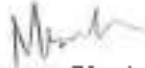

HOD (IT) cum Chairman
Board of Studies

Distributions:

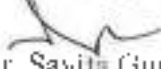
1. Director, GNDEC, Ludhiana for kind information
2. All Members of BOS(IT)
3. Dean Academics, GNDEC, Ludhiana
4. BOS File
5. Faculty of the department of IT

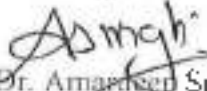

Dr. Kulwinder Singh Mann


Dr. Akshay Girdhar


Dr. Manpreet Singh


Dr. Kiran Tyoti


Dr. Savita Gupta


Dr. Amanpreet Singh

Dr. Krishan Kumar
Saluja


Dr. Harpreet Khattar

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Ref. No.: I.T./02/2018/74

Dated: 31/8/18

Minutes of 6th meeting of Board of Studies of Information Technology department held on August 31, 2018 at 11.00 am in the office of HOD (IT).

Following members were present:

1. Dr. Kiran Jyoti, Assistant Professor and Head, Department of Information Technology, GNDEC, Ludhiana (Chairman)
2. Dr. Akshay Girdhar, Professor, Department of Information Technology, GNDEC, Ludhiana (Member) and COE
3. Dr. Kulvinder Singh Mann, Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
4. Dr. Amit Kamra, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)

External Members

5. Dr. Savita Gupta, Professor, UIET, Panjab University Chandigarh (Member) (Could not Attend)
6. Dr. Amardeep Singh, Professor, UCOE, Punjabi University, Patiala (Member)
7. Dr. Sarbjit Singh, Professor, UIET, Panjab University Chandigarh (Member)
8. Er. Harpreet Singh, MD, Harksh Technologies Private Limited, Ludhiana (Member)
9. Er. Kshitiz Adhlakha, Founder, Secugenius Pvt. Ltd., Noida (Could not Attend)
10. Dean Academics
11. Er. Sandeep Singla, Nominee of TPO

Dr. Kiran Jyoti

Dr. Kulvinder Singh Mann

Dr. Akshay Girdhar

Dr. Amit Kamra

Dr. Sarbjit Singh

Er. Harpreet Khattar

Dr. Amardeep Singh

Er. Sandeep Singla

Dean Academics

Agenda Item-1

1.1 Proposal of new course under Autonomous Status

After discussion and deliberation, the title of course was approved as below. The Committee approved the course and authorized Chairman BOS for further changes if required.

Title: Bachelor of Vocation (B.Voc) with specialization in Software Development as per UGC Guidelines

Intake: 15

Approved

Agenda Item-2

2.1 Proposal to apply new course under National Vocational Education Qualification Framework (NVEQF) through AICTE

After discussion and deliberation, the committee suggested to apply for the course mentioned below.

Title: Bachelor of Vocation (B.Voc) with specialization in Software Development as per AICTE Guidelines

Approved

Agenda Item-3

3.1 Discussion on study scheme of 3rd and 4th semester of B.Tech IT-2018 onwards.

The discussion for B.Tech (IT) from 2018 batches and onwards was discussed at large keeping in mind the model curriculum of AICTE, B.Tech (IT) Scheme of IKGPTU Jalandhar and Information Technology Curricula 2017 developed by ACM and IEEE-CS. The scheme of 3rd and 4th semester for B.Tech (IT)-2018 batches and onwards was discussed in detail. The subjects will be finalized by next BOS meeting.

Dr. Kiran Jyoti

Dr. Amit Kamra

Dr. Amardeep Singh

Dr. Kulwinder Singh Mann

Dr. Sarabjit Singh

Er. Sandeep Singla

Dr. Akshay Girdhar

Er. Harpreet Khattar

Dean Academics

Agenda Item -4

4.1 Proposal to add non-credit course on Environment Science during workshop training.

The course content related to Environment Science shall be covered during workshop training for batch 2017.

Approved

Agenda Item -5

5.1 Approval for panel of externals for B.Tech (IT) and M.Tech (IT) Part-time.

Approved

Agenda Item -6

6.1 Proposal to start M.Tech (IT) AICTE Approved

There is a proposal to start a 2 years M.Tech degree in Information Technology, AICTE approved as the department has very good infrastructure, 6 PhD faculty members and 12 M.Tech faculty members. Committee authorized Chairman BOS for further changes if required.

Approved

Any Other Agenda Item

COE suggested that review of end semester question papers should be done through BOS.

Dr. Kiran Jyoti

Dr. Amit Kamra

Dr. Amardeep Singh

Dr. Kulwinder Singh Mann

Dr. Sarabjit Singh

Er. Sandeep Singla

Dr. Akshay Girdhar

Er. Harpreet Khattar

Dean Academics

Nominee of TPO suggested that duration of training after 4th semester to be of 4-6 weeks for ongoing Study Scheme

Meeting ended with the vote of thanks


HOD (IT) cum Chairman
Board of Studies

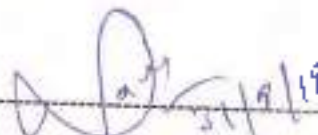
Distributions:

1. Principal for Information. Please 
2. All Members of BOS(IT) .
3. Dean Academics 
4. COE 
5. TPO 
6. BOS File
7. All Faculty members (IT)

Dr. Kiren Jyoti

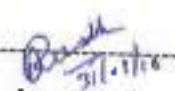
Dr. Amit Kamra

Dr. Amardeep Singh

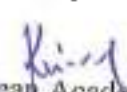

Dr. Kulwinder Singh Mann


Dr. Sarabjit Singh


Er. Sandeep Singla


Dr. Akshay Girdhar


Er. Harpreet Khattar


Dean Academics

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology

Ref. No.: IT./02/1958

Dated: 26-02-2019

Minutes of 7th meeting of Board of Studies of Information Technology department held on Feb, 26, 2019 at 10.00 am in the office of HOD (IT) .

Following members were present:

1. Dr. Kiran Jyoti, Assistant Professor and Head, Department of Information Technology, GNDEC, Ludhiana (Chairman)
2. Dr. Akshay Girdhar, Professor , Department of Information Technology, GNDEC, Ludhiana (Member) and COE
3. Dr. Kulvinder Singh Mann, Professor, Department of Information Technology, GNDEC, Ludhiana (Member)
4. Dr. Amit Kamra, Assistant Professor, Department of Information Technology, GNDEC, Ludhiana (Member)

External Members

5. Dr. Savita Gupta, Professor, UIET, Panjab University Chandigarh (Member)
6. Dr. Amardeep Singh, Professor, UCOE, Punjabi University, Patiala (Member)
7. Dr. Sarbajit Singh Professor, UIET, Panjab University Chandigarh (Member) (Could not Attend)
8. Er. Harpreet Singh, MD, Harksh Technologies Private Limited, Ludhiana (Member)
9. Er. Kshitz Adhlakha, Founder, Secugenius Pvt. Ltd., Noida (Could not Attend)
10. Dean Academics/Nominee
11. TPO/Nominee

Agenda Item-1

Dr. Kiran Jyoti
Dr. Amit Kamra
Dr. Amardeep Singh

Dr. Kulvinder Singh Mann
Dr. Savita Gupta
TPO/Nominee

Dr. Akshay Girdhar
Er. Harpreet Khattar
Dean Academics/TPO

Agenda Item-1

1.1 Finalization New Study scheme of 3rd and 4th semester for batches 2018 and onwards

After discussion and deliberation, the committee finalized the scheme.

Approved

Agenda Item-2

2.1 Finalize syllabus of 3rd and 4th semester of IT for batches 2018 and onwards.

After discussion and deliberation, the committee finalized the syllabus.

Approved

Agenda Item-3

3.1 Discussion on study scheme of 5th, 6th 7th and 8th semester for batches 2018 and onwards

The committee deliberated on the same and scheme will be finalized in next BOS meeting.

Agenda Item -5

4.1 Approval for BOS panel for external paper settings of subjects of B.Tech (IT).

Approved

Meeting ended with the vote of thanks

HOD (IT) cum Chairman
Board of Studies

Distributions:

1. Principal for Information
2. All Members of BOS(IT)
3. Dean Academics
4. COE
5. TPO
6. BOS File

Dr. Kiran Jyoti

Dr. Amit Kamra

Dr. Amardeep Singh

Dr. Kulwinder Singh Mann

Dr. Savita Gupta

TPO/Nominee

Dr. Akshay Girdhar

Er. Harpreet Khattar

Dean Academics/TPO

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ 36/2368

Dated: 06-03-2018

MINUTES OF MEETING

The first meeting of the new Board of Studies (Mechanical Engineering) of Guru Nanak Dev Engineering, Ludhiana constituted by Principal vide Office Order No. RK38/2042 dated 16.11.17 was held on 05.03.2018 (Monday) at 03:00 pm in the Committee Room of Guru Nanak Dev Engineering, Ludhiana.

Following were the agenda points:-

1. Welcome of the new members and thanks of the outgoing Chairman BOS.
2. **Approval of detailed contents of the course DEME14205 Machining Science (copy attached).**
3. Correction in the subject/course code of subject DEME14714 Operations Management mentioned in the syllabus of Departmental Elective -IV (General Group) as per Study Scheme.
4. Review of Course Outcomes (COs) of B. Tech. (Mechanical) subjects in context with the LOTS (Low Order Thinking Skills) and HOTS (High Order Thinking Skills) of Revised Bloom's Taxonomy.
5. Discussion on change of nomenclature of AICTE approved PG Program of M.Tech. (Industrial Engg.).
6. Start of new PG Programs by the department.
7. Any other issue with the permission of the Chairman BOS.

Following members of the BOS were present and actively participated:-

1. Dr. Paramjit Singh	Chairman
2. Dr. Sehijpal Singh	Outgoing Chairman (Special Invitee)
3. Dr. H.S. Shan	Member
4. Dr. Pardeep Rajan	Member
5. Dr. Jatinder Madan	Member
6. Er. D.S Dogra	Member
7. Dr. Harwinder Singh	Member
8. Dr. Jatinder Kapoor	Member
9. Er. Deepinder Singh	Member
10. Dr. G.S. Brar	Member

Following members of the BOS couldn't attend the meeting:-

1. Dr. S.P Singh	Member
2. Dr. Harmesh K Kansal	Member
3. Dr. Harmeet Singh	Member
4. Dean (Academics)/Nominee	Member
5. COE/Nominee	Member
6. Dean (T&P)/Nominee	Member

The minutes of the meeting were as under:-

1. The Chairman welcomed all the members and introduced the new members of the Board. On behalf of the Guru Nanak Dev Engineering College, Ludhiana he also expressed words of gratitude to the previous members of the BOS and especially to the Outgoing Chairman of the Board for their excellent and dedicated contributions.
2. **In reference to the 2nd agenda point, the BOS approved the contents of the course DEME 14205 Machining Science with minor modifications.**
3. The 3rd agenda point was also approved and correction in the syllabus of subject DEME14714 Operations Management was incorporated.

[Signature]
06/03/2018

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

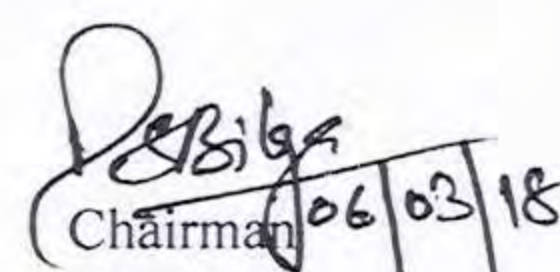
(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ 36/2368

Dated: 06-03-2018

4. In regard to the review of Course Outcomes (COs) of B.Tech (Mechanical) subjects in context with the LOTS (Low Order Thinking Skills) and HOTS (High Order Thinking Skills) of Revised Bloom's Taxonomy, the Board approved the contents of COs with minor corrections and authorized the Chairman BOS and his team of two senior Professors to check the grammar of the COs and incorporate the corrections accordingly.
5. The 5th agenda point was discussed in detail by the Board in context with the changing market scenario of the country and NBA process. The members suggested to change the nomenclature from M.Tech. (Industrial Engineering) to M.Tech. (Mechanical Engineering) with specialization on Thermal, Design, Manufacturing and Industrial Engineering etc. But during the ongoing discussions, one of the member (outside GNDEC), Dr. Jatinder Madan suggested the merger of Department of Mechanical Engineering and Department of Production Engineering into a single department with the name of Department of Mechanical and Production Engineering at par with the national level institutes of repute and in the larger interest of the institute and the students. This was also appreciated by one of the senior member Prof. (Dr.) H.S. Shan and other members. All the members were unanimously of the view that the approval for the merger of the departments must be initiated from competent authorities at the earliest.
6. It was suggested by the BOS that department should explore the possibility of PG diploma in Safety Engg/Manufacturing/CAD/CAM/Non Traditional Manufacturing Processes/ etc. but only after the proper survey and discussions with Department of Labour, District Industries Centre, Ludhiana, MSME Development Institute, Ludhiana, and other R & D organizations and local & other industrialists etc. A committee consisting of the following members of BOS was constituted to look into the matter at the earliest preferably within month:-
 1. Dr. Harwinder Singh, Coordinator
 2. Er. Daljit Singh, Member
 3. Dr. Jatinder Kapoor, Member
7. Under the any other issue with the permission of the Chairman BOS, the study scheme of 1st year batch 2018 UG programs was discussed especially in context with mechanical related subjects. It was unanimously decided that the distribution of hours to Engineering Graphics and Design subject should be kept at par with similar subject taught by the faculty during previous year. Further, the members of the BOS unanimously approved the minutes of meeting of Department Advisory Committee held on 18.01.2018 regarding Program Outcomes (POs) and Program Specific Outcomes (PSOs) of B.Tech. (Mechanical Engg.).


Chairman
BOS (ME)

Encl.:

1. Corrected and approved copy of syllabus of subject DEME 14205 Machinery Science.
2. Approved copy of syllabus of subject DEME14713 Operations Management having corrected code.
3. Corrected and approved copy of Course Outcomes (COs) of B.Tech (Mechanical) subjects for 2014 to 2017 admission batches.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)
DEPARTMENT OF MECHANICAL ENGINEERING

Dated: 28-2-2019

No. ME/ 26/3763

MINUTES OF MEETING

A meeting of Board of Studies (Mechanical Engineering) of Guru Nanak Dev Engineering, Ludhiana constituted by Principal vide Office Order No. RK38/2042 dated 16.11.17 was held on 20.02.2019 (Wednesday) at 11.00 am in the Committee Room, of the Institute.

Following were the agenda Points:-

1. To discuss and approve the curriculum (study scheme) of B.Tech (Mechanical Engineering) of 2018 admission batch onwards.
2. To discuss and approve the detailed contents of the course of following elective subjects of 2014-2018 study scheme:-
 - i. DEME 14101 IC Engine.
 - ii. DEME 14612 Heat Treatment Processes.
3. Discussion and approval of detailed contents of the courses of 3rd and 4th semester B.Tech. (Mechanical Engineering) curriculum of 2018 admission batch onwards.
4. Any other issue with the permission of the Chairman BOS.

Following members of the BOS were present and actively participated:-

1. Dr. Paramjit Singh	Chairman
2. Dr. H.S. Shan	Member
3. Dr. Pardeep Rajan	Member
4. Dr. S.P Singh	Member
5. Dr. Harmesh K Kansal	Member
6. Dr. Harneet Singh	Member
7. Dr. Harwinder Singh	Member
8. Dr. Jatinder Kapoor	Member
9. Er. Deepinder Singh	Member
10. Dean (Academics)/Nominee	Member
11. COE/Nominee	Member
12. Dean (T&P)/Nominee	Member

Following members of the BOS couldn't attend the meeting:-

1. Er. D.S Dogra	Member
2. Dr. Jatinder Madan	Member

Following Special Invitees were also present in the meeting:

1. Dr. Sehijpal Singh	Principal (GNDEC)
2. Er. Davinder Singh Bhogal	Asstt. Prof. (ME)
3. Er. Prem Singh	Asstt. Prof. (ME)
4. Er. Ardamanbir Singh	Asstt. Prof. (ME)
5. Er. Aprinder Singh Sandhu	Asstt. Prof. (ME)

Following Special Invitees could not attend the meeting:

1. Er. Gurmeet Kaur	Asstt. Prof. (ME)

Deeplax
28/02/2019

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(An Autonomous College w/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ 36/3763

Dated: 28-2-2019

The following decisions were taken unanimously based upon the discussions and suggestions of various members of BOS and Special Invitees:-

- 1) In regard to the Study Scheme of B.Tech (Mechanical Engineering) of 2018 admission batch onwards following modifications had been suggested:-
 - a) The Engineering Mechanics subject shall be under Engineering Science courses and being very fundamental course for Mechanical Engineers its credits shall be increased from 2 credits to 3 credits.
 - b) The subjects of Manufacturing Science - I and Manufacturing Science - II shall be renamed as Manufacturing Processes and Modern Manufacturing Processes respectively and the contents of manufacturing technology shall also be included alongwith contents related to manufacturing sciences.
 - c) GNDEC being mainly catering to rural area students, some subjects/courses or contents related to Rural Technologies or Sustainable Technologies shall be made part of the curriculum.
 - d) The credits for elective subjects shall be made flexible between 2-4 credits in order to increase the number of elective subjects in the form of theory as well as practical/practice and to cover Special topic/s of Mechanical Engineering.
 - e) There is no need of separate lab of Computer Aided Manufacturing (CAM) course and the requisite contents needed shall be included in some other relevant subject/lab.
- 2) The detailed contents of following elective subjects of 2014-2018 study scheme had been approved with minor modifications (Copies attached):-
 - i) DEME 14101 IC Engine.
 - ii) DEME 14612 Heat Treatment Processes.
- 3) A detailed discussion on the contents of the courses of 3rd and 4th semester B.Tech (Mechanical Engineering) curriculum of 2018 admission batch onwards had been held and following modifications and suggestions had been proposed:-
 - a) The topics/ contents related to piping and instrumentation diagram (P&ID), Building Information and Management System (BIMS), Computational Fluid Dynamics (CFD) and digital manufacturing shall be included in appropriate subjects.
 - b) The course of Industrial Automation and Robotics must include some contents related to mechatronics and DH (Denavit-Hartenberg) parameters.
 - c) The contents of Thermodynamics shall be reduced and some important/requisite contents could be made a part of Topics for Self Learning (TSL).
 - d) Topics of Probability and Statistics must be included in course of Mathematics-III.
 - e) Concept of Similitude and Hydro Power Plant shall be included in course of Fluid Mechanics and Machinery.
 - f) Basics of Industrial Engineering must be incorporated in the course of Operations Research.
 - g) Include some contents of Machine Tools and various finishing processes in course of Manufacturing Processes.
 - h) The contents of Engineering Mechanics must include topics of Trusses and frames.
 - i) The contents related to kinematics, flywheel and governors must be included in Theory of Machines subject.
- 4) The proposed study scheme for 3rd to 8th Semester B.Tech. (Mechanical Engineering) curriculum of 2018 admission batch onwards has been modified in light of the above and a new study scheme for 3rd to 8th semester B.Tech. (Mechanical Engineering) curriculum of 2018 admission batch onwards had been

[Signature]
28/2/2019

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(An Autonomous College w/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ 36/3763

Dated: 28-2-2019

finalized and approved (Copy attached). The detailed contents of various courses of 3rd and 4th semester B.Tech. (Mechanical Engineering) curriculum of 2018 admission batch onwards will be finalized in the next meeting alongwith the remaining courses of subsequent semesters.


Chairman 28/2/2019
BOS. (ME)

Encl.:

1. Approved copy of syllabus of subject DEME 14101 IC Engine.
2. Approved copy of syllabus of subject DEME 14612 Heat Treatment Processes.
3. Approved copy of Study Scheme for 3rd to 8th semester B.Tech. (Mechanical Engineering) curriculum of 2018 admission batch onwards.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No.ME/_____

Dated:_____

MINUTES OF MEETING

A meeting of Board of Studies (Mechanical Engineering) was held on 31.05.2019(Friday) at 11.00 am in the Committee Room of the Institute.

Following were the agenda Points:-

1. Discussion and approval of detailed contents of the courses of 3rd and 4th semester B.Tech. (Mechanical Engineering) of 2018 admission batch onwards.
2. To discuss and approve the curriculum (study scheme) of M.Tech. (Mechanical Engineering) of 2019 admission batch onwards.
3. Any other issue with the permission of the Chairman BOS.

Following members of the BOS, external expert and special invitee were present and actively participated:-

1. Dr. Paramjit Singh Bilga	Chairman
2. Dr. H.S. Shan	Member
3. Dr. Pardeep Rajan	Member
4. Dr. S.P Singh	Member
5. Dr. Harmesh K Kansal	Member
6. Dr. Harmeet Singh	Member
7. Dr. Jatinder Kapoor	Member
8. Dr. Amit Kamra	Member [COE Nominee]
9. Er. Gagandeep Singh Sodhi	Member[Dean (T&P)]
10. Dr. Sugandh Malhotra	External Expert (IIT Bombay)
11. Dr. Subhash Chandra	External Expert (NIT, Jalandhar)
12. Er. Davinder Singh Bhogal	Special Invitee (GNDEC)
13. Er. Gurmeet Kaur	Special Invitee (GNDEC)
14. Er. Pushpinder Singh	Special Invitee (GNDEC)

Following members of the BOS couldn't attend the meeting:-

1. Er. D.S Dogra	Member
2. Dr. Jatinder Madan	Member
3. Dr. Harwinder Singh	Member
4. Er. Deepinder Singh	Member
5. Dean (Academics)/Nominee	Member
6. Dr. Sehijpal Singh	Principal (GNDEC)
7. Dr. P.M.V. Subbarao	External Expert (IIT Delhi)

The following decisions were taken unanimously based upon the discussions and suggestions of various members of BOS, external expert and special invitees:-

- 1) In regard to the detailed contents of the courses of 3rd and 4th semester B.Tech. (Mechanical Engineering) of 2018 admission batch onwards following modifications had been suggested:-
 - a) There should be COURSE STATUS instead of ELECTIVE STATUS in syllabus template.

Dr. Bilga
05/07/2019

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)
DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ _____

Dated: _____

- b) In all the Syllabi of B. Tech. Mechanical Engineering Batch 2018 onwards there shall be five text books and maximum of six reference books with authors (at least 2-3 Foreign/Indian authors) from the same field/subject area and renowned/reputed publications.
 - c) Include the Topics of MIG, TIG, Gas welding, Cutting Tool Geometry and Cutting Tool materials in course of Manufacturing Processes under the Chapters of Welding Processes and Cutting processes respectively.
 - d) Advance Processes of Welding, Casting and Forming shall be included in Modern Manufacturing Processes.
 - e) In course of Engineering Materials and Metallurgy, change the name of 5th Chapter to Metals and Alloys.
 - f) Dimensionless numbers (Reynolds, Froude's, Euler, Mach and Weber) shall be included in the course of Fluid Mechanics and Machinery under the Chapter of Fluid Kinematics and Fluid Dynamics.
 - g) In course of Machine Drawing & Computer Aided Design, change the name of Free-hand sketches to Freehand Proportional Sketches. Further, the most of the fundamental topics/contents related to geometric modeling, geometric transformations and curves and surfaces shall be omitted but essential contents related to CAD practices shall be included. Separate Chapter on Limits, Fits and Tolerances shall be included. Modify the practice part of syllabus as per the suggestions (for e.g. topic 1 shall be merged/ practiced with the contents of the assembly of various Mechanical Components and both Manual CAD based practice of assemblies of various Mechanical Components shall be carried out).
 - h) Modify the list of practicals/ experiments based on the modified contents of "Modern Manufacturing Processes" theory subject and availability of the equipment in the college and accordingly change the CO's based on learning imparted to students.
 - i) Minor modifications were suggested for the courses of Applied Thermodynamics, Engineering Mechanics, Strength of Materials and Theory of Machines.
- 2) In regard to discussion and approval the curriculum (study scheme) of M.Tech. (Mechanical Engineering) of 2019 admission batch onwards following changes were suggested:
- a) First semester shall have all core subjects and no elective subjects.
 - b) Students of final year B.Tech. programme can also opt for M.Tech. Elective subjects and note regarding this can be incorporated in the study scheme of B. Tech Mechanical Engineering 2018 Batch onwards.
 - c) Course/s of Ergonomics/ Human factors/ Condition Monitoring shall be included in list of electives.
 - d) Modify the Point No. 1 of Note as "A Student can opt any five Programme Elective subjects subjected to fulfilling of their Pre-requisites".
- 3) Under agenda Point No. 3 i.e. any other issue with the permission of the Chairman BOS, following supplementary agenda points were discussed and unanimous decisions were made:
- i. Syllabus of TR-101 Institutional Training to be held in the college Workshops/labs at the end of 2nd Semester for Four (04) weeks duration.
 - ii. Eligibility criteria of M. Tech. Mechanical Engg.
 - iii. PEO, PO and PSO of M. Tech. Mechanical Engg.


05/07/2019

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ _____

Dated: _____

- a) In syllabus of TR-101 Institutional Training to be held in the college Workshops/labs at the end of 2nd Semester for Four (04) weeks duration., the students will be required to perform (in groups) the utility based projects based on their learning in first year.
- b) Eligibility of M. Tech. Mechanical Engineering shall be as per the University Criteria but some modifications in the eligibility may be suggested to University for approval which will include some specific branches of B. Tech/B.E. fulfilling the pre-requisites course# to undergo M. Tech. Mechanical Engineering Programme.
- c) Expert advice on PEO, PO and PSO of M. Tech, Mechanical Engg. had been taken to finalize the same.


Chairman
BOS (ME) 15/07/2019

Encl.:

1. Approved copy of Study Scheme of M. Tech. (Mechanical Engineering) 2019 admission batch onwards.
2. Approved copy of detailed contents of 3rd and 4th semester B.Tech. (Mechanical Engineering) 2018 admission batch onwards.
3. Approved copy of question paper format of Machine Drawing & Computer Aided Design.
4. Approved copy of syllabus of "TR-101 Institutional Training".
5. Approved copy of PEO's, Po's and PSO's of M.Tech. (Mechanical Engineering) 2019 admission batch onwards.
6. Suggestions about modifications in eligibility criteria M.Tech. (Mechanical Engineering).

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ 86/4833

Dated: 4-11-19

MINUTES OF MEETING

A meeting of internal members of Board of Studies (Mechanical Engineering) was held on 24.10.2019 (Thursday) at 11.00 am in the Committee Room of the Institute.

Following were the agenda Points:-

1. Discussion and approval of detailed contents of the courses of 1st semester M.Tech. (Mechanical Engineering) of 2019 admission batch onwards.
2. Any other issue with the permission of the Chairman BOS.

Following members of the BOS and special invitee were present and actively participated:-

1. Dr. Paramjit Singh Bilga	Chairman
2. Dr. Harwinder Singh	Member
3. Dr. Harmeet Singh	Member
4. Dr. Jatinder Kapoor	Member
5. Dr. Narwant Singh	Member [Dean academic nominee]
6. Er. Gagandeep Singh Sodhi	Member [Dean (T&P)]
7. Er. Davinder Singh Bhogal	Special Invitee (GNDEC)
8. Er. Gurmeet Kaur	Special Invitee (GNDEC)
9. Dr. Chatwant Singh	Special Invitee (GNDEC)

Following members of the BOS couldn't attend the meeting:-

1. Er. Deepinder Singh	Member
2. Er. Ardamanbir Singh	Special Invitee (GNDEC)
3. Er. Pushpinder Singh	Special Invitee (GNDEC)
4. COE/ Nominee	

The following decisions were taken unanimously based upon the discussions and suggestions of various members of BOS and special invitees:-

- 1) The detailed contents of courses of 1st semester M.Tech. (Mechanical Engineering) 2019 admission batch onwards has been approved by internal members of BOS by incorporating the following suggestions in the proposed contents of aforesaid courses:
 - a) In all the Syllabi of M. Tech. (Mechanical Engineering) Batch 2019 onwards there shall maximum of five reference books with authors (at least 2-3 Foreign/Indian authors) from the same field/subject area and renowned/reputed publications.
 - b) Number of chapters in each course shall be maximum six.
 - c) Course Outcomes of Finite Element Analysis shall be reformulated.
 - d) Pre-requisites for course of Finite Element Analysis shall be engineering mathematics and physics/mechanics.
 - e) Number of teaching hours in course of finite element analysis shall be 36.

Signature
01/11/19

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)
DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ _____

Dated: _____

- f) Detailed contents of finite element analysis related to 3d trusses, beams and frames and dynamic problems shall be omitted.
 - g) Omit contents of, Single phase, multi-phase systems and Statical thermodynamics ad change course outcomes accordingly.
 - h) Reformulate the Course Outcomes for Decision Making Methods according to High Order Thinking Skills.
- 2) The comments of the external members of BOS shall be taken through E-mail before finalizing the detailed contents of courses of 1st semester of M.Tech. (Mechanical Engg.) 2019 admission batch onwards.
- 3) Under agenda Point No. 2 i.e. any other issue with the permission of the Chairman BOS, following supplementary agenda points were discussed and unanimous decisions were made:
- a) Corrections in the study scheme of M.Tech. (Mechanical Engineering) 2019 admission batch onwards.
 - i. Subject Codes for M.Tech. (Mechanical Engg.) 2019 admission batch onwards has been changed as per the guidelines provided by office of Dean Academics (GNDEC, Ldh.) vide notice number M.Tech/01/3496 and M.Tech/01/3528 dated 16/07/2019 and 17/07/2019 respectively.
 - ii. The external evaluation marks for Audit Courses of M.Tech. (Mechanical Engg.) 2019 admission batch onwards has been omitted and there are no credits for this course, only satisfactory/unsatisfactory has to be awarded.
 - b) Corrections in the study scheme of B.Tech. (Mechanical Engineering) 2018 admission batch onwards.
 - i. Nomenclature for Industrial Training of B.Tech. (Mechanical Engg.) 2018 admission batch onwards has been modified to Training-I in 3rd semester.
 - ii. Correction in Subject course outcome number 6 of Strength of Materials (PCME-102).
 - iii. Abbreviated forms for nomenclature of subjects and respective practicals are changed to their full form as follows:

Previous Abbreviation Form

- Engg. Materials and Metallurgy
- Strength of Materials Lab
- Engineering Materials and Metallurgy Lab
- Manufacturing Processes Lab
- Theory of Machines Lab
- Applied Thermodynamics Lab
- Fluid Mechanics & Machinery Lab
- Modern Manufacturing Process Lab
- Industrial Automation and Robotics Lab
- Mechanical Measurement and Control Lab
- Heat Transfer Lab
- Mechanical Vibrations Lab
- Refrigeration and Air Conditioning Lab

Previous Subject Code

- LPCME-102
- BSC-202

Corrected to Full Form

- Engineering Materials and Metallurgy
- Strength of Materials Laboratory
- Engineering Materials and Metallurgy Laboratory
- Manufacturing Processes Laboratory
- Theory of Machines Laboratory
- Applied Thermodynamics Laboratory
- Fluid Mechanics & Machinery Laboratory
- Modern Manufacturing Process Laboratory
- Industrial Automation and Robotics Laboratory
- Mechanical Measurement and Control Laboratory
- Heat Transfer Laboratory
- Mechanical Vibrations Laboratory
- Refrigeration and Air Conditioning Laboratory

Corrected to New Subject Code

- LPCME-103
- BSME-101

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GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
(An Autonomous College u/s 2 (f) and 12 (B) of UGC Act 1956)
DEPARTMENT OF MECHANICAL ENGINEERING

No. ME/ _____

Dated: _____

Other Correction:-

Semester of Strength of Materials, Manufacturing Processes and Machine Drawing and Computer Aided Design is changed from 4th to 3rd.


Chairman 01/11/19
BOS (ME)

Encl.:

1. Modified Study Scheme of M. Tech. (Mechanical Engineering) 2019 admission batch onwards
2. Modified Study Scheme of B.Tech. (Mechanical Engg.) 2018 admission batch onwards
3. Detailed Contents of 1st semester M. Tech. (Mechanical Engineering) 2019 admission batch onwards
4. Modified Course Outcome detail of Strength of Materials (PCME-102).

DEME 14205

Machining Science

Internal Marks: 40

External Marks: 60

Total Marks: 100

L	T	P	C
4	0	0	4

Course Outcomes

After studying this course the students will be able to:

1. Elaborate the conceptual significance of conventional material removal in manufacturing.
2. Apply basic principles of science to correlate the input parameters of conventional machining processes with output parameters like cutting forces, power, tool life etc.
3. Solve problems and derive theoretical relations related to mechanics of metal machining
4. Develop procedure for experimental determination of cutting force, temperature and tool life by using suitable equipment.
5. Analyze and optimize machining processes.
6. Suggest remedial measures to reduce the harmful ecological impact of machining processes.

Detailed Contents:

1. **Introduction to Machining Processes:** Concept of conventional material removal; Classification and applications of machining processes in modern manufacturing practices; Surface generation with machining; Orthogonal and oblique cutting; Tool geometry of conventional cutting tools. **07 Hrs**
2. **Mechanics of Machining:** Mechanism of chip formation process; Type of chips; Chip contraction coefficient; Machining parameters; Cutting force and power requirement in single point turning process; Velocity ratios; Merchant's theory; Shear angle relationships; Specific cutting pressure. **09 Hrs**
3. **Tool Wear and Tool Life:** Mechanism of wear; Type of wear in reference to cutting tools; Criteria of tool wear; Measurement of tool wear; Tool life: definition & factors affecting tool life; Taylor's tool life equation; Applications of tool life equation. **06 Hrs**
4. **Machinability:** Concept of machinability; Assessment of machinability; Role of various factor on machinability; Estimation of machining time in turning, drilling, milling and broaching operations; Major factor affecting machining time; Methods of calculating machining time in turning, drilling and milling operations; Process capabilities of different machining processes. **07 Hrs**
5. **Measurement of Cutting Forces:** Basic principles and need for measurement of cutting forces; Introduction to tool dynamometers for turning, drilling and milling operations. **05 Hrs**

6. **Thermal Aspects of Machining:** Friction and shear stress distribution in metal cutting; Kinetic coefficient of friction; Stagnant phenomena; Average shear plane temperature; Average chip-tool interface temperature; Experimental determination of cutting temperature. **07 Hrs**
7. **Economy and Ecological Aspect of Machining:** Machining costs; Determination of optimum cutting speed for minimum cost; Maximum production rate and profit rate; Metal cutting fluids, their characteristics & applications; Harmful ecological and health effects of metal cutting fluids; Economical use of metal working fluids. **07 Hrs**

Suggested Reading/Books:

1. Winston A. Knight, Geoffery Broothrøyd, "*Fundamentals of Metal Machining & Machine Tools*", CRC Taylor & Francis, 2005.
2. Serope Kalpankjian, Steven R. Sachimid, "*Manufacturing Engineering and Technology*", Pearson Education, 2001
3. G.K. Lal, "*Introduction to Machining Science*", New Age International Ltd., 2007
4. B.L. Juneja, G.S. Sekhon, "*Fundamentals of Metal Cutting and Machine Tools*", New Age International Ltd., 2003.
5. A. Bhattacharya, "*Metal Cutting Principles*", CBS Publishers, 1989.

Topics for Self Learning (TSL)

1. Systems of tool nomenclature
2. Advanced materials for cutting tools
3. Standards for tool wear measurements
4. Minimum quantity lubrication

Internal Marks: 40**External Marks: 60****Total Marks: 100**

L	T	P	C
4	0	0	4

Course Outcome:

1. To understand working of two stroke and four stroke SI/CI engines
2. To analyze the air standard cycle, fuel-air cycle and actual cycle and their importance.
3. To know different types of fuels and air requirement for complete combustion.
4. To understand principle of carburetion and fuel injection system requirements for SI and CI engines.
5. To comprehend stages of combustion and combustion chamber designs for SI and CI engines
6. To understand testing methods for various performance parameters of IC engine.

Detailed Contents:

1. **Introduction:** Definition of engine; Heat Engine, Classification & Nomenclature, working principle of four/ two stroke spark ignition (SI) and compression ignition (CI) engine, Review of Ideal cycles (Carnot Cycle, , Otto Cycle, Diesel cycle, Dual Cycle, Stirling Cycle, Ericson Cycle, Brayton Cycle) Application of IC Engines. (06 hours)
2. **Fuel Air Cycles and their analysis:** Introduction to fuel air cycles and their significance, composition of cylinder gases, variable specific heats, Dissociation, effect of no. of moles, comparison of air standard& fuel air cycles, Effect of operating variables, Comparison of actual and air standard cycles. (06 hours)
3. **Fuels:** solid, liquid and gaseous conventional fuels, combustion equation for hydrocarbon fuels, determination of minimum air required for combustion, conversion of volumetric analysis to mass analysis, qualities of S.I. & C.I. Engine fuels and their rating, types of Alternative Fuels. (05 hours)
4. **Carburetion:** Principle of carburetion, factors affecting carburetion, mixture requirements at different loads and speeds, the simple/ideal carburetor and its essential parts, analysis of single jet carburetor, compensating devices. (05 hours)
5. **Fuel Injection Systems:** functional requirements of an injection system, Mechanical injection system and its components, Electronic fuel injection system for SI and CI engine, MPFI system, Electronic control system, (06 hours)
6. **Combustion and combustion chambers:** Stages of Combustion in SI Engine, Flame front propagation, factor influencing the flame speed, ignition lag and factors affecting the lag, Abnormal combustion and knocking, combustion chambers for SI Engines, Stages of Combustion in CI Engine and CI combustion chambers, Concept of supercharging and Turbo charging. (05 hours)

7. **Measurement and Testing:** Measurement of friction horse power, brake horse power, indicated horse power, measurement of speed, air consumption, fuel consumption, heat carried by coolant and exhaust gases, performance parameters and characteristics (04 hrs)

Suggested Reading/ Books:

1. V. Ganesan, "*Internal Combustion Engines*", McGraw Hills.
2. V. M. Damundwar, "*A Course in Internal Combustion Engines*", Dhanpat Rai.
3. John B. Heywood, "*Internal combustion engine fundamentals*", McGraw-Hill,
4. Colin R. Ferguson, "*Allan Kirkpatrick Internal combustion engines: applied thermosciences*", John Wiley & Sons.
5. Richard Stone, "*Introduction to Internal Combustion Engines*", Palgrave Macmillan.

Topics for Self-learning:

1. *Advanced IC engine: Homogeneous Charge Compression Ignition (HCCI), Stratified Charge Engine, Gasoline Direct Ignition Engine, and Electrical Hybrid Engines.*

Course Outcome

After learning the course the students should be able to:

1. Knowledge of Physical Metallurgy for the understanding theory of Heat Treatment.
2. Understanding Principles and Processes of Heat Treatment.
3. Grasping concepts of Hardenability and significance of suitable quenching media.
4. Comprehending Surface hardening and Thermo Chemical Heat Treatment Processes.
5. Understanding heat treatment Processes of Commercial steel, Cast Iron & Non-ferrous metals.
6. Insight into procedures for testing Heat treated components and energy economy in heat treatment processes.

Detailed Contents:

1. **Nature of Metals, Alloys & Iron –Iron carbide equilibrium diagram:** Nature of Alloys, Phase diagrams, Iron-Cementite Phase diagram, Effect of Alloying elements on Iron –Iron carbide phase diagram, Classifications of steel. **06 Hrs**
2. **Principles of Heat Treatment of Steels:** Introduction & importance of Heat Treatment, Definition of various Phases and terms used in Heat Treatment, Kinetics of formation of Austenite, Austenite grain size, Determination and importance of Austenite grain size, Decomposition of Austenite, Time Temperature Transformation Curves, Effect of alloying elements on TTT curves, Continuous Cooling Transformation, Pearlitic transformation,: Mechanism, Kinetics, Effect of alloying elements on transformation, Inter-lamellar spacing, Bainitic transformation: Mechanism, Characteristics, Bainitic structure. Martensitic transformation: Mechanism, Kinetics, Ms - Mf temperatures, A thermal & isothermal martensite, Effect of applied stress on transformation, Habit planes, Bain distortion model, Retained austenite. **09 Hrs**
3. **Heat treatment processes:** Stress Relieving, Annealing, Spheroidizing, Normalizing, Hardening and Tempering, Hardening of typical steels, cast irons and non-ferrous alloys. **05Hrs**
4. **Hardenability and Quenchants:** Significance, Measurement Grossman method, Critical and ideal critical diameter, Jominy End Quench method, Use/Significance of Hardenability data, Effect of grain size and composition, Residual stresses, Factors affecting hardenability, Quenchants: Characteristics of quenchants, Different quenching media, Synthetic quenchants, Mechanism of quenching. **04 Hrs**
5. **Surface hardening of metals:** Principles involved in induction and flame hardening methods and application of selective hardening, Laser hardening, Case carburizing (solid, liquid and gaseous), Cyaniding, Carbonitriding, Nitriding, Depth of penetration - its measurement and relation with time and temperature. Special heat treatment processes: Austempering, Martempering, Ausforming, Patenting and Cryogenic treatment. Thermo-Mechanical treatments. **06 Hrs**
6. **Heat treatment of alloy Steels and Non-Ferrous alloys:** Heat Treatment of Tool and dies steels, Stainless steels and cast irons – specific examples, Heat treatment of Aluminium alloys, titanium alloys and copper alloys, Concept of age-hardening. **04 Hrs**
7. **Design for heat treatment:** Recommended features of parts suitable for heat treatment, Heat treatment furnaces- their temperature and atmosphere control, Defects in heat treated parts their Causes and remedies. Heat treated material testing and Energy economy in Heat treatment. **06 Hrs**

Suggested Reading/ Books:

1. Heat Treatment (Principles and Techniques) by T. V. Rajan, C. P. Sharma and A. Sharma, PHI
2. Physical Metallurgy for Engineers by D. S. Clark and W. R. Varney, East-West Press
3. Introduction to Physical Metallurgy by S. H. Avner, Tata Mc-Graw Hill
4. Engineering Physical Metallurgy and Heat Treatment by Yu. M. Lakhtin, MIR Publishers
5. Material Science and Metallurgy for Engineers by V D Kodgire and S V Kodgire, Everest Publishing House
6. ASM, Metals Hand Book: Heat Treating, Vol. 4, 9th Ed., Metals Parks, Ohio
7. Heat Treatment of Metals, Singh, Vijendra, Standard Publishers Distributors, Delhi.
8. George Krauss: Steels-Heat Treatment and Processing Principles, ASM International, Materials Park, Ohio, 1990.

TOPICS FOR SELF LEARNING (TSL)

1. *Use of Spectroscopy for the testing composition of materials.*
2. *Insight into Phase and Structure characterization techniques: X-Ray Diffraction, SEM, TEM etc.*

Programme: B.Tech.(ME)	L: 3 T: 0 P: 0
Semester: 3	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design/Programming Problems: 70%
External Marks: 60	Duration of End Semester Exam(ESE): 3hr
Total Marks: 100	Course Status: Compulsory

Prerequisites:

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the meaning of Engineering Mechanics.
2	Solve the problem related to the behaviour of a rigid body due to an external load.
3	Solve, analyze and design moment of area of plane figures.
4	Analyze the mass moment of solid objects.
5	Apply the Work-Energy Equation and Impulse-Momentum equation.
6	Analysis and Solve friction related problems.

Detailed Contents:

Part-A

1. Basics and Statics of particles: Introduction: Units and Dimensions ; Laws of Mechanics : Lami's theorem, Parallelogram and triangular; Law of forces: Vectorial representation of forces , Vector operations of forces: additions, subtraction, dot product, cross product ; Coplanar Forces : rectangular components ; Equilibrium of a particle, Forces in space , Equilibrium of a particle in space , Equivalent systems of forces , Principle of transmissibility.

07 Hrs

2. Equilibrium of Rigid Bodies: Types of supports; Free body diagram; Action and reaction forces; stable equilibrium ; Moments and Couples : Moment of a force about a point and about an axis, Vectorial representation of moments and couples , Scalar components of a moment; Varignon's theorem: Single equivalent force, Equilibrium of Rigid bodies in two dimensions ,Equilibrium of Rigid bodies in three dimensions.

07 Hrs

3. Properties of Surfaces and Solids: Centroids and centre of mass, Centroids of lines and areas: Rectangular, circular, triangular areas by integration, T section, I section, Angle section, Hollow section by using standard formula ; Theorems of Pappus: Area moments of inertia of plane areas: Rectangular, circular, triangular areas by integration, T section, I section, Angle section, Hollow section by using standard formula ; Parallel axis theorem and perpendicular axis theorem ; Principal moments of inertia of plane areas, Principal axes of inertia, Mass moment of inertia ;mass moment of inertia for prismatic, cylindrical and spherical solids from first principle; Relation to area moments of inertia.

07 Hrs

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Part-B

4. **Friction:** Friction force: Laws of sliding friction, equilibrium analysis of simple systems with sliding friction, wedge friction; Rolling resistance. **04 Hrs**
5. **Dynamics of Particles:** Displacements, Velocity and acceleration, their relationship, Relative motion, Curvilinear motion; Newton's laws of motion ; Work Energy Equation; Impulse and Momentum; Impact of elastic bodies. **07 Hrs**
6. **Dynamics of Rigid Bodies and its application:** Translation and Rotation of Rigid Bodies, Velocity and acceleration, General Plane motion of simple rigid bodies such as a cylinder, disc/wheel, and sphere. **04 Hrs**

Text Books

1. Russell C. Hibbeler, "*Engineering Mechanics: Statics & Dynamics*", Pearson Publishers 14th Edition, 2016.
2. R.K. Banal, "*Engineering Mechanics*", Luxmi publishers" 8th Edition, 2016.
3. Irving H. Shames, "*Engineering Mechanics*", Prentice Hall, 4th Edition, 2006
4. R. C. Hibler and Ashok Gupta, "*Engineering Mechanics (Statics, Dynamics)*", Pearson Education, 11th Edition, 2010
5. F. P. Beer and E. R. Johnston, "*Vector Mechanics for Engineers, Vol I - Statics, Vol II, - Dynamics*", Tata McGraw Hill Publishing, 9th Edition, 2011

Reference Books

1. K. L. Kumar, "*Engineering Mechanics*", Tata McGraw-Hill Publishing Company, 3rd Edition 2008.
2. S Rajasekaran and G. Sankarasubramanian, "*Engineering Mechanics Statics and Dynamics*", Vikas Publishing House Pvt. Ltd., 3rd Edition, 2005.
3. E. Nelson, Charles Best, William Mclean, Merle Potter, "*Schaum's Outline of Engineering Mechanics: Statics*", McGraw-Hill Education; 6th Edition, 2010. (E-Book Available)
4. E. Nelson, Charles Best, William Mclean, Merle Potter, "*Schaum's Outline of Engineering Mechanics Dynamics*", McGraw-Hill Education, 2010. (E-Book Available)
5. Robert W. Messler Jr., "*Reverse Engineering: Mechanisms, Structures, Systems & Materials*", McGraw-Hill Education, 1st Edition, 2013). (E-Book Available)

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Programme: B.Tech.(ME)	L: 3 T: 0 P: 0
Semester: 3	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design/Programming Problems: 70%
External Marks: 60	Duration of End Semester Exam(ESE): 3hr
Total Marks: 100	Course Status: Compulsory

Prerequisites:**Additional Material Allowed in ESE:** [Scientific Calculator]**On completion of the course, the student will have the ability to:**

CO#	Course Outcomes (CO)
1	Understand and use basic concepts and First Law of Thermodynamics for engineering applications.
2	Apply the Second law of Thermodynamics and related properties for the feasibility of engineering systems and solve engineering problems.
3	Recognize the nature of substance from the understanding of its properties and use related Tables and Charts.
4	Evaluate and analyze the performance of Air Standard and Vapor power cycles.
5	Apply combustion equations to analyze the products of combustion and combustion phenomenon.
6	Select IC Engine for a particular application.

Detailed Contents:**PART-A**

- 1. Basic concepts and First law of Thermodynamics:** Brief concept of continuum, Thermodynamic System, Boundary and Surroundings, Control(fixed) mass and Control Volume concept, Thermodynamic State, Thermodynamic Property, Condition for any quantity to be a property, Thermodynamic equilibrium, Thermodynamic path, Thermodynamic process, Concept of reversible process, Quasi-static process, Irreversible process, Cyclic process, Thermodynamic Cycle, Energy and its forms; Physical insight to internal energy, Energy transfer across system boundary i.e. transient energies, Heat and work transfer- their comparison and sign conventions, Displacement work and other modes of work, Zeroth law of Thermodynamics, First law of Thermodynamics and its applications to closed and open system, Steady and unsteady flow processes. **06 Hrs**
- 2. Second law of Thermodynamics:** Limitations of first law of Thermodynamics, Heat reservoir, source and sink, Heat engine, Refrigerator, Heat pump, Kelvin-Planck and Clausius Statements of second law and their corollaries, Carnot and reversed Carnot cycle, Concept of entropy, T-S diagram, Principle of increase in entropy, Applications of second law, High grade and low grade energy, Available and non-available energy, Enthalpy and entropy as a function of independent variables, Third law of Thermodynamics. **08 Hrs**
- 3. Properties of pure substances and Gas Mixtures:** Formation of steam and its Thermodynamic properties, p-V, T-S and an h-s diagram for a pure substance, Use of the

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steam table and Mollier chart, Determination of dryness fraction, Equation of State of a Gas, Ideal Gas, Internal energy, Enthalpy and Entropy of Gas Mixtures. **06 Hrs**

PART-B

4. **Thermodynamic cycles:** Air standard cycle: Otto cycle, Diesel cycle, Dual cycle and Brayton cycle; Vapor power Cycles: Steam power cycles, Rankine Cycles, Comparison of Rankine and Carnot Cycles, Reheat Cycle, Regenerative Cycles, Reheat – Regenerative Cycle, Binary Vapor Cycles, Thermodynamics of combined cycles. **08 Hrs**
5. **Combustion of fuel:** Types of fuels, Combustion of fuel, Combustion equations, Minimum air requirements and air-fuel ratio, Wet and dry analysis of products of combustion, Conversion of volumetric analysis into gravimetric analysis and vice-versa, Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature. **08 Hrs**
6. **Introduction to IC Engines:** Introduction to heat engines; Merits of I.C. Engines and their important applications, Classification and constructional features of I.C. Engines; Working of two stroke and four stroke Petrol and Diesel engines and their comparison. **04 Hrs**

Text Books:

1. P.K. Nag, "Engineering Thermodynamics", McGraw Hill Education (India), Chennai, 6th Edition 2017.
2. V. Ganeshan, "Thermal Engineering", McGraw Hill Education (India), Chennai
3. Y.A. Cengel, M. A. Boles, "Thermodynamics – An Engineering Approach", McGraw Hill Education, 8th Edition 2017.
4. R. E. Sonntag, C. Borgnakke, & G. J. V. Wylen, "Fundamentals of Thermodynamics", Wiley, 7th Edition 2009.
5. M. J. Moran, H. N. Shapiro, D. D. Boettner & M. Bailey, "Fundamentals of Engineering Thermodynamics", John Wiley & Sons, 7th Edition, 2010.

Reference Books:

1. J. B. Jones, & R. E. Dugan, "Engineering Thermodynamics", Prentice Hall, 1st Edition 1995.
2. D.B. Spalding, E.H. Cole, "Engineering Thermodynamics", Edward Arnold, London, 1982.
3. V.G. Erokhim, M.G. Makhani, "Fundamentals of Thermodynamics and Heat Engines", Mir Publishers, Moscow, 1986.
4. I. Shvets, V. Tolubinsky, "Heat Engineering", MedTech Science and Technology Series, 2nd Edition 1975.

Topics for Self Learning (TSL)
1. Concept of Irreversibility
2. Types of steam generators
3. Gibbs Function of a mixture
4. Maxwell's Equations
5. Combustion phenomenon in IC Engines (Knocking and detonation)

Subject Code: PCME-103

Subject Name: Manufacturing Processes

Programme: B.Tech.(ME)	L: 3 T: 0 P: 0
Semester: 3	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design/Programming Problems: 10%
External Marks: 60	Duration of End Semester Exam(ESE): 3hr
Total Marks: 100	Course Status: Compulsory

Prerequisites: Manufacturing Practices

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Use the Knowledge of Fundamental principles of Castings, Welding, forming and cutting processes for their practical applications.
2	Identify and suggest equipment, tools and accessories required for performing the various manufacturing processes.
3	Know about cutting tools and their materials and related concepts like tool life, wear, and coolants/lubricants.
4	Identify various machine tools and knowledge of different parameters of the processes for analyzing their effect.
5	Suggest a suitable process for manufacturing of component.
6	Understand the latest technologies in Manufacturing Processes.

Detailed Contents:

Part-A

- 1. Introduction:** Classification of manufacturing processes; Selection criteria for manufacturing processes; General trends in manufacturing. **02Hrs**
- 2. Casting Processes:** Introduction to metal casting; Patterns: types, materials and allowances; Moulding materials: moulding sand compositions and properties, sand testing, types of moulds, moulding machines. Cores: function, types, core making process, core-prints, chaplets. Gating system design, Riser design. Melting furnaces, and Metallurgical considerations in casting, Solidification of metals and alloys, Directional solidification, Segregation, Nucleation and Grain growth. **10Hrs**
- 3. Welding Processes:** Introduction and classification of welding processes; Principle, Equipment and constructional details for Gas welding, Electric Arc welding, relative merits of AC & DC arc welding; Electrodes: types, selection, electrode coating ingredients and their function; Thermal effects on weldment: heat affected zone, grain size and its control; Resistance welding: principle and their types. TIG and MIG welding processes: principle, equipment and constructional details. **10Hrs**

Part - B

- 4. Metal Forming:** Introduction and classification; Rolling process: introduction, classification, rolling mills, products of rolling, rolling defects and remedies; Forging: open and closed die


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- forging, forging operations, forging defects, their causes and remedies; Extrusion: classification, equipment, defects and remedies; Drawing: drawing of rods, wires and tubes, drawing defects and remedies; Introduction to sheet metal forming operations. **06Hrs**
5. **Metal Cutting:** Introduction to machining processes; Cutting tool geometry, Cutting tool materials: high carbon steels, alloy carbon steels, high-speed steel, cast alloys, cemented carbides, ceramics and diamonds, and CBN; Mechanics of chip formation process, concept of shear angle and cutting forces in metal cutting; Merchant theory, tool wear, tool life, machinability; **05Hrs**
6. **Machine Tools:** Classification, description and operations of Lathe machine, Shaping and planing machine, Milling machine, Boring machine, Broaching machine. **05Hrs**

Text Books

1. P. N. Rao, "*Manufacturing Technology, Foundry, Forming & Welding*", Tata McGraw Hill, 4th Edition, 2017
2. P. N. Rao, "*Manufacturing Technology, Metal Cutting and Machine Tools*", Tata McGraw Hill, 4th Edition, 2017
3. B. L. Juneja and G. S. Sekhon, "*Fundamentals of Metal Cutting & Machine Tools*", New Age International (P) Ltd, 2nd Edition, 2017.
4. P. C. Sharma, "*A Text Book of Production Technology*", S. Chand & Company Ltd., 8th Edition, 2014.
5. H. S. Shan, "*Manufacturing Processes*", Cambridge University Press, 2nd Edition, 2018.

Reference Books:

1. SeropeKalpakjian and Steven R. Schmid, "*Manufacturing Engineering and Technology*", Pearson Publishers, 4th Edition, 2002.
2. J.A. Schey, "*Introduction to Manufacturing Processes*", McGraw Hill Co., 3rd Edition 2000.
3. G. Boothroyd and W.A. Knight, "*Fundamentals of Machining and Machine Tools*", 2nd Edition, Marcel Dekker, Inc., 1989.
4. Uday S. Dixit, "*Metal Forming: Technology and Process Modeling*", McGraw-Hill Professional, 2013. (E-book available)
5. HwaiyuGeng, "*Manufacturing Engineering Handbook*", McGraw-Hill Professional 2nd Edition. (E-book available)
6. Jonathan Beddoes, M. J. Bibby, "*Principles of Metal Manufacturing Processes*", Butterworth Heinemann Elsevier Publications. (E-book available)

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Subject Code: PCME-104 Subject Name: Machine Drawing and Computer Aided Design

Programme: B.Tech.(ME)	L: 1 T: 0 P:4
Semester: 3	Teaching Hours: 60
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design/Programming Problems: 90%
External Marks: 60	Duration of End Semester Exam(ESE): 3hr
Total Marks: 100	Course Status: Compulsory

Prerequisites: Engineering Drawing and Graphics.

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	To acquire the knowledge of CAD software and its features.
2	To inculcate an understanding of the detail/assembly drawings using orthographic projections and sectional views.
3	To familiarize the students with Indian Standards on drawing practices.
4	To impart knowledge of thread forms, fasteners, keys, joints and couplings.
5	To make the students interpret drawings of machine components so as to prepare assembly drawings either manually and using CAD packages.
6	To acquire the knowledge of limits fits and tolerance pertaining to machine drawings.

Detailed Contents:

Part-A (Theory)

Traditional Machine Drawing (TMD) and Computer Aided Design (CAD)

- 1. Introduction:** Requirements of machine drawing; Review of Sectioning and conventional representation, Dimensioning, Machining Symbols, introduction and Familiarization of Code SP 46:2003. **01Hrs**
- 2. Fasteners:** Various types of screw threads, nuts and bolts, screwed fasteners, welding joints, riveted joints, knuckle joint, couplings, keys and cotter. **02Hrs**
- 3. Assembly in First Angle Projection of Various Mechanical Components:** Plummer Block, Foot Step Bearing, Steam Stop Valve, spring-loaded Safety Valve, Blow-off Cock, Tail Stock, Screw Jack, Expansion Joint. **03Hrs**
- 4. Introduction to CAD:** Introduction to CAD and its role in Product design and development cycle; CAD system; advanced input and output devices; Functions of a graphics package; Digital Printing, Rapid Prototyping, Application areas of CAD. **01Hrs**
- 5. Fits and Tolerance:** The concept of limits, fits & tolerances and their representation; types of fits: running , sliding , location, assembly, transition and interference ;ISO system of tolerance , tolerance zones, and grades; tolerance types : dimensional and geometric ; Gauging

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Part – B (Practice) TMD and CAD

Use of Traditional Machine Drawing (TMD)

1. Types of sectioning, limits, fits & tolerances; machining and welding symbols. **02 Hrs**
2. Sketches of various fasteners (screw threads, nuts and bolts, screwed fasteners, riveted joints, keys and cotter) **04Hrs**
3. Freehand sketches **06Hrs**
 - a) **Couplings:** Solid or Rigid Coupling, Protected Type Flange coupling, Pin type flexible coupling, muff coupling, universal coupling, cone friction clutch, single plate friction clutch.
 - b) **Pulleys:** fast and loose pulleys, stepped pulleys.
 - c) Knuckle and cotter joints, keys; Spigot and socket joint, Union joint.
4. **Assembly in First Angle Projection of Various Mechanical Components:** Plummer Block, Foot Step Bearing, Steam Stop Valve, spring-loaded Safety Valve, Blow-off Cock, Tail Stock, Screw Jack. **18 Hrs**

Use of 3D CAD software

5. Practice of 2D drawing using sketcher. **03 Hrs**
6. 3D modelling using 3D features. **06 Hrs**
7. Drafting and assembling of (any one from Plummer Block, bench vice, Screw Jack, Steam Stop Valve, knuckle joint etc.) with proper mating conditions and interference checking using 3D software. **08 Hrs**
8. Surface modelling (Computer mouse; Plastic bottles). **05 Hrs**

Text Books:

1. Ajeet Singh, "Machine Drawing (including Auto CAD)", McGraw Hill, 2nd edition, 2012
2. N.D. Bhatt, "Machine Drawing", Charotar publications, 50th Edition, 2014
3. P.S. Gill, "Machine Drawing", S K Kataria and Sons, 18th edition, 2017 Reprint
4. Mikell P. Groover, Emory W. Zimmer's, "CAD/CAM: Computer-Aided Design and Manufacturing", PHI, 2nd Edition, 1984.
5. D. D. Bedworth, M. R. Henderson & P.M. Wolfe, "Computer Integrated Design and Manufacturing", McGraw Hill, 2nd Edition, 1991.
6. Z. Ibrahim, "CAD/CAM - Theory and Practice", McGraw Hill, 2nd Edition, 2009.

Reference Books:

1. Gene R. Cogorno, "Geometric Dimensioning and Tolerancing for Mechanical Design", McGraw-Hill Professional, 2nd Edition, 2011. (E-Book Available)
2. Paul Drake, Jr., "Dimensioning and Tolerancing Handbook", McGraw-Hill Professional, 1st Edition, 1999. (E-Book Available)
3. Joseph E. Shigley, "Standard Handbook of Machine Design", McGraw-Hill Professional, 3rd Edition 2004. (E-Book Available)

Shigley
01/11/2019

Subject Code: LPCME-103**Subject Name: Manufacturing Processes Laboratory**

Programme: B.Tech. (ME)	L: 0 T: 0 P:2
Semester: 3	Teaching Hours: 20
Theory/Practical: Practical	Credits: 1
Internal Marks: 30	Percentage of Numerical/Design/Programming Problems: 100%
External Marks: 20	Duration of End Semester Exam(ESE): 1 hr
Total Marks: 50	Course Status: Compulsory

Prerequisites: Manufacturing Practices**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes(CO)
1	Conduct various tests on molding sand
2	Determine major characteristics of molding sand.
3	Use the equipments like TIG MIG, welding and study the effect of various process parameters on weld quality.
4	Learn about grinding practice of single and multipoint cutting tools for efficient use of grinding equipment.
5	Use conventional cutting machine tools like milling for given jobs /work pieces.
6	Determine cutting forces with the use of tool dynamometer.

Special Instruction related to resources requirement: Instruments should be used under guidance of Lab Technician or Teacher.

Sr.No.	Name of Practical
1.	To determine grain fineness number, clay content and moisture content of a given sample of moulding sand.
2.	To Prepare a specimen of moulding sand on a standard Rammer and to carry out following tests: a) Tensile, compressive and transverse strength b) Mould Hardness c) Shatter index d) Permeability
3.	To study the effect of process parameters of MIG Welding (Voltage, wire feed, gas flow) on welding of Mild steel sheet.
4.	To study the effect of process parameters of TIG welding (Pulse, Gas flow, current) on welding of Stainless steel and Mild steel sheets.
5.	To grind single point and multipoint cutting tools and to prepare introductory report on cutting inserts.
6.	To determine cutting forces with dynamometer for turning operation.
7.	To prepare a job of spur gears by the use of milling machines.

Reference Material

Manuals available in Lab.



Subject Code: PCME-109

Subject Name: Modern Manufacturing Processes

Programme: B.Tech.(ME)	L: 3 T: 0 P: 0
Semester: 4	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design/Programming Problems: 10%
External Marks: 60	Duration of End Semester Exam(ESE): 3hr
Total Marks: 100	Course Status: Compulsory

Prerequisites: Manufacturing Technology

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the concept of latest technologies and Non Traditional machining processes needed for manufacturing of components.
2	Select suitable technology or process for stringent requirement of manufacturing industry.
3	Describe and demonstrate the constructional features of machines/set ups related to major nonconventional machining.
4	Analyze the effect of process parameters on performance of major non-conventional machining.
5	Understand the concepts related to hybridization of modern machining processes and their utilization in industry.
6	Use various additive manifesting processes according to industrial requirements.

Detailed Contents:

Part – A

- 1. Introduction:** Latest trends in Manufacturing; Introduction to Flexible manufacturing system; Introduction to computer integrated manufacturing; Development of Non-conventional manufacturing processes. **04Hrs**
- 2. Modern Manufacturing Processes:** Modern Machining Processes: Mechanical Processes: Basics of Ultrasonic machining, Water Jet Machining and Abrasive Flow Machining; Applications and limitations, Electrochemical & Chemical Removal Processes: Principle of operation; elements and applications of Electrochemical Machining; Electro-chemical grinding; Electro-chemical honing; chemical machining. Thermal Metal Removal Processes: Electric Discharge Machining- Mechanism of metal removal; electrode feed control; selection of electrode material; applications. Plasma Arc Machining- Mechanism of metal removal; PAM parameters and applications. Laser Beam machining- Material removal; limitations and advantages. Electron-Beam Machining-; Generation and control of electron beam; process capabilities and limitations. Hybrid Machining Processes: Concept; classification; application; Advantages. **14 Hrs**

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Part - B

3. **Modern Welding Processes:** Principle, Equipment and Constructional details: Electron Beam Welding, Laser Beam Welding, Ion Beam Welding, Plasma welding, Thermit Welding, Electro slag and Electro gas Welding, Ultrasonic welding; Cold Metal Transfer technology; Friction stir Welding; Regulated Metal Deposition Process; Adhesive Bonding; Additive Manufacturing by welding. **07 Hrs**
4. **Modern casting Processes:** Evaporative Casting Process, investment, Shell Mold Casting, ceramic shell mould Vacuum molding, hot box, cold box casting process, full mould process, die casting, centrifugal casting. **05 Hrs**
5. **Modern Forming Processes:** High Energy Rate Forming Methods (HERF) Comparative Study of Conventional and High Velocity Forming of Metals, Review of Theory of plasticity, Principle, Process Parameters, equipment & mechanics of explosive forming, electro-hydraulic forming, magnetic pulse forming, Application of HERF Techniques. **05 Hrs**
6. **Additive manufacturing:** Introduction, advantages, limitations, and applications; Methods of producing metal powders, briquetting and sintering; Introduction to Selective Laser Melting and Selective Laser Sintering; 3-D Printing; Rapid prototyping and rapid tooling. **05Hrs**

Text Books:

1. P. C Panday ,H. S. Shan, "*Modern Machining Processes*", Tata McGraw Hill , 33rd Reprint , 2008.
2. Amitabha Ghosh and Asok Kumar Malik, "*Manufacturing Science*", Pearson Publications, 2nd Edition, 2010.
3. Serope Kalpakjian and Steven R. Schmid, "*Manufacturing Engineering and Technology*", Pearson Publishers, 4th Edition, 2002.
4. V.K. Jain, "*Advanced Machining Processes*", Allied Publishers, 1st Edition, 2007.
5. Abdel Hassan, El-Hofy Gawad, "*Fundamentals of Machining Processes: Conventional and Nonconventional Processes*", Taylor & Francis, 2014.

Reference Books:

1. Amithaba Bhattacharyya, "*New Technology*", The Institution Of Engineers, India
2. HMT Bangalore, "*Production Technology*", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.


05/07/2019

Subject Code: LPCME-107 Subject Name: Modern Manufacturing Process Laboratory

Programme: B.Tech. (ME)	L: 0 T: 0 P: 2
Semester: 4	Teaching Hours: 24
Theory/Practical: Practical	Credits: 1
Internal Marks: 30	Percentage of Numerical/Design/Programming Problems: 100%
External Marks: 20	Duration of End Semester Exam(ESE): 1hr
Total Marks: 50	Course Status: Compulsory

Prerequisites:

On completion of the course, the student will have the ability to:

CO#	Course Outcomes(CO)
1	Understand the concepts of CNC machine tools, their types and features
2	Generate part programs using CNC programming and simulation.
3	Evaluate the performance of drilling by CNC drill machine.
4	Understand the concept of additive manufacturing.
5	Understand the performance of EDM.
6	Evaluate the performance of electrochemical machine.

Sr.No.	Name of Practical
1.	Study the characteristics of various CNC machines on swansoft simulator.
2.	Machining practice on CNC milling trainer
3.	Practice on single axis CNC Drilling machine.
4.	Study the performance characteristics of electrical discharge machining process
5.	Demonstration the working of 3D Printer machine.
6.	Machining practice on electrochemical machine.

Reference Material

Manuals available in Lab.

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Subject Code: MME-101

Subject Name: Finite Element Analysis

Programme: M.Tech. (ME)	L: 3 T: 0 P: 0
Semester: I	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 50	Percentage of Numerical/Design/Programming Problems: 50%
External Marks: 100	Duration of End Semester Exam(ESE): 3hr
Total Marks: 150	Course Status: Core

Prerequisites: Knowledge of Basic concepts of Mechanics and Engineering Mathematics
Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Interpret the philosophy behind principles, design and modeling considerations in using finite element analysis.
2	Describe the concept of direct equilibrium method and potential energy method for structural mechanics problems
3	Develop stiffness matrices for spring, truss, beam, plane stress problems and three dimensional problems.
4	Derive the shape function for elements having different nodes.
5	Use mathematical tools to calculate stresses, forces, temperature etc. for given problem.
6	Apply the concepts of FEM in Dynamic problems.

Detailed Contents:

Part-A

- 1. Introduction:** Introduction of the FEM and its historical background, Brief overview of the steps used in FEM and various approaches to formulate elemental equations, Review of the concept of stresses, strains, equilibriums, boundary conditions, temperature effect and their relations, Concept and application of Minimum Potential energy method, Rayleigh Ritz method, Galerkin Method and Principle of Virtual Work applied to elasticity problems. **08 Hrs**
- 2. Matrix Algebra & Gauss Elimination Method:** Matrix algebra and its different operations, Eigen values and Eigen vectors, Positive definite matrix, Gauss elimination method to solve a large linear equations. **04 Hrs**
- 3. 1- Dimensional Problem:** Introduction, finite element modeling using bar element, shape functions, Iso, super and sub parametric types of FEM formulation, Potential energy approach and Galerkin method to solve 1-D problems, assembly of elemental equations, types and applications of boundary conditions, higher order 1-D element and their shape functions, its application to 1-D problem, Accounting of temperature effect in 1-D problems. **07 Hrs**
- 4. Trusses:** Introduction, 2-D, concept of local and global coordinate system and its transformation matrix, solution of 2-D by the FEM, stress calculations, Accounting of the temperature effect,

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computer programming concepts and its implementation to FEM, sample source code of processing, pre and post processing of the FEM. **07 Hrs**

Part-B

5. **2-D Problem Using Constant Strain Triangles (CST):** Introduction, finite element modeling using CST elements, its shape function, Potential energy approach, solution of the 2-D problem, Accounting of temperature effect, Problem modeling and boundary conditions for symmetrical problems. **05 Hrs**
6. **2-D Isoparametric Elements and Numerical Integration:** Introduction, Four noded quadrilateral element based FE Modeling and its solution, Numerical integration, concept of weights and gauss points, its values for one point, two point etc. formulae, 2-D & 3-D numerical integration and its application in FEM, Higher order quadrilateral and triangular elements and its numerical integration. **05 Hrs**

Reference Books

1. Robert D. Cook , David S. Malkus , Michael E. Plesha , Robert J. Witt , "*Concept & Application of Finite Element Analysis*", John Wiley, 4th Edition , 2001
2. Chandrupatala & Belegundu, "*Introduction to Finite Elements in Engineering*", PHI, 3rd Edition
3. C S Krishnamoorthy, "*Finite Element Analysis (Theory & programming)*", TMH, 2nd Edition, 2004
4. J N Reddy , "*Finite Element Method*", McGraw Hill, 3rd Edition .2005

Online Courses and Video Lectures

1. <https://nptel.ac.in/courses/112104116/>
2. <https://nptel.ac.in/courses/112104115/>
3. <https://nptel.ac.in/courses/105/105/105105041/>



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Subject Code: MME-102

Subject Name: Advanced Thermodynamics

Programme: M.Tech.(ME)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 50	Percentage of Numerical/Design/Programming Problems: 60%
External Marks: 100	Duration of End Semester Exam(ESE): 3hr
Total Marks: 150	Course Status: Core

Prerequisites: Engineering Thermodynamics, Engineering Mathematics

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course the student will have the ability to:

CO #	Course Outcomes (CO)
1.	Analyze thermodynamic systems using advance concepts of First Law of thermodynamics.
2.	Examine and conceptualize the thermodynamic systems using with knowledge of Second law of thermodynamics.
3.	Identify and quantify irreversibility or exergy destruction or entropy generation within various processes and components of thermodynamic cycles and systems.
4.	Comprehend the advanced concepts in thermodynamics with emphasis on thermodynamic relations, properties of single phase systems.
5.	Use thermodynamic relations, properties and phase diagrams for equilibrium and stability of multi-phase multi component systems.
6.	Understand and apply the molecular basis of thermodynamics to determine the thermodynamic properties of thermal systems.

Detailed Contents:

- 1. The First Law:** Review of basic terms of thermodynamics; Closed Systems: Work Transfer, Heat Transfer; Energy Change: Open Systems. **04 Hrs**
- 2. The Second Law:** Closed Systems: Cycle in Contact with One Temperature Reservoir, Cycle in Contact with Two Temperature Reservoirs, Cycle in Contact with Any Number of Temperature Reservoirs, Process in Contact with Any Number of Temperature Reservoirs; Open Systems; Local Equilibrium; Entropy Maximum and Energy Minimum. **07 Hrs**
- 3. Entropy Generation, Or Exergy Destruction:** Lost Available Work; Exergy; Irreversibility; Cycles: Heat Engine Cycles, Refrigeration Cycles, Heat Pump Cycles; Non-flow Processes; Steady-Flow Processes; Mechanisms of Entropy Generation: Heat Transfer across a Temperature Difference, Flow with Friction, Mixing; Entropy Generation Minimization: Method, Tree-Shaped Fluid Flow, Entropy Generation Number. **08 Hrs**
- 4. Single-Phase Systems:** Simple System; Equilibrium Conditions; Fundamental Relation: Energy Representation, Entropy Representation, Extensive Properties versus Intensive Properties, Euler Equation, Gibbs–Duhem Relation; Legendre Transforms; Relations between Thermodynamic Properties: Maxwell's Relations. **08 Hrs**

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5. **Multiphase Systems:** Energy Minimum Principle: Energy Minimum, Enthalpy Minimum, Helmholtz Free-Energy Minimum, Gibbs Free-Energy Minimum, Star Diagram; Stability of a Simple System: Thermal Stability, Mechanical Stability, Chemical Stability.

06 Hrs

6. **Statistical Thermodynamics:** Introduction: Statistical Foundation of Classical Thermodynamics; Classification Scheme for Statistical Thermodynamics; Why Statistical Thermodynamics; Statistics of Independent Particles: Essential Concepts from Quantum Mechanics.

03 Hrs

Reference Books:

1. A. Bejan, "*Advanced Engineering Thermodynamics*", John Wiley and sons, 4th Edition, 2016.
2. I. K. Puri and K. Annamalai, "*Advanced Engineering Thermodynamics*", CRC Press, 2001.
3. Yunus A. Cengel And Michael A. Boles, "*Thermodynamics- An Engineering Approach*", 8th Edition, McGraw Hill Education, 2015.
4. Gordon J. Van Wylen and Richard E. Sonntag, "*Fundamentals of Classical Thermodynamics*", 3rd Edition, John Wiley, 1986.
5. Normand M. Laurendeau, "*Statistical Thermodynamics: Fundamentals and Applications*", Cambridge University Press, 2005.
6. Chang L. Tien and John H. Linhard, "*Statistical Thermodynamics*", Hemisphere Publishing Corporation, Revised Edition, 1985.

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Subject Code: MME-103

Subject Name: Decision Making Methods

Programme: M.Tech. (ME)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 50	Percentage of Numerical/Design/Programming Problems: 60%
External Marks: 100	Duration of End Semester Exam(ESE): 3hr
Total Marks: 150	Course Status: Core

Prerequisites: Knowledge of Probability and Basic Mathematics

Additional Material Allowed in ESE: [NIL]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand different types of decision making tools.
2	Solve a variety of business issues using appropriate decision tools and frameworks.
3	Application of different case studies in real environment.
4	Analyse organizational systems to identify opportunities to improve decision making.
5	Evaluate various approaches in decision making in taking the better decision.
6	Synthesis the decision making on basis of individual and group decision making.

Detailed Contents:

- 1. Introduction:** Problem Solving and Decision Making, Types of decisions: Insight, innovation and creativity in decision making, Decision Making Tools and Models, Individual and Group Decision Making, Quantitative and Qualitative Methods in Practice. **05 Hrs**
- 2. Probability:**Experiments and the Sample Space, Assigning Probabilities to Experimental Outcomes, Probability Distributions, Random Variables, Discrete Probability Distributions, Uniform Probability Distribution, Normal Probability Distribution, Decision Making with/without Probabilities. **05 Hrs**
- 3. Linear Programming:**Linear Programming Problem: Problem Formulation, Graphical, Simplex, Big M Method, Duality, Duality Theorem, Sensitivity Analysis and Interpretation of Solution. **08 Hrs**
- 4. Distribution and Sequencing Methods:**Transportation Problem, Assignment Problem, Sequencing Problem, Processing n jobs through one machine, two machine and m machines. **06 Hrs**
- 5. Multi-Criteria Decision Methods:**Concept of MCDM, Difference between MCDM and MADM, AHP, TOPSIS, DEA. **08Hrs**
- 6. Big Data:**The future of big data and decision making, Case discussion **04 Hrs**


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Reference Books

1. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, James J. Cochran, "*Quantitative Methods for Business*", 13th Edition, South Western Cengage Learning, Mason, OH, 2015.
2. Prem Kumar Gupta, D S Hira, "*Operations Research*", 6th Edition, S. Chand, New Delhi 2011.
3. R V Rao, "*Decision Making in the Manufacturing Environment Using Graph Theory and Fuzzy Multiple Attribute Decision Making Methods*", 1st Edition, Springer-Verlag London, 2007.
4. Christian Albright, Wayne L. Winston, "*Business Analytics: Data Analysis and Decision Making*", 5th Edition, Cengage Learning, 2015.

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Subject Code: MME-104

Subject Name: Computer Integrated Manufacturing

Programme: M.Tech. (ME)	L: 3 T: 0 P: 0
Semester: I	Teaching Hours: 36
Theory/Practical: Theory	Credits: 3
Internal Marks: 50	Percentage of Numerical/Design/Programming Problems: 20%
External Marks: 100	Duration of End Semester Exam(ESE): 3hr
Total Marks: 150	Course Status: Core

Prerequisites: Computers, manufacturing and automation

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Describe various manufacturing aspects of the machining.
2	Compare NC, CNC and DNC machines
3	Construct part programmes for given sample components
4	Develop an FMS (Flexible Manufacturing System) layout for sample part family, using group technology concepts.
5	Apply computer aided process planning, MRP, CNC part programming.
6	Recognize use of robotics in the field of manufacturing and explain the various robot configurations, robot motions.

Detailed Contents:

- 1. Introduction to CAD and CAM:** Brief introduction to CAD and CAM, Manufacturing Planning, Manufacturing control, Concurrent Engineering, CIM concepts; Computerized elements of CIM system, Manufacturing models, Manufacturing Control, Basic Elements of an Automated system, Automation principles and strategies , Lean Production and Just-In Time Production. **06 Hrs**
- 2. Computer Aided Process Planning:** Process planning ,Computer Aided Process Planning (CAPP), Logical steps in Computer Aided Process Planning ,Approaches to CAPP,Implementation techniques,the Master Production Schedule ,Material Requirement planning, Capacity Planning, Control Systems, Shop Floor Control Inventory Control, Brief on Manufacturing Resource Planning & Enterprise Resource Planning (ERP). **06 Hrs**
- 3. NC and CNC Machines:** Fundamentals of NC Technology; Basic Components of an NC System, NC Coordinate Systems- Motion, Applications of NC, Machine Tool Applications, Computer Numerical Control Features of CNC, The Machine Control Unit for CNC- CAM Software, CNC Applications- Advantages and Disadvantages of CNC, Direct Numerical Control of machine tools. **06 Hrs**

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4. **CNC Part Programming:**Basic terms of part programming , coordinate system, tool functions, basic codes, Description of codes- G codes, M codes, Other codes , Turning centre programming, Machining centre programming, computer aided part programming. **08 Hrs**
5. **Group Technology and FMS:**Group technology-Definition-Advantages and limitations of GT-Part family formation, Classification and coding-, Applications & benefits of GT, Flexible manufacturing system (FMS) -Scope of FMS-FMS compared to other types of manufacturing approaches- Major elements of FMS-Benefits of FMS. **06 Hrs**
6. **Industrial Robotics:**Introduction; configuration of robot, the manipulator, controller power supply, Programming robots –online programming, offline programming, programming languages- robot sensors- robots and computer aided design, Programming robots-Programming methods, Applications of industrial robot. **04Hrs**

Reference Books

1. Mikell.P.Groover "*Automation, Production Systems and Computer Integrated Manufacturing*", Pearson; 5th Edition, 2018.
2. P. Radhakrishnan S. Subramanyan and V. Raju, "*CAD/CAM/CIM*", New Age International (P) Ltd, New Delhi, 2nd Edition, 2000.
3. P N Rao, "*CAD/CAM Principles and Applications*", McGraw Hill India; 3rd Edition, 2010.
4. Quesada Robert, "*Computer Numerical Control-Turning and Machining centers*" Prentice Hall, 2014.
5. Farid Amirouche, "*Principles of computer aided design and manufacturing*", Pearson, 2nd Edition, 2004.
6. M. Groover, "*CAD/ CAM*", Pearson Education; 1st Edition, 2003.

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01/11/2019

Subject Code: LMME-101

Subject Name: Finite Element Analysis Laboratory

Programme: M.TECH. (ME)	L: 0 T: 0 P:4
Semester: I	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal Marks:50	Percentage of Numerical/Design/Programming Problems: N.A.
External Marks: 50	Duration of End Semester Exam(ESE): 2hr
Total Marks: 100	Course Status: Core

Prerequisites: Fundamental of Strength of materials, CADD

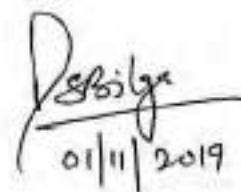
On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1.	Understand the general steps used in the finite element analysis to model problems in engineering.
2.	Create and design engineering structures using finite element methods.
3.	Develop the finite element formulations for heat transfer problems
4.	Explore the issues in convergence of solutions using finite element analysis.
5.	Predict the safe design limits for engineering structures.
6.	Communicate effectively through a written report the creation of optimized design of engineering structures.

Detailed Contents:

Each student can use any FEA software to perform the different analysis such as mechanical/ thermal deformation, strain, stresses etc. on various structural elements like bars, trusses, beams, etc as well as various complex mechanical components and assemblies using different shape functions. The various practices can be done by changing boundary conditions for the given application.

48 Hrs


01/11/2019

Subject Code: LMME-102

Subject Name: Advanced Thermodynamics Laboratory

Programme: M.Tech.(ME)	L: 0 T: 0 P: 4
Semester: I	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal Marks: 50	Percentage of Numerical/Design/Programming Problems: N.A.
External Marks: 50	Duration of End Semester Exam(ESE): 2hr
Total Marks: 100	Course Status: Core

Prerequisites: Physics, chemistry, Engineering Thermodynamics, Engineering Mathematics
Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course the student will have the ability to:

CO #	Course Outcomes (CO)
1.	Perform theoretical and experimental parametric studies of thermodynamic systems.
2.	Visualize the effect of different parameters on the thermodynamic phenomenon.
3.	Analyze thermodynamic systems using advance concepts of First Law and Second Law of thermodynamics.
4.	Identify and quantify irreversibility or exergy destruction or entropy generation within various processes and components of thermodynamic cycles and systems.
5.	Plan the experimentation using methods of design of experiments using available software.
6.	Do single objective optimization of thermodynamic systems using available software

Detailed Contents:

Each student is required to independently work on at least three experimental setups available within the laboratory related to the subject matter of the theory course in this regard in the curriculum. Each student shall do the detailed theoretical and experimental parametric studies and analyze the thermodynamic system using advance concepts of first law and second law of thermodynamics. The thermodynamic system may be related with power producing system such as I.C. engine etc., power consuming system such as vortex tube refrigeration or heating etc. and thermal energy storage such as waste heat recovery using waxes etc. Each student will be able to plan the experimentation using some method of design of experiments and may do single objective optimization using available software.

48 Hrs

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Subject Code: LMME-103 Subject Name: Computer Integrated Manufacturing Laboratory

Programme: M.TECH. (ME)	L: 0 T: 0 P: 4
Semester: I	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal Marks: 50	Percentage of Numerical/Design/Programming Problems: N.A.
External Marks: 50	Duration of End Semester Exam(ESE): 2hr
Total Marks: 100	Course Status: Core

Prerequisites: Nil

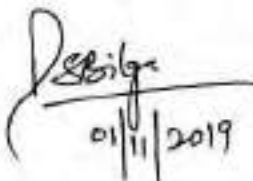
On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1.	Understand the concepts of CNC machine tools and CAPP.
2.	Apply JIT and Lean production concept in industry.
3.	Generate part programs using CNC programming.
4.	Evaluate the performance of drilling by CNC drill machine.
5.	Understand and apply the concept of additive manufacturing.
6.	Identify the need for FMS and GT concept in a manufacturing system.

Detailed Contents:

Each student is required to work independently on the non-conventional and CNC machines available in the mechanical laboratory and workshop. Each student shall do the detailed theoretical and experimental studies of machining parameters on any three available machines like electrochemical machine, electro discharge machine, CNC drill machine, CNC milling etc. Each student will plan the experiment using some method of design of experiments. Demonstration and use of 3D printing machine will be done for understanding the concept of additive manufacturing. Each student shall make the program for pick and place of objects.

48Hrs


01/11/2019

Guru Nanak Dev Engineering College, Ludhiana

Department of Production Engineering

No. PE/159(i)

Dated: 22/3/14

MINUTES OF MEETING

Minutes of meeting of First Board of Studies held on 22-03-2014 at 10:30 AM in committee room:

The following persons were present:

1. Dr. O.P Singh	9. Dr. Jatinder Kapoor
2. Dr. Sanjeev kumar	10. Dr. Harwinder Singh
3. Dr. R.S Bhatti	11. Prof. B.S Gill
4. Prof. J.S Ratol	12. Prof. Jagdeep Singh
5. Er. Lalit Sharma	13. Prof. Jaswinder Singh
6. Prof J.S Grewal	14. Prof. Parminder Singh
7. Dr. Rupinder Singh	15. Prof. Iqwinderpreet Singh
8. Dr.J.N Jha	

The meeting started with welcome note & already circulated agenda was set in notion.

Following decisions were taken unanimously:-

Proceedings

1.1 Percentage of credit hours of existing course is given below for discussion:-

S.No.	Broad Area	Existing Percentage of credits	Range recommended as per AICTE model curriculum
1.	Humanities and Social Sciences (HS) including Management	9.1	5-10
2.	Basic sciences (including electives) and Env. Sc. Including human values	10.2	15-20
3.	Engineering sciences including materials, workshops, drawing, basics of electrical/electronics/mechanical/computer etc.	26.5	15-20
4.	Professional courses relevant to the chosen specialization/branch	39.3	30-40
5.	Professional subjects-electives relevant to chosen specialization	4	10-15
6.	Open elective from other technical and emerging subject areas	2	5-10
7.	Project work/seminar and/or internship in Industry	11.7	10-15

Discussion was made on this issue. The matter was approved in principle.

- 1.2 Industrial Training : Discussion on the Present system and suggestions for further improvement

Discussion was made on this issue. Members were interested for bifurcation of training into 2-3 parts for its effectiveness. The matter was approved in principle.

- 1.3 Credit based System to be implemented from 2015 Admission Batch

Approved

- 1.4 Core/ Elective Subjects has to be reviewed must be covering the Gate Syllabus.

Discussion was made on this issue. The matter was approved in principle

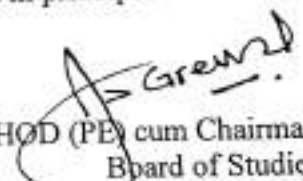
- 1.5 The question papers of End Semester examinations should be 100% internal but should be checked by a committee consisting of two external members, two internal members and HOD for proper format and standard.

Discussion was made on this issue. The matter was approved in principle.

- 1.6 The revised Scheme and syllabus should be completed before 15th june,2014 and final approval of the same should be taken by BOS before 30th june,2014 .

Discussion was made on this issue. The matter was approved in principle

The meeting ended with vote of thanks.


HOD (PE) cum Chairman
Board of Studies

Distribution:

1. Director, GNDEC, Ludhiana for kind information
2. All members of BOS (PE)
3. Dean Academics, GNDEC, Ludhiana
4. BOS file

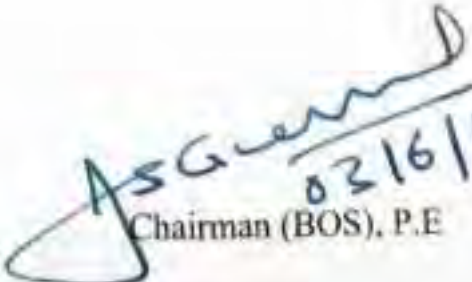
A meeting of BOS (Production Engg.) was held on 03-06-2019 at 12.15PM in Production Engineering Dept.. The following members were present.

- Dr. J.S.Grewal, Prof. & Head P.E (Co-ordinator)
 - Dr. Rupinder Singh, Prof. P.E (Internal member)
 - Dr. Harpuneet Singh Asst. Prof. P.E (Internal member)
 - Dr. Jagdeep Singh, Asst. Prof. P.E (Internal member)
 - Dr. Harwinder Singh Prof. M.E (Internal member)
 - Dr. O.P.Singh, Prof. M.E BCET Gurdaspur (External member academic)
 - Dr. Dixit Garg, Prof. M.E NIT KKR (External member academic)
 - Sh. Jagjeet Singh, Alumni cum Parents representative
 - Dr. Sanjeev Kumar, Prof. M.E PEC Chandigarh (External member academic) via Skype
 - Dr. Sandeep Grover Prof. M.E YMCA Univ. of Sc. & Tech. Fbd. (PTU nominee) via Skype
 - Mr. Aman Bhartee (Final Yr. B.Tech. student)
 - Mr. Gurchetan Singh (Final Yr. M Tech student)
1. Apprising the Board of Studies about 3rd and 4th semester syllabus and complete scheme of U.G. and P.G Production Engineering programme.

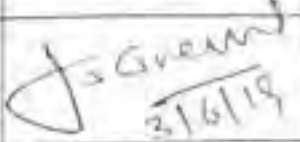
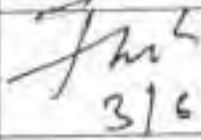
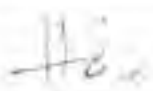
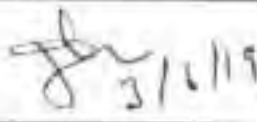
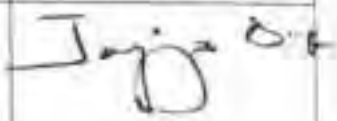
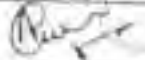
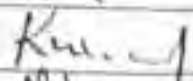
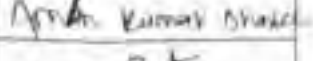
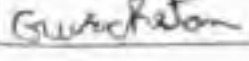
Approved

2. Finalising the content and scheme of summer training.

Approved


03/06/19
Chairman (BOS), P.E

List of BOS members

S.No.	Name	Designation	Signature
1.	Dr. J.S.Grewal, Prof. & Head P.E	Chairman	 31/6/19
2.	Dr. Rupinder Singh, Prof. P.E	Member	
3.	Dr. Harpuneet Singh, Asst. Prof. P.E	Member	 31/6/19
4.	Dr. Jagdeep Singh, Asst. Prof.P.E	Member	
5.	Dr. Harwinder Singh Prof. M.E	Member	
6.	Dr. Jatinder Kapoor Prof. M.E	Member	
7.	Dr. O.P.Singh, Prof. M.E	External Member (Academician)	 03/06/19
8.	Dr. S^njeev Kumar, Prof. M.E	External Member (Academician) (via Skype)	
9.	Dr. Dixit Garg Prof. M.E	External Member (Academician)	 31/6/19
10.	Sh. Jagjeet Singh	Industrialist, Alumni cum Parents representative (Special invitee)	
11.	Dr. Sandeep Grover	IKGPTU Nominee (via Skype)	
12.	COE/ Nominee Dr. Akshay Girdhar	Member	
13.	Dean Academics/Nominee Dr. K. S. Gill	Member	
14.	TPO/ Nominee Prof. G. S. Sudhi	Member	
15.	Mr. Aman Bhartee	Final Yr. B.Tech P.E student	 Aman Kumar Bhartee
16.	Mr. Gurchetan Singh	Final Yr. M.Tech P.E student	 Gurchetan

Department of Production Engineering
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
BACHELOR OF TECHNOLOGY
(PRODUCTION ENGINEERING) 2018

3RD SEMESTER

Sr. No	Code	Type of Course	Subject	Contact Hours Credit			Type of Subject		Marks	
				L	P	Total			Int.	Ext. Total
1	PCPE-101	Professional Core Course	Strength of Materials	3	0	3	Theory		40	60 100
2	PCPE-102	Professional Core Course	Machine Drawing	2	4	6	Theory		40	60 100
3	PCPE-103	Professional Core Course	Thermal Engineering	3	0	3	Theory		40	60 100
4	HSMPE-101	Humanities Course	Operations Management	3	0	3	Theory		40	60 100
5	BSPE-101	Basic Science Course	Material Science	3	0	3	Theory		40	60 100
6	ESPE-101	Engineering Science Course	Industrial Engineering	3	0	3	Theory		40	60 100
7	LPCPE-101	Professional Core Course	Strength of Material Laboratory	0	2	2	Practical		30	20 50
8	LPCPE-102	Professional Core Course	Thermal Engineering Laboratory	0	2	2	Practical		30	20 50
9	TR-101	Training	Training I*	-	-	-	Practical		60	40 100
10	PRPE-101	Project/Seminar	Seminar and Technical Report Writing	0	2	2	Practical		50	- 50
11	MPD-102	Mandatory Course	Mentoring and Professional Development	0	1	1	Practical		-	-
				17	11	28	23		410	440 850

*Institutional/Industrial Training after 2ND semester of 4 weeks duration will be conducted during summer vacations and marks will be added in 3RD Semester

4TH SEMESTER

Sr. No	Code	Type of Course	Subject	Contact Hours Credit			Type of Subject	Marks	
				L	P	Total		Int.	Ext. Total
1	PCPE-104	Professional Core Course	Design of Machine Elements	4	0	4	Theory	40	60 100
2	PCPE-105	Professional Core Course	Fluid Mechanics and Machinery	4	0	4	Theory	40	60 100
3	PCPE-106	Professional Core Course	Manufacturing Processes	3	0	3	Theory	40	60 100
4	PCPE-107	Professional Core Course	Kinematics and Dynamics of Machines	3	0	3	Theory	40	60 100
5	PCPE-108	Professional Core Course	Physical Metallurgy and Heat Treatment	3	0	3	Theory	40	60 100
6	LPCPE-103	Professional Core Course	Fluid Mechanics and Machinery Laboratory	0	2	2	Practical	20	30 50
7	LPCPE-104	Professional Core Course	Kinematics and Dynamics of Machines Laboratory	0	2	2	Practical	20	30 50
8	LPCPE-105	Professional Core Course	Manufacturing Processes and Physical Metallurgy & Heat Treatment Laboratory	0	4	4	Practical	20	30 50
9	MCPE-101	Mandatory Non Credit Course	Environmental Science	2	0	2	Theory	50	8/ NS 50
10	MPD-102	Mandatory Course	Mentoring and Professional Development	0	1	1	Practical	100	- 100
				19	9	28	21	410	440 850

Total

5th SEMESTER

Sr No	Code	Type of Course	Subject	Contact Hours Credit			Type of Subject	Marks	
				L	P	Total		Int.	Ext. Total
1	PCPE-109	Professional Core Course	Industrial Automation and Robotics	3	0	3	Theory	40	60 100
2	PCPE-110	Professional Core Course	Inspection and Quality Control	3	0	3	Theory	40	60 100
3	PCPE-111	Professional Core Course	Metal Forming	3	0	3	Theory	40	60 100
4	PCPE-112	Professional Core Course	Engineering Metrology	3	0	3	Theory	40	60 100
5	PCPE-113	Professional Core Course	Machining Science	3	0	3	Theory	40	60 100
6	PEPE-XXX	Professional Elective Course	Elective 1	4	0	4	Theory	40	60 100
7	LPCPE-106	Professional Core Course	Industrial Automation and Robotics Laboratory	0	2	2	Practical	30	20 50
8	LPCPE-107	Professional Core Course	Metal Forming and Machining Science Laboratory	0	2	2	Practical	30	20 50
9	LPCPE-108	Professional Core Course	Engineering Metrology Laboratory	0	2	2	Practical	30	20 50
10	TR-102	Training	Training 2*	-	-	-	Practical	60	40 100
11	MPD-103	Mandatory Course	Mentoring and Professional Development	0	1	1	Practical	-	-
				19	7	26	23	390	400 850

*Industry Institutional Training after 4th semester of 4 weeks duration will be conducted during summer vacations and marks will be added in 5th Semester

6th SEMESTER

Sr No	Code	Type of Course	Subject	Contact Hours Credit			Type of Subject	Marks	
				L	P	Total		Int.	Ext. Total
1	PCPE-114	Professional Core Course	Industrial Tribology	3	0	3	Theory	40	60 100
2	PCPE-115	Professional Core Course	Machine Tool Design	3	0	3	Theory	40	60 100
3	PCPE-116	Professional Core Course	Operation Research	3	0	3	Theory	40	60 100
4	PCPE-117	Professional Core Course	Non-Traditional Machining	3	0	3	Theory	40	60 100
5	PEPE-XXX	Professional Elective Course	Dept. Elective-II	4	0	4	Theory	40	60 100
6	OEZZ-XXX	Professional Open Course	Open Elective-1	3	0	3	Theory	40	60 100
7	LPCPE-109	Professional Core Course	Industrial Tribology and Machine Tool Design Laboratory	0	2	2	Practical	20	30 50
8	LPCPE-110	Professional Core Course	Non-Traditional Machining Laboratory	0	2	2	Practical	20	30 50
9	PRPE-102	Project	Minor Project	0	4	4	Practical	60	40 100
10	MPD-103	Mandatory Course	Mentoring and Professional Development	0	1	1	Practical	100	100
Total				19	9	28	23	440	460 900

7th SEMESTER

Sr. No	Code	Type of Course	Subject	Contact Hours			Type of Subject	Marks		
				L	P	Total		Int	Ext	Total
1	PEPE-XXX	Professional Elective Course	Dept. Elective-III	4	0	4	Theory	40	60	100
2	PEPE-XXX	Professional Elective Course	Dept. Elective-IV	4	0	4	Theory	40	60	100
3	OEZZ-XXX	Professional Open Course	Open Elective- II	3	0	3	Theory	40	60	100
4	MCI-102	Mandatory Non Credit Course	Indian Constitution	2	0	2	Theory	50	S/NS	50
5	PRPE-102	Project	Project I	0	6	6	Practical	120	80	200
6	TR-102	Training	Training 3*	-	-	-	Practical	100	50	150
7	MPD-104	Mandatory Course	Mentoring and Professional Development	0	1	1	Practical	-	-	-
				13	7	20		390	310	700

*Industry/Institutional Training after 6th semester of 6 weeks duration will be conducted during summer vacations and marks will be added in 7th Semester

8th SEMESTER

Sr. No	Code	Type of Course	Subject	Contact Hours			Type of Subject	Marks		
				L	P	Total		Int	Ext	Total
1	PEPE-XXX	Professional Elective Course	Dept. Elective-V	4	0	4	Theory	40	60	100
2	PEPE-XXX	Professional Elective Course	Dept. Elective-VI	4	0	4	Theory	40	60	100
3	OEZZ-XXX	Professional Open Course	Open Elective- III	3	0	3	Theory	40	60	100
4	MCI-103	Mandatory Non Credit Course	Organizational Behaviour	2	0	2	Theory	30	S/NS	50
5	PRPE-103	Project	Project 2	0	6	6	Practical	120	80	200
6	MPD-104	Mandatory Course	Mentoring and Professional Development	0	1	1	Practical	100	-	100
		Total		13	7	20		390	260	450

List of Departmental Elective Subjects

Once an elective group is selected in the 5th semester then same group will be used in 6th semester. In 7th and 8th semester any elective group can be selected irrespective of group selected in 5th & 6th semester. Minimum strength requirement for running an elective subject is 10 students

Elective I (5 th Semester)				Elective II (6 th Semester)			
Design & Manufacturing Engineering Group				Design & Manufacturing Engineering Group			
S. N	Code	Name of Elective Subject		S.N	Code	Name of Elective Subject	
1	PEPE-101	Jig Fixture and Die Design		1	PEPE-105	Advance Casting and Welding Technology	
2	PEPE-102	Tool and Cutter Design		2	PEPE-106	Maintenance and Reliability Engineering	
3	PEPE-103	Introduction to Robotics		3	PEPE-107	Statistic and Numerical Analysis	
4	PEPE-104	Micro Manufacturing		4	PEPE-108	Cryogenic Manufacturing	
Industrial Engineering Group				Industrial Engineering Group			
S. N	Code	Name of Elective Subject		S.N	Code	Name of Elective Subject	
1	PEPE-125	Human Engineering		1	PEPE-129	Plant Layout and Material Handling	
2	PEPE-126	Agile Manufacturing		2	PEPE-130	Productivity Management	
3	PEPE-127	Technology Management		3	PEPE-131	Project Management	
4	PEPE-128	Marketing Management		4	PEPE-132	Estimating and Costing	
Materials Group				Materials Group			
S. N	Code	Name of Elective Subject		S. N	Code	Name of Elective Subject	
1	PEPE-149	Composite Materials		1	PEPE-153	Advance Engineering Material	
2	PEPE-150	Materials Testing and Characterization		2	PEPE-154	Advance Ceramics	
3	PEPE-151	Science and Engineering of Metals		3	PEPE-155	Material Processing	
4	PEPE-152	Deformations and Defects of Materials		4	PEPE-156	Aero Space Materials	
Elective III (7 th Semester)				Elective IV (7 th Semester)			
Design & Manufacturing Engineering Group				Design & Manufacturing Engineering Group			
S. N	Code	Name of Elective Subject		S. N	Code	Name of Elective Subject	
1	PEPE-109	Non Destructive Testing		1	PEPE-113	Plastic and Ceramics Technology	
2	PEPE-110	Computer Aided Design & Manufacturing		2	PEPE-114	Finite Element Method	
3	PEPE-111	Precision Engineering		3	PEPE-115	Automobile Engineering	
4	PEPE-112	Theory of Plasticity		4	PEPE-116	Industrial Finishing	
Industrial Engineering Group				Industrial Engineering Group			
S. N	Code	Name of Elective Subject		S. N	Code	Name of Elective Subject	
1	PEPE-133	Supply Chain Management		1	PEPE-137	Industrial Safety and Environment	
2	PEPE-134	Quality and Reliability Engineering		2	PEPE-138	Value Engineering	
3	PEPE-135	Green Manufacturing		3	PEPE-139	Intellectual Property Rights	
4	PEPE-136	Investment Planning		4	PEPE-140	Total Productive Maintenance	
Materials Group				Materials Group			
S. N	Code	Name of Elective Subject		S. N	Code	Name of Elective Subject	
1	PEPE-157	Texture in Materials		1	PEPE-161	Nano Materials	
2	PEPE-158	Environmental Degradation of Materials		2	PEPE-162	Explosive Materials used in Industries	

3	PEPE-159	Fundamentals of Semi-Conductor Fabrication	3	PEPE-163	Wear Technology
4	PEPE-160	Nuclear Materials	4	PEPE-164	Thermodynamics of Materials
Elective V (8th Semester)					
Design & Manufacturing Engineering Group					
S. N	Code	Name of Elective Subject	S.N	Code	Name of Elective Subject
1	PEPE-117	Computer Integrated Manufacturing	1	PEPE-121	Rapid Prototyping
2	PEPE-118	Design of Experiments	2	PEPE-122	Mechatronics
3	PEPE-119	Bio Mechanics	3	PEPE-123	Product Design and Development
4	PEPE-120	Reverse Engineering	4	PEPE-124	Surface Engineering
Industrial Engineering Group					
S. N	Code	Name of Elective Subject	S.N	Code	Name of Elective Subject
1	PEPE-141	Research Methodology	1	PEPE-145	Production Planning and Control
2	PEPE-142	Materials Management	2	PEPE-146	Entrepreneurship
3	PEPE-143	Probability and Statistics	3	PEPE-147	Quality Assurance
4	PEPE-144	Total Quality Management	4	PEPE-148	Enterprise Resource Planning
Materials Group					
S. N	Code	Name of Elective Subject	S.N	Code	Name of Elective Subject
1	PEPE-165	Extreme Environmental Materials	1	PEPE-169	Medical Materials
2	PEPE-166	Cryogenic Materials	2	PEPE-170	Hazardous Materials
3	PEPE-167	Bio Materials	3	PEPE-171	Smart Materials
4	PEPE-168	Waste Material and Management	4	PEPE-172	Lather Technology

List of Open Elective Subjects Offered by the Department

Sr. No.	Semester	Open Elective No.	Code of Subject	Elective Subject Name
1	6 th Semester	Open Elective No 1	OEPE-101	Industrial Engineering
2	7 th Semester	Open Elective No 2	OEPE-102	Human Engineering
			OEPE-103	Advanced Engineering Materials
3	8 th Semester	Open Elective No 3	OEPE-104	Materials Management
			OEPE-105	Industrial Safety and Environment
			OEPE-106	Supply Chain Management

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

DEPT. OF PRODUCTION ENGINEERING

MINUTES OF MEETING

A meeting of stake holders has been scheduled on 21 Jan. 2019 at 11.00AM. Following were present:

1.	Dr. J.S.Grewal	Prof. & Head (Coordinator)
2.	Prof. (Dr.) Rupinder Singh	Internal member
3.	Prof. (Dr.) Harpuneet Singh	Internal member
4.	Prof. (Dr.) O.P. Singh	External expert (Academics)
5.	Prof. (Dr.) Sanjeev Kumar	External expert (Academics) & Alumni member
6.	Er. Lalit Sharma	Industrialist, entrepreneur & Alumni member
7.	Er. Jagjit Singh	Industrialist, entrepreneur, parent & Alumni member
8.	Mr. Aman K. Bhartee	B.Tech Final Year student
9.	Mr. Harpreet Singh	B.Tech Final Year student
10.	Mr. Dinker Jha	B.Tech Third Year student
11.	Mr. Jaspreet Singh	B.Tech Third Year student
12.	Mr. Gurchetan Singh	M.Tech student

Following decisions have been taken unanimously:

1. The detailed syllabus scheme was discussed for all semesters of B.Tech and M.Tech. The recommendations are as under:
 - For 3rd semester Machine Drawing Course will be followed and the course of Fluid Mechanics and machinery will be followed in 4th semester.
 - The subject name of Theory of Machine has been changed to Kinematics and Dynamics of M/C in 4th semester
 - Engineering Materials and Metallurgy has been changed to Physical metallurgy and heat treatment in 4th semester.
 - In 4th semester the Primary production processes will be renamed as Manufacturing processes.
 - In 5th semester IQC will be followed and O.R will be followed in 6th semester. The course of CIM will be put as elective course and Non-Traditional machining with practices will be taught in 5th semester.
 - More number of electives in 04 groups needs to be introduced (Minimum 15 in each group).
2. For M.Tech course casting forming welding and cutting should be introduced as core courses
 - Advanced casting subject will be introduced in place of rapid prototyping which will be offered as elective course.
 - Advanced welding technology will be as core in place of computer aided design which will be a elective course.
 - More number of elective will be introduced in the list

The detailed curriculum will be discussed in next meeting.

The meeting ended with a vote of thanks.


(HOD P.E)

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
DEPT. OF PRODUCTION ENGINEERING
MINUTES OF MEETING

A meeting of BOS P.E was scheduled on 20 Feb. 2019 at 11.30AM. Following were present:

1.	Dr. J.S.Grewal	Prof. & Head (Coordinator)
2.	Dr. Rupinder Singh	Internal member
3.	Dr. Harpuneet Singh	Internal member
4.	Dr. Jagdeep Singh	Internal Member
5.	Dr. Jatinder Kapoor	Internal Member (From M.E Dept.)
6.	Dr. Harwinder Singh	Internal Member (From M.E Dept.)
7.	Dr. O.P. Singh	External Member (Academics), BCET Gurdaspur
8.	Dr. Sanjeev Kumar	External Member (Academics), PEC Chandigarh
9.	Dr. Sandeep Grover	PTU Nominee (Through Skype), YMCA Faridabad
10.	Dr. Dixit Garg	External Member (Through Skype), NIT KKR
11.	Dr. K.S.Gill	Dean Academics
12.	Dr. Akshay Girdhar	COE
13.	Er. Sukhinderpal Singh	T & P Nominee

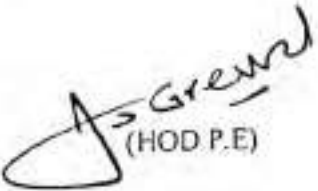
Following decisions have been taken unanimously:

The detailed syllabus scheme was discussed for all semesters of B.Tech P.E (UG Programme). The recommendations are as under:

- The standard template for syllabus will be used (to be provided by COE) for final submission to the office of Dean Academics for possible considerations in upcoming Academic council.
- In Fifth semester one Dept. Elective will be offered in place of Core course, which will be taught in 6th semester.
- In third semester Material Science subject syllabus is modified and revised syllabus is attached.
- In fourth semester syllabus of Manufacturing Processes and Physical Metallurgy & Heat Treatment has been modified and revised syllabus is attached.
- Minor project related to subjects is to be intruded wherever possible in practical courses.
- In Machine drawing subject Solid works/ProE and AutoCAD software practices has been introduced. Minimum 30 seats to be procured before the start of next semester.

The detailed syllabus for remaining semesters will be discussed in next meeting.

The meeting ended with a vote of thanks.


(HOD P.E)

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
DEPT. OF PRODUCTION ENGINEERING
MINUTES OF MEETING

A meeting of stake holders has been scheduled on 21 Jan. 2019 at 11.00AM. Following were present:

1.	Dr. J.S.Grewal	Prof. & Head (Coordinator)
2.	Prof. (Dr.) Rupinder Singh	Internal member
3.	Prof. (Dr.) Harpuneet Singh	Internal member
4.	Prof. (Dr.) O.P. Singh	External expert (Academics)
5.	Prof. (Dr.) Sanjeev Kumar	External expert (Academics) & Alumni member
6.	Er. Lalit Sharma	Industrialist, entrepreneur & Alumni member
7.	Er. Jagjit Singh	Industrialist, entrepreneur, parent & Alumni member
8.	Mr. Aman K. Bhartee	B.Tech Final Year student
9.	Mr. Harpreet Singh	B.Tech Final Year student
10.	Mr. Dinker Jha	B.Tech Third Year student
11.	Mr. Jaspreet Singh	B.Tech Third Year student
12.	Mr. Gurchetan Singh	M.Tech student

Following decisions have been taken unanimously:

1. The detailed syllabus scheme was discussed for all semesters of B.Tech and M.Tech. The recommendations are as under:
 - For 3rd semester Machine Drawing Course will be followed and the course of Fluid Mechanics and machinery will be followed in 4th semester.
 - The subject name of Theory of Machine has been changed to Kinematics and Dynamics of M/C in 4th semester
 - Engineering Materials and Metallurgy has been changed to Physical metallurgy and heat treatment in 4th semester.
 - In 4th semester the Primary production processes will be renamed as Manufacturing processes.
 - In 5th semester IQC will be followed and O.R will be followed in 6th semester. The course of CIM will be put as elective course and Non-Traditional machining with practices will be taught in 5th semester.
 - More number of electives in 04 groups needs to be introduced (Minimum 15 in each group).
2. For M.Tech course casting forming welding and cutting should be introduced as core courses
 - Advanced casting subject will be introduced in place of rapid prototyping which will be offered as elective course.
 - Advanced welding technology will be as core in place of computer aided design which will be a elective course.
 - More number of elective will be introduced in the list

The detailed curriculum will be discussed in next meeting.
The meeting ended with a vote of thanks.


(HOD P.E)

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
DEPT. OF PRODUCTION ENGINEERING
MINUTES OF MEETING

A meeting of BOS P.E was scheduled on 20 Feb. 2019 at 11.30AM. Following were present:

1.	Dr. J.S.Grewal	Prof. & Head (Coordinator)
2.	Dr. Rupinder Singh	Internal member
3.	Dr. Harpuneet Singh	Internal member
4.	Dr. Jagdeep Singh	Internal Member
5.	Dr. Jatinder Kapoor	Internal Member (From M.E Dept.)
6.	Dr. Harwinder Singh	Internal Member (From M.E Dept.)
7.	Dr. O.P. Singh	External Member (Academics), BCET Gurdaspur
8.	Dr. Sanjeev Kumar	External Member (Academics), PEC Chandigarh
9.	Dr. Sandeep Grover	PTU Nominee (Through Skype), YMCA Faridabad
10.	Dr. Dixit Garg	External Member (Through Skype), NIT KKR
11.	Dr. K.S.Gill	Dean Academics
12.	Dr. Akshay Girdhar	COE
13.	Er. Sukhinderpal Singh	T & P Nominee

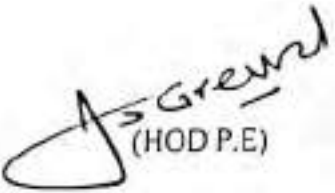
Following decisions have been taken unanimously:

The detailed syllabus scheme was discussed for all semesters of B.Tech P.E (UG Programme). The recommendations are as under:

- The standard template for syllabus will be used (to be provided by COE) for final submission to the office of Dean Academics for possible considerations in upcoming Academic council.
- In Fifth semester one Dept. Elective will be offered in place of Core course, which will be taught in 6th semester.
- In third semester Material Science subject syllabus is modified and revised syllabus is attached.
- In fourth semester syllabus of Manufacturing Processes and Physical Metallurgy & Heat Treatment has been modified and revised syllabus is attached.
- Minor project related to subjects is to be intruded wherever possible in practical courses.
- In Machine drawing subject Solid works/ProE and AutoCAD software practices has been introduced. Minimum 30 seats to be procured before the start of next semester.

The detailed syllabus for remaining semesters will be discussed in next meeting.

The meeting ended with a vote of thanks.


(HOD P.E)

7th BOS meeting
of
Production Engineering
on
13-12-2019 (Friday)



Venue: Production Engg. Dept.

Guru Nanak Dev Engineering College
An Autonomous College u/s Act 2(f) and 12(B) of UGC act 1956
Gill Road, Gill Park, Ludhiana

Minutes of meeting of 7th Board of Studies Meeting of Production Engineering on 13-12-2019

A meeting of BOS (Production Engg.) was held on 13-12-2019 at 12.30PM in Production Engineering Dept.. The following members were present-

Dr. J.S.Grewal, Prof. & Head P.E GNDEC Ludhiana
Dr. Rupinder Singh, Prof. P.E GNDEC Ludhiana
Dr. Jagdeep Singh, Asst. Prof. P.E GNDEC Ludhiana.
Dr. Jatinder Kapoor, Prof. M.E GNDEC Ludhiana
Dr. Harwinder Singh, Prof. M.E GNDEC Ludhiana
Dr. O.P.Singh, Prof. M.E BCET Gurdaspur
Dr. Sanjeev Kumar, Prof. M.E PEC Chandigarh
Dr. Dixit Garg, Prof. M.E NIT Kurukshetra
Dr. Sandeep Grover, Prof. M.E YMCA Faridabad
Er. Lalit Sharma (Industrialist and Alumni GNDEC Ludhiana)
Dr. N.S.Bhangu (Nominee of Dean Academics GNDEC Ludhiana)
Er. G.S.Sodhi (TPO, GNDEC Ludhiana)
Dr. H.S.Rai (COE, GNDEC Ludhiana)

The following member was not able to attend the meeting: Dr. Harpuneet Singh, Asst. Prof. P.E GNDEC Ludhiana, Dr. J.P Singh Senior Scientific Officer, DGQA (MoD)

1. Apprising the Board of Studies about name change of UG Production Engineering course from Production Engineering to Production and Industrial Engineering

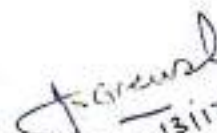
The matter was discussed at large. Approved with new nomenclature as B.Tech Mechanical (Production) in accordance with AICTE notification F.No 27/RIFD/Pay/01/2017-18, Dt. 28 April, 2017

2. To discuss and finalize the M.Tech Production Engineering syllabus

Approved

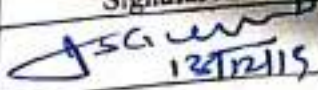
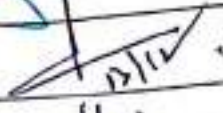
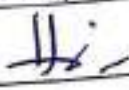
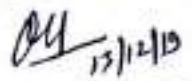
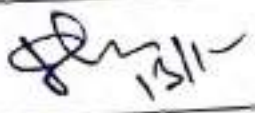
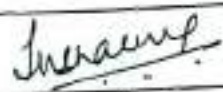
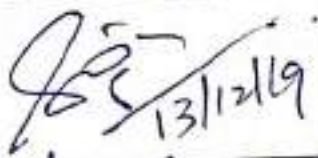
3. To start certificate course/diploma/post diploma/ post graduate diploma

Approved. Initially the course will be offered on 3D printing


13/12/2019
Chairman (BOS), P.E

3

List of BOS members

S.No.	Name	Designation	Signature
1.	Dr. J.S.Grewal, Prof. & Head	Chairman	 13/12/19
2.	Dr. Rupinder Singh, Prof.	Member	
3.	Dr. Harpuneet Singh, Asst. Prof.	Member	— As
4.	Dr. Jagdeep Singh, Asst. Prof.	Member	
5.	Dr. Jatinder Kapoor, Prof. Mechanical Engg.	Member	
6.	Dr. Harwinder Singh, Prof. Mechanical Engg.	Member	
7.	Dr. O.P.Singh, Prof. Mechanical Engg. BCET Gurdaspur	Member	 13/12/19
8.	Dr. Dixit Garg, Prof. Mechanical Engg. NIT Kurukshetra	Member	 13/11
9.	Dr. J.P.Singh, Senior Scientific Officer, DGQA (MoD)	Member	— As
10.	Er. Lalit Sharma, Industrialist	Member	
11.	Dr. Sanjeev Kumar, Prof. Mechanical Engg. PEC Chandigarh	Member	
12.	Dr. Sandeep Grover, Prof. Mechanical Engg. YMCA Univ. of Sc. & Tech., Faridabad	Member Nominated by IKGPTU Jalandhar	 13/12/19
13.	Dean Academic/ Nominee	Member	
14.	COE/Nominee	Member	
15.	Dean T & P/ Nominee	Member	

Agenda Items

1. Apprising the Board of Studies about name change of UG Production Engineering course from Production Engineering to Production and Industrial Engineering

Keeping in view of GATE 2020 requirement it is proposed to change the B.Tech Production Engineering course to B.Tech Production and Industrial Engineering. For additional subjects required in Industrial Engineering part, it is proposed to offer the same through MOOCs platform.

The syllabus for GATE 2020 under Production and Industrial Engineering is enclosed (Annex. I). Also the study scheme and syllabus for B.Tech Production Engineering is also attached (Annex. II). The courses deficit to comply by GATE 2020 may be offered through MOOCs platform.

Submitted for Consideration & Approval

2. To discuss and finalize the M.Tech Production Engineering syllabus

The detailed syllabus and scheme is enclosed (Annex. III) for discussion and ratification.

Submitted for Consideration & Approval

3. To start certificate course/diploma/post diploma/ post graduate diploma

In accordance with UGC approval to Autonomous Colleges to run certificate/diploma/post diploma/post graduate diploma it is proposed to run the same in following two specializations:

- (a) Project management
- (b) 3D printing

The syllabus for both (a) Project management and (b) 3D printing is enclosed (Annex. IV and Annex. V)

Submitted for Consideration & Approval

ACTION TAKEN REPORT

1. The syllabus of 3rd and 4th semester UG Production Engineering along with detailed scheme for UG and PG has been prepared.

Noted, Implemented.

2. Summer training was successfully completed with modified syllabus contents.
Noted, Implemented.

3. The BOS has recommended revision in syllabus of Machine drawing, Material science, Manufacturing processes, Physical metallurgy and heat treatment along with some structural changes in examination pattern.

Noted and implemented.

MINUTES OF MEETING

Minutes of 12th meeting of Board of Studies of Computer Science and Engineering department held on 03.09.2014 at 11.00 am in the college committee room.

The following persons were present:

1. Dr. Parminder Singh, Associate Professor & Head, Department of Computer Science and Engineering, GNDEC, Ludhiana (Chairman)
2. Er. Amanpreet Singh Brar, Associate Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
3. Er. Sumet Kaur Sehra, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
4. Er. Vivek Thapar, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
5. Dr. Gurpreet Singh Lehal, Professor, Department of Computer Science, Punjabi University, Patiala (Member)
6. Dr. Sukhwinder Singh, Professor, UIET, Punjab University Chandigarh (Member)
7. Dr. Paramjit Singh, Assistant Professor, Giani Zail Singh Punjab Technical University Campus, Bathinda (Member)

The meeting started with welcome address by chairman BOS. and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Proceedings:

Agenda Item 1

Apprising the Board of Studies about adopted Outcome Based Education (OBE) Model and discussion on attainment of Program Educational Objectives (PEO's) through Program Outcomes and in turn through courses.

The Following items are approved:

Vision of Department:

To generate competent professionals to become part of the industry and research organizations at the national and international levels

Mission of Department:

Dr. Parminder Singh

Er. Amanpreet Singh Brar

Er. Sumet Kaur Sehra

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Sukhwinder Singh

Dr. Paramjit Singh

- a) Providing a strong theoretical and practical background across the computer science discipline with an emphasis on software development.
- b) Imparting the skills necessary to continue education to grow professional.
- c) Empowering the youth in rural communities with computer education.
- d) Inculcating professional behavior, strong ethical values, innovative research capabilities and leadership abilities.

Program Education Objectives (PEO's) of M.Tech. (Computer Science and Engineering):

1. Practice with an expertise in academics, entrepreneurship, design and development in computing technology, or research in a specialized area of computer science and Engineering to pursue higher studies.
2. Exhibit analytical, decision-making and problem solving skills by applying research principles for handling real-life problems with realistic constraints.
3. Ability to communicate the findings or express innovative ideas in an effective manner with an awareness of professional, social and ethical responsibilities.

Program Outcomes (PO's) of M.Tech. (Computer Science and Engineering):

- a) Apply knowledge of recent computing technologies, skills and current tools of computer science and engineering.
- b) Ability to design and conduct experiments, as well as to analyze and interpret data.
- c) Knowledge of contemporary research issues in the different areas of computer science & engineering.
- d) Ability to explore research gaps, analyze and carry out research in the specialized/emerging areas.
- e) Design software systems, components, or processes to meet identified needs within economic, environmental and social constraints.
- f) Ability to express/present ideas in an impressive and professional manner.
- g) Recognize the need to engage in lifelong learning through continuing education and research.
- h) Ability to work in multi-disciplinary and multi-cultural environment.
- i) Ability to become entrepreneur based upon societal needs.
- j) An understanding of professional, social and ethical responsibilities.

Agenda Item 2

To discuss and finalize the Curriculum Design Process

Approved

Dr. Parminder Singh

Er. Anshu Preet Singh Brar

Dr. Nirmal Kumar Singh

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Sukhvinder Singh

Dr. Paramjit Singh

3.1 Finalizing the new scheme for M.Tech. Computer Science and Engineering

The Following Scheme for M.Tech Computer Science and Engineering is approved

M.Tech. (Full-Time) Computer Science & Engineering Course Scheme					
Sr. No.	Subject Code	Course Title	Type	L-T-P	Credits
Semester 1st					
1	MTCS501	Software Engineering Methodologies	Core	4-0-0	4
2	MTCS502	Databases and Data Mining	Core	4-0-0	4
3	MTCS503	Advanced Data Structures	Core	4-0-0	4
4	MTCS6xx	Programme Elective – I	Programme Elective	3-0-0	3
5	MTCS6xx	Programme Elective – II	Programme Elective	3-0-0	3
6	MTCS507	Lab – I (Software Engineering Methodologies + Advanced Data Structures)	Lab-I	0-0-4	2
Semester 2nd					
1	MTCS504	Distributed Computing Architecture	Core	4-0-0	4
2	MTCS505	Digital Image Processing	Core	4-0-0	4
3	MTCS506	Information Retrieval	Core	4-0-0	4
4	MTCS6xx	Programme Elective – III	Programme Elective	3-0-0	3
5	MTCS6xx	Open Elective – I	Open Elective	3-0-0	3
6	MTCS508	Lab – II (Digital Image Processing + Information Retrieval)	Lab-II	0-0-4	2
Semester 3rd					
1	MTCS6xx	Programme Elective – IV	Programme Elective	3-0-0	3
2	MTCS6xx	Open Elective – II	Open Elective	3-0-0	3
3	MTCS509	Pre-Thesis Seminar	Pre Thesis Seminar	0-0-4	4
4	MTCS510	Pre-Thesis Project	Pre Thesis Project	0-0-4	4
Semester 4th					
1	MTCS511	Thesis	Thesis	0-0-14	14

Dr. Parminder Singh

Er. Amanpreet Singh Brar

Er. Sumant Kaur Sahas

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Sukhwinder Singh

Dr. Paranjit Singh

Finalizing the List of Core and Elective subjects of new scheme for M.Tech. Computer Science and Engineering

M.Tech. (Full-Time) Computer Science & Engineering Course Scheme.					
Sr. No.	Subject Code	Course Title	Type	L-T-P	Credits
1	MTCS501	Software Engineering Methodologies	Core	4-0-0	4
2	MTCS502	Databases and Data Mining	Core	4-0-0	4
3	MTCS503	Advanced Data Structures	Core	4-0-0	4
4	MTCS504	Distributed Computing Architecture	Core	4-0-0	4
5	MTCS505	Digital Image Processing	Core	4-0-0	4
6	MTCS506	Information Retrieval	Core	4-0-0	4
7	MTCS507	Lab.-I (includes MTCS501 and MTCS 503)	Core	4-0-0	2
8	MTCS508	Lab.-II (includes MTCS505 and MTCS 506)	Core	4-0-0	2
9	MTCS509	Pre-Thesis Seminar	Core	0-0-4	4
10	MTCS510	Pre-Thesis Project	Core	0-0-4	4
11	MTCS511	Thesis	Core	0-0-14	14
12	MTCS601	Network Security	Programme Elective	3-0-0	3
13	MTCS602	Ad-hoc Networks	Programme Elective	3-0-0	3
14	MTCS603	Wireless Networks	Programme Elective	3-0-0	3
15	MTCS604	Parallel Computing	Programme Elective	3-0-0	3
16	MTCS605	Cloud Computing	Programme Elective	3-0-0	3
17	MTCS606	Big Data Analytics	Programme Elective	3-0-0	3
18	MTCS607	Advanced Operating System	Programme Elective	3-0-0	3
19	MTCS608	Object Oriented Analysis and Design Using UML	Programme Elective	3-0-0	3
20	MTCS609	Software Testing and Quality Assurance	Programme Elective	3-0-0	3
21	MTCS610	Compiler Design	Programme Elective	3-0-0	3
22	MTCS611	Pattern Recognition	Programme Elective	3-0-0	3
23	MTCS612	Machine Learning	Programme Elective	3-0-0	3
24	MTCS613	Bioinformatics	Programme Elective	3-0-0	3
25	MTCS614	Soft Computing	Programme Elective	3-0-0	3
26	MTCS615	Natural Language Processing	Programme Elective	3-0-0	3
27	MTCS616	Speech Processing	Programme Elective	3-0-0	3
28	MTCS617	Research Methodology	Programme Elective	3-0-0	3

Dr. Parminder Singh
 Er. Amanpreet Singh Brar
 Er. Sumant Kaur Sehra

Er. Vivek Thapar
 Dr. Gurpreet Singh Lehal
 Dr. Sukhwinder Singh

Dr. Paramjit Singh

			Elective		
30	MTCS618	Optimization Techniques	Programme Elective	3-0-0	3
31	MTCS619	Modeling and Simulation	Programme Elective	3-0-0	3
32	MTCS620	Neural Networks and Fuzzy Logic	Programme Elective	3-0-0	3
33	MTCS621	Project Management	Programme Elective	3-0-0	3
34	MTCS622	Human Resources Development and Training Methods	Programme Elective	3-0-0	3

3.3 Finalizing the syllabus of subjects of 1st semester of M.Tech. Computer Science and Engineering New Scheme

Committee approved the proposed syllabus of subjects of 1st semester of M.Tech. Computer Science and Engineering new Scheme and authorized Chairman BOS for further changes, if required.

Agenda Item 4

Question paper setting for end semester examinations of B.Tech. and M.Tech.

The BOS approved the paper setting mechanism by the Controller of examination from the panel of examiners recommended by the Head of department. Regarding the quality checking of the question paper the committee gave the following recommendation:

"The BOS members are of the view that the quality (coverage of syllabus, distribution, format as per specified instructions) of the question paper of end semester examinations should be checked only after the conduct of examination and necessary steps should be taken in case of any discrepancy found."

Agenda Item 5

5.1 Finalizing the books of B.Tech. 1st year Subject FCP&IT

The Following list of books for the subject FCP&IT are approved:

1. Fundamentals of Computers , V. Rajaraman, Prentice Hall of India
2. C: The Complete Reference: Herbert Schildt, McGraw Hill
3. E Balagurusamy, Programming in ANSI C, 3ed., Tata McGraw Hill, 2003
4. Let us C: Y.P. Kanetkar, B.P.B. Publications
5. Computer Concepts and Programming in C, R.S. Salaria, Salaria Publications House
6. Programming in C, Ajay Mittal, Pearson Education
7. Fundamental of Computer Programming and IT, Sumita Arora, Dhanpat Rai & Company.

Dr. Parminder Singh

Er. Amanpreet Singh Brar

Er. Sumant Kaur Sehgal

Er. Vivek Thapar

Dr. Gurpreet Singh Lehal

Dr. Sukhwinder Singh

Dr. Parminder Singh

Finalizing the syllabus of 1st year B.Tech. Subject FCP&IT Lab
The following syllabus of 1st year B.Tech. Subject FCP&IT Lab is approved

Fundamentals of Computer Programming and IT Lab

1. Familiarization with the Computer System
2. Navigating with Explorer, Working with Control Panel, work at the command prompt, understanding of virus guards and antivirus software, Exploring the Internet.
3. Word processing, spread sheets, presentation software
4. Write a program to find the nature of the roots as well as value of the roots. However, in case of imaginary roots, find the real part and imaginary part separately.
5. Write a program, which takes two integer operands and one operator from user, performs the operation and then prints the result. (Consider the operators +, *, /, % and use switch statement). For example, the input should be in the form: 5 + 3 the output should come Result = 8
6. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first n terms of the sequence. For example, for $n = 8$, the output should be 0 1 1 2 3 5 8 13
7. Write a program to print all the prime numbers between m and n , where the value of m and n is supplied by the user.
8. The number such as 1991, is a palindrome because it is same number when read forward or backward. Write a program to check whether the given number is palindrome or not.
9. A positive integer number $1JK$ is said to be well-ordered if $1 < J < K$. For example, number 138 is called well-ordered because the digits in the number (1, 3, 8) increase from left to right, i.e., $1 < 3 < 8$. Number 365 is not well-ordered because 6 is larger than 5. Write a program that will find and display all possible three digit well-ordered numbers. The program should also display the total number of three digit well-ordered numbers found.
10. Write a function to compute the highest common factor of integer numbers m and n . Use this function to find the highest common factor of integer numbers a and b .
11. Given the marks (out of 100) obtained by each student in a test of a class with n students. Write a program to obtain the following information:
 - (a) minimum and maximum marks score
 - (b) average score of the class, and
 - (c) number of students whose score is greater than class's average score
12. Write a program to multiply matrix $A_{m \times n}$ by $B_{p \times q}$, given that $n = p$.
13. Write a program to sort a list of n integer numbers in descending order using bubble sort method.

Dr. Parminder Singh
Er. Amarjit Singh Brar
Er. Sumant Kaur

Er. Vivek Thapar
Dr. Gurpreet Singh Lehana
Mr. Sukhvir Singh

Dr. Parminder Singh

14. Write a program to perform the addition and multiplication of two complex numbers using structures.
15. Write a program using pointers to compute the sum of all elements stored in an array.

Dr. Parminder Singh
Er. Amanpreet Singh Brar
Er. Sumant Kaur Sahel

Er. Vivek Thapar
Dr. Gurpreet Singh Lehal
Dr. Sukhvirinder Singh

Dr. Paramjit Singh

Guru Nanak Dev Engineering College, Ludhiana
Department of Computer Science & Engineering

Ref. No.: CSE/2220

Dated: 30-7-19

Minutes of 10th meeting of Board of Studies of Computer Science and Engineering Department held on 26.07.2019 at 10:00 am in the Committee Room, GNDEC, Ludhiana.

The following persons were present:

1. Dr. Parminder Singh, Professor & Head, Department of Computer Science and Engineering, GNDEC, Ludhiana (Chairman)
2. Prof. Amanpreet Singh Brar, Associate Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
3. Prof. Amandeep Kaur Sohal, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
4. Dr. Sumeet Kaur Sehra, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
5. Dr. Vivek Thapar, Assistant Professor, Department of Computer Science and Engineering, GNDEC, Ludhiana (Member)
6. Mr. Rinku Garg, Senior Technical Lead, Fidelity Information Services India Pvt. Ltd., Chandigarh (Member)
7. Mr. Ravi Kumar, Assistant Professor, Department of CSE, Atal Bihari Vajpayee Govt. Institute of Engineering and Technology, Pragati Nagar, District Shimla. (Member)
8. Dr. Maninder Singh, Professor, Dept. of CSE, Thapar Institute of Engineering and Technology, Patiala (External Expert)
9. Dr. K.S. Gill, Dean Academics, GNDEC, Ludhiana.
10. Prof. Gagandeep Singh Sodhi, Training and Placement officer, GNDEC, Ludhiana.
11. Dr. Amit Kamra, Nominee, Controller of Examination, GNDEC, Ludhiana.

The meeting started with welcome address by chairman BOS, and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Dr. Parminder Singh

Dr. Vivek Thapar

Dr. Maninder Singh

Dr. Amanpreet Singh Brar

Nominee, COE

THO

Dr. Amandeep Kaur Sohal

Mr. Rinku Garg

Dean Academics

Dr. Sumeet Kaur Sehra

Mr. Ravi Kumar

Agenda Item 1

Discussion about course scheme 2018 of B.Tech. Computer Science and Engineering applicable to students of 2018 admission batch onwards and to finalise study scheme of 3rd and 4th semester.

Approved

Agenda Item 2

Discussion about syllabus of 3rd and 4th semester of B.Tech. Computer Science and Engineering of study scheme 2018.

Syllabus of different subjects were discussed and following suggestions were given for different subjects.

1. Course outcomes of subjects needs to be in align with NBA standards and blooms Taxonomy
2. Encourage the students to use tools like Domjudge , Hackerrank, EBox, Packet Tracer, and NS2
3. Practical Examination duration may be changed to 2 hours.
4. Practicals should be open ended for Data structures and Object Oriented Programming.

Further, Committee authorize the BOS chairman for further changes if required.

Dr. Parminder Singh

Dr. Vivek Thapar

Dr. Maninder Singh

Dr. Anandjeet Singh Brar

Nominee, COE

TPO

Dr. Anandeep Kaur Sohal

Mr. Rinku Garg

Dean Academics

Dr. Sumeet Kaur Sehra

Mr. Ravi Kumar

Agenda Item 3

Discussion about subjects to be offered for minor degree in Computer Science and Engineering.

1. Courses to be taken through classroom study are approved.
2. MOOC courses approved for current session and committee authorize BOS chairman along with internal members to finalize list of courses offered for minor degree from time to time and take suggestions of experts through e-mail.

Agenda Item 4

Discussion about courses to be offered through MOOC for Honour degree.

Approved for current session and committee authorize BOS chairman along with internal members to finalize list of courses offered through MOOC from time to time and take suggestions of experts through e-mail.

Agenda Item 5

Discussion about study scheme 2019 of M.Tech. Computer Science and Engineering applicable to students of 2019 admission batch onwards.

Approved

Dr. Parminder Singh

Dr. Amanpreet Singh Brar

Dr. Amandeep Kaur Sohal

Dr. Sumrit Kaur Sehra

Dr. Vivek Thapar

Nominee, COE

Mr. Rinku Garg

Mr. Ravi Kumar

Dr. Maninder Singh

TPO

Dean Academics

Agenda Item 6

Discussion about syllabus of subjects of M.Tech. Computer Science and Engineering study scheme 2019.

Syllabus of different subjects were discussed and following suggestions were given for different subjects.

1. SDNs, Interplanetary networks, and Delay tolerant networks can be added in Advances in Computer Networks subject.
2. Practicals need to be changed and datasets to be added in Data warehousing and data mining laboratory.
3. ECC and Stream cipher RC5 has to be added in Cryptography.
4. WPA2 to be added in Network Security.
5. Wireshark has to be deleted from Simulation and Modelling.
6. JIRA, Mycolab and Orange Scrum (Project management tools) to be added in Project Management

Further Committee authorize the BOS chairman for any further changes if required.

Dr. Parminder Singh

Dr. Anandpreet Singh Brar

Dr. Amandeep Kaur Sohal

Dr. Sumreet Kaur Sehra

Dr. Vivek Thapar

Nominee, COE

Mr. Rinku Garg

Mr. Ravi Kumar

Dr. Maninder Singh

Dean Academics

Course: B.Tech. Computer Science and Engineering

(Scheme - 2018 Batch onwards)

3rd Semester

Category	Course Code	Course Name	Subject Type (Theory / Practical)	Load Allocation (per week)				Marks Distribution		Total Marks	Credits
				L	T	P		Internal	External		
Professional Core Courses	PCCS-101	Object Oriented Programming	Theory	3	0	0		40	60	100	3
Professional Core Courses	PCCS-102	Computer Networks	Theory	3	0	0		40	60	100	3
Engineering Science Courses	ESCS-101	Digital Electronics	Theory	3	0	0		40	60	100	3
Basic Science Course	BSCS-101	Mathematics-III	Theory	3	1	0		40	60	100	4
Humanities and Social Sciences including Management Courses	HSMCS-101	Human values and Professional Ethics	Theory	3	0	0		40	60	100	3
Professional Core Courses	LPCCS-101	Object Oriented Programming Laboratory	Practical	0	0	4		30	20	50	2
Professional Core Courses	LPCCS-102	Computer Networks Laboratory	Practical	0	0	2		30	20	50	1
Engineering Science Courses	LESCS-101	Digital Electronics Laboratory	Practical	0	0	2		30	20	50	1
Training	TR-101	Training-I	Practical	0	0	0		60	40	100	1
Seminar/Project	PRCS-101	Seminar and Technical Report Writing	Practical	0	0	2		50	0	50	1
Mentoring and Professional Development*		Mentoring and Professional Development	Practical	0	0	1		-	-	-	-
Total				15	1	11		400	400	800	22
Contact Hours = 26+1*											

*Evaluation of 4 weeks institutional/industrial training held after 2nd semester in the institute.

There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

4th Semester

Category	Course Code	Course Name	Subject Type (Theory / Practical)	Load Allocation (per week)			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
Professional Core Courses	PCCS-103	Discrete Mathematics	Theory	3	1	0	40	60	100	4
Professional Core Courses	PCCS-104	Computer Architecture and Microprocessor	Theory	3	0	0	40	60	100	3
Professional Core Courses	PCCS-105	Operating Systems	Theory	3	1	0	40	60	100	4
Professional Core Courses	PCCS-106	Data Structures	Theory	3	0	0	40	60	100	3
Professional Core Courses	PCCS-107	Software Engineering	Theory	3	1	0	40	60	100	4
Professional Core Courses	LPCCS-103	Computer Architecture and Microprocessor Laboratory	Practical	0	0	2	30	20	50	1
Professional Core Courses	LPCCS-104	Operating Systems Laboratory	Practical	0	0	2	30	20	50	1
Professional Core Courses	LPCCS-105	Data Structures Laboratory	Practical	0	0	4	30	20	50	2
Mandatory Courses	MCI-101	Environmental Sciences	Theory	2	0	0	50	0	50	0
Mentoring and Professional Development #	MPD-102	Mentoring and Professional Development	Practical	0	0	1	100	0	100	1
Total				17	3	9	440	360	800	23
			Contact Hours = 28+1*							

There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

M.Tech. Computer Science and Engineering (Scheme-2019)

Total Credits=19+17+16+16=68

SEMESTER 1

Sr. No.	Category	Course Code	Subject Name	Subject Type	Load Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Core	MCS-101	Mathematical Foundations of Computer Science	Theory	3	0	0	50	100	150	3
2	Programme Core	MCS-102	Advanced Data Structures	Theory	3	0	0	50	100	150	3
3	Programme Core	MRM-101	Research Methodology and IPR	Theory	3	0	0	50	100	150	3
4	Programme Elective	MCS-11X	Elective -1	Theory	3	0	0	50	100	150	3
5	Programme Elective	MCS-12X	Elective -2	Theory	3	0	0	50	100	150	3
6	Programme Core	LMCS-102	Advanced Data Structures Laboratory	Practical	0	0	4	50	50	100	2
7	Programme Elective	LMCS-11X	Elective -1 Laboratory	Practical	0	0	2	50	50	100	1
8	Programme Elective	LMCS-12X	Elective -2 Laboratory	Practical	0	0	2	50	50	100	1
9	Audit Course*	MAC-XXX	Audit Course	Theory	2	0	0	50	0	50	S/US
					17	0	8	450	650	1100	19
TOTAL Contact Hours: 25											

SEMESTER 2

Sr. No.	Category	Course Code	Subject Name	Subject Type	Scheme of Studies Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Core	MCS-103	Advance Algorithms	Theory	3	0	0	50	100	150	3
2	Programme Core	MCS-104	Soft Computing	Theory	3	0	0	50	100	150	3
3	Programme Elective	MCS-13X	Elective-3	Theory	3	0	0	50	100	150	3
4	Programme Elective	MCS-14X	Elective-4	Theory	3	0	0	50	100	150	3
5	Programme Core	LMCS-103	Advance Algorithms Laboratory	Practical	0	0	2	50	50	100	1
6	Programme Core	LMCS-104	Soft Computing Laboratory	Practical	0	0	2	50	50	100	1
7	Programme Elective	LMCS-XXX	Based on Electives-3	Theory	0	0	2	50	50	100	1
8	Core	LMPCS-101	Project	Practical	0	0	4	50	50	100	2
9	Audit Course*	MAC-XXX	Audit Course	Theory	2	0	0	50	0	50	S/US
					16	0	6	450	600	1050	17
TOTAL Contact Hours: 26											

**M. Tech (CSE) Scheme
(2019 Batch Onwards)
SEMESTER 3**

Sr. No.	Category	Course Code	Subject Name	Subject Type	Load Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Elective	MCS-15X	Elective -5	Theory	3	0	0	50	100	150	3
2	Open Elective	MOCS-XXX	Open Elective	Theory	3	0	0	50	100	150	3
3	Proj Thesis	MPTCS-XXX	Formulation of Research Problem	Practical	0	0	20 (2*+18*)	100	100	200	10
					6	0	20	200	300	500	16

TOTAL Contact Hours: 8

#Maximum hours for Teacher

*Independent study Hours

SEMESTER 4

Sr. No.	Category	Course Code	Subject Name	Subject Type	Load Per Week			Marks Distribution			Credits
					L	T	P	Int.	Ext.	Total	
1	Programme Core	MTCS-101	Thesis	Practical	0	0	32 (4*+28*)	100	200	300	10
					0	0	20	100	200	300	10

TOTAL Contact Hours: 4

#Maximum hours for Teacher

*Independent study Hours

LIST OF ELECTIVES

List of Elective-1

Sr. No.	Course Code	Subject Name
1	MCS-111	Machine Learning
2	MCS-112	Advances in Artificial Intelligence
3	MCS-113	Wireless and Mobile Networks
4	MCS-114	Advances in Computer Networks
5	MCS-115	Advanced Operating Systems
6	LMCS-111	Machine Learning Laboratory
7	LMCS-112	Advances in Artificial Intelligence Laboratory
8	LMCS-113	Wireless and Mobile Networks Laboratory
9	LMCS-114	Advances in Computer Networks Laboratory
10	LMCS-115	Advanced Operating Systems Laboratory

List of Elective-2

Sr. No.	Course Code	Subject Name
1	MCS-121	Data Ware House & Data Mining
2	MCS-122	Advance Data Base System Concepts
3	MCS-123	Software Engineering Methodologies
4	MCS-124	Cloud Computing and Security
5	MCS-125	Digital Image Processing
6	LMCS-121	Data Ware House and Data Mining Laboratory
7	LMCS-122	Advance Data Base System Concepts Laboratory
8	LMCS-123	Software Engineering Methodologies Laboratory
9	LMCS-124	Cloud Computing and Security Laboratory
10	LMCS-125	Digital Image Processing Laboratory

List of Elective-3

Sr. No.	Course Code	Subject Name
1	MCS-131	Cryptography
2	MCS-132	Wireless Sensor Networks
3	MCS-133	Network Security
4	MCS-134	Data Science
5	MCS-135	Web Crawler and Search Engines
6	MCS-136	Software Testing and Quality Assurance
7	LMCS-131	Cryptography Laboratory
8	LMCS-132	Wireless Sensor Networks Laboratory
9	LMCS-133	Network Security Laboratory
10	LMCS-134	Data Science Laboratory
11	LMCS-135	Web Crawler and Search Engines Laboratory
12	LMCS-136	Software Testing and Quality Assurance Laboratory

List of Elective-4

Sr. No.	Course Code	Subject Name
1	MCS-141	Agile Software Development Approaches
2	MCS-142	Human and Computer Interaction
3	MCS-143	Natural Language Processing
4	MCS-144	Information Storage and Management
5	MCS-145	Introduction to Intelligent System
6	MCS-146	Computer Vision

List of Elective-5

Sr. No.	Course Code	Subject Name
1	MCS-151	Optimization Techniques
2	MCS-152	Social Network Analysis
3	MCS-153	Distributed Systems
4	MCS-154	Neural Networks and Fuzzy Logic
5	MCS-155	Data Preparation and Analysis
6	MCS-156	Smart Sensors and Internet of Things

List Of Open Electives offered to other Departments

Sr. No.	Course Code	Subject Name
1	MOCS-101	Simulation and Modeling
2	MOCS-102	Project Management
3	MOCS-103	Business Information System
4	MOCS-104	Human Resources Development and Training Methods
5	MOCS-105	Multimedia Communications

LIST OF AUDIT COURSES

Sr. No.	Course Code	Subject Name
1.	MAC-101	English for Research Paper Writing
2.	MAC-102	Disaster Management
3.	MAC-103	Sanskrit for Technical Knowledge
4.	MAC-104	Value Education
5.	MAC-105	Constitution of India
6.	MAC-106	Pedagogy Studies
7.	MAC-107	Stress Management
8.	MAC-108	Personality Development through Life Enlightenment Skills

Annexure I

MINUTES OF 2nd BOS MEETING

Minutes of 2nd meeting of Board of Studies held on 01.09.2014 at 11.00 am in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill
2. Pf. Kanwaljit Singh
3. Pf. Amecta Seehra
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Ajay Kumar Sharma
7. Dr. Kanav Kahol
8. Pf. Nirmal Singh Grewal
9. Dr. S. Bansal

The meeting started with welcome by Chairman BOS for the 2nd Board of Studies Meeting to the present members.

Following decisions were taken:-

Item No. 1 **Confirmation of Minutes of 1st meeting of Board of Studies held on 07.04.2014.**

Action Taken: Minutes of 1st meeting confirmed.

Item No. 2 **Apprising the members of Board of Studies about the Program Educational Objectives (PEO), Program Outcomes (PO) and in turn their achievement through courses for M.Tech (ECE).**

Action Taken: All members agreed that the self employment / entrepreneurship factor should be included in PEO 1. So the PEO 1 is modified as follows:

PEO 1: Work in educational, R & D institutes, Industry and as an entrepreneur in Electronics & Communication Engineering field.

PEO 2 - 4 approved as proposed.

The POs from PO 1 to 5 and PO 7 to 11 are approved as proposed but the PO 6 is modified as follows:

Annexure I

MINUTES OF 2nd BOS MEETING

Minutes of 2nd meeting of Board of Studies held on 01.09.2014 at 11.00 am in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill
2. Pf. Kanwaljit Singh
3. Pf. Ameeta Seehra
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Ajay Kumar Sharma
7. Dr. Kanav Kahol
8. Pf. Nirmal Singh Grewal
9. Dr. S. Bansal

The meeting started with welcome by Chairman BOS for the 2nd Board of Studies Meeting to the present members.

Following decisions were taken: -

Item No. 1 **Confirmation of Minutes of 1st meeting of Board of Studies held on 07.04.2014.**

Action Taken: Minutes of 1st meeting confirmed.

Item No. 2 **Apprising the members of Board of Studies about the Program Educational Objectives (PEO), Program Outcomes (PO) and in turn their achievement through courses for M.Tech (ECE).**

Action Taken: All members agreed that the self employment / entrepreneurship factor should be included in PEO 1. So the PEO 1 is modified as follows:

PEO 1: Work in educational, R & D institutes, Industry and as an entrepreneur in Electronics & Communication Engineering field.

PEO 2 - 4 approved as proposed.

The POs from PO 1 to 5 and PO 7 to 11 are approved as proposed but the PO 6 is modified as follows:

PO 6: An ability to perform effectively in diverse and Multidisciplinary teams as a member / leader and take objective & rational decisions to achieve common goals.

The finalized PEO's & PO's are attached as Annexure I(a).

Item No. 3 **Introduction of credit based system for MTech (ECE)**

Action Taken: Approved.

Item No. 4 **Revision of syllabus of M.Tech (ECE) 2014 admission batch.**

Action Taken: The board was of the view that

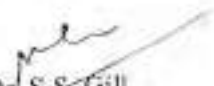
- i. The engineering design subject should be added as core so the title of subject MTEC-505 is modified to "Engineering Design & Project Management"
- ii. Data Mining subject should be added so the title of subject MTEC-607 is modified to "Data Mining & Cloud Computing"
- iii. Instead of specifying the core subjects, a list of cores should be proposed and any three core subjects as per availability of teachers should be taught in 1st / 2nd semester.
- iv. A chapter on parallel processing may be added to the subject MTEC-616 Computer Communication & Networks.
- v. A Chapter on Discrete Algebra should be added to MTEC-501 Advanced Mathematics for Engineers.
- vi. The syllabus of MTEC-503 is changed and the new syllabus proposed by Dr. Ajay Kumar Sharma is approved.
- vii. Few topics related to A.I. techniques proposed to be added to the syllabus of the subject MTEC-605 Soft Computing.
- viii. The syllabus of the subjects MTEC-502 and MTEC-601 approved as proposed.

The finalized syllabus of five subjects is attached as Annexure-I(b).

Item No. 5 **To ratify the broad classification of curriculum upto 2013 batch and finalize the broad classification of curriculum 2014 onwards.**

Action Taken: Approved.

The meeting ended with the vote of thanks by chairman BOS.



Dr. S.S. Gill,
Chairman
Board of Studies
Deptt. of ECE

Distribution: -

1. Director, GNDEC, Ludhiana for kind information
2. All Members of Board of Studies (ECE) through email
3. Dean, Academic, GNDEC, Ludhiana
4. Dean PG, GNDEC, Ludhiana
5. BOS File.

No. ECE/ 45

Date: 18.01.16

MINUTES OF MEETING

Minutes of the 4th meeting of Board of Studies of Department of Electronics & Communication Engineering held on 18.01.2016 at 11.00 AM in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill (Chairman)
2. Pf. Ameeta Seehra
3. Pf. Narwant Singh Grewal
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Baljeet Kaur
7. Dr. Ajay Kumar Sharma
8. Pf. Nirmla Singh Grewal
9. Dr. Rajeevan Chandel

Received
Hans.
22/3/2016

The meeting started with the Chairman BOS welcoming the members to the 4th Board of Studies Meeting.

Following decisions were taken: -

Item No. 1 **Confirmation of minutes of 3rd meeting of Board of Studies held on 27.01.2015.**

Action Taken: Minutes of 3rd meeting confirmed.

Item No. 2 **Approval of syllabus of subjects of B.Tech. (ECE) 2014 admission batch onwards upto 5th semester.**

Action Taken: **Approved with following modifications:**

- i. For each subject, text books, and reference books should be separately specified.

Page 1 of 3

Minutes of 4th Meeting of BOS on 18.01.2016 (Department of Electronics & Communication Engineering)

- ii. In place of "minimum numerical contents," the term should be "Numerical/Design Problem contents" and a range should be specified for the same.
- iii. There should be 12-13 experiments in all lab subjects and hardware experimental results should be validated using simulation softwares/MATLAB wherever possible.
- iv. Reference Books / In-house manuals should be specified in the syllabus of lab subjects.

Numerous other suggestions were given by the BOS members regarding course contents, addition / deletion of certain topics, addition / deletion of reference books, standardisation of syntax for syllabus of all subjects, etc. All the suggestions have been incorporated in the syllabus and the final syllabus is attached at Annexure-I.

Item No. 3

Syllabus of remaining subjects of M.Tech. (ECE) 2014 admission batch.

Action Taken:

Approved with the following modifications: -

(i) The title of "Digital VLSI Design" subject should be changed to "VLSI Design Verification & Testing" and that of "Advanced Error Control Codes" should be changed to "Error Control Coding Techniques".

(ii) The subject of "Data Mining & Cloud Computing" should be separated into two subjects namely

- Databases and Data Mining
- Cloud Computing

As for B.Tech syllabus, many suggestions were given by the BOS members regarding the addition / deletion of topics, books, etc. All the suggestions have been incorporated in the syllabus. The final study scheme and syllabus is attached at Annexure-II.

189

Item No. 4 **Approval of panel of external paper setters for B.Tech (ECE) & M.Tech.**

Action Taken: Approved as proposed. The approved list attached at annexure III.

The meeting ended with the vote of thanks by chairman BOS.



Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

Encl:-

- i. Annexure I
- ii. Annexure II
- iii. Annexure III

GURU NANAK DEV ENGINEERING COLLEGE LUDHIANA
(Department of Electronics & Communication Engineering)

No. ECE/1178

MINUTES OF MEETING

Date: 08.08.19

Minutes of 12th meeting Board of Studies of Department of Electronics and Communication Engineering held on 02.08.2019 at 11.00 AM in college committee room.

The following members were present in the meeting.

1. Er. Ameeta Seehra, Chairperson
2. Dr. Balwinder Singh Dhaliwal, Member
3. Dr. Munish Rattan, Member
4. Dr. Baljeet Kaur, Member
5. Dr. Amit Kumar Kohli, Associate Professor, ECE Department, Thapar University, Patiala, Member
6. Er. H.S. Jatana, Group and Process Ground, SCL, Mohali, Member
7. Dr. J.S. Sahambi, Professor, Department of EE, IIT Ropar, Member
8. Sh. Ajeet Thakur, Assistant Professor, ECE, ABVGIET, Shimla, HP, Member
9. Dr. Amit Kamra, COE Nominee
10. Er. Gagandeep Singh Sodhi, TPO (GNDEC)

The following decisions were taken: -

1. The new scheme for M.Tech (ECE) for 2019 batch for all the four semesters (according to latest AICTE guidelines) was discussed and finalized by BOS.
2. The syllabus of M.Tech (ECE) for 1st and 2nd semester for 2019 batch was discussed and finalized by BOS.
3. The panel of external paper setters for B.Tech (ECE) and M.Tech (ECE) was finalized by BOS members.
4. The list of courses offered for Minor Degree and Honours Degree in Electronics and Communication Engineering was finalized by BOS members.

Ameeta Seehra

(Er. Ameeta Seehra)
Chairperson
Board of Studies,
Department of ECE,
GNDEC, Ludhiana.

Annexure 3.1

M. Tech. (ECE) PEO's

After quite-a-few years of completing M Tech (ECE), the students will:

PEO1 Work in educational, R&D institutes, Industry and as an Entrepreneur in Electronics & Communication Engineering field.

PEO2 Pursue their doctoral studies and research in the institutes of high repute in India & abroad and develop independent and lifelong learning skills for continuous professional development.

PEO3 Analyze the technical problems and develop feasible, optimal, environmentally and socially acceptable solutions by applying research skills, technical knowledge and modern tools while working individually and in teams.

PEO4 Demonstrate an ability to communicate effectively and practice professional ethics and social responsibility in their career.

M. Tech. (ECE) PO's

After completing M Tech (ECE), the students will have

S. No.	Graduate Attributes	Program Outcomes (PO's)
1.	GA1: Scholarship of knowledge	PO1:An ability to discriminate, evaluate, analyze & synthesize the existing and new knowledge of electronics and communication engineering and to integrate the same for enhancement of knowledge
2.	GA2: Critical Thinking	PO2:An ability to analyze a problem and formulate intellectual & creative framework for conducting research for its solution in a theoretical, practical and policy context.
3.	GA3: Problem Solving	PO3:An ability to evaluate alternative solution of an electronics & communication engineering related problems to find the feasible and optimal solution with appropriate consideration for public health and safety, cultural, societal and environmental issues.
4.	GA4: Research Skill	PO4:An ability to use research based techniques and skills including literature survey, experiments, research methodologies, analysis and interpretation of data and development of scientific/technical knowledge to provide valid conclusions by contributing individually or in groups.
5.	GA5: Usage of Modern tools	PO5:An ability to develop appropriate models, techniques, skills using modern engineering & software tools for solving electronics & communication engineering problems.
6.	GA6: Collaborate and Multidisciplinary Work	PO6:An ability to perform effectively in diverse and Multidisciplinary teams as a member / leader and take objective & rational decisions to achieve common goals.

7.	GA7: Project Management and Finance	PO7:An ability to comprehend and apply engineering and management principles to manage individual and team projects with appropriate consideration to economical & financial aspects.
8.	GA8: Communication	PO8:An ability to Communicate effectively, clearly and confidently with a range of audience through oral and written presentations.
9.	GA9: Life-long learning	PO9:An ability to recognize the need for and engage in continuous professional development and life-long learning
10.	GA10: Ethical Practices and Social Responsibility	PO10:An understanding of professional, ethical, intellectual issues, practices, and social responsibilities as a researcher and member of society.
11.	GA11: Independent and Reflective Learning	PO11:An ability for critical self analysis and self correction.

M Tech (ECE) Pending Elective Subjects' Syllabus

M. Tech (ECE) Syllabus Scheme 2014 Admission Batch Onwards

Semester-I

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-501	Advanced Mathematics for Engineers	Core	4	0	4	4
2	MTEC-502	Advanced Communication System	Core	4	0	4	4
3	MTEC-503	Advanced Optical Communication System	Core	4	0	4	4
4	MTEC-xxx	Department Elective - I	Program Elective	3	0	3	3
5	MTEC-xxx	Department Elective – II	Program Elective	3	0	3	3
6	MTEC-507	Lab – I	Core	0	4	4	2
Total				18	4	22	20

Semester II

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-504	Advanced Digital Signal Processing	Core	4	0	4	4
2	MTEC-505	Engineering Design and Project Management	Core	4	0	4	4
3	MTEC-506	Advanced Microwave Engineering	Core	4	0	4	4
4	MTEC-xxx	Department Elective - III	Program Elective	3	0	3	3
5	MTxx-xxx	Open Elective – I	Program Open	3	0	3	3
6	MTEC-508	Lab – II	Core	0	4	4	2
Total				18	4	22	20

Semester-III

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-xxx	Department Elective - IV	Program Elective	3	0	3	3
2	MTxx-xxx	Open Elective – II	Program Open	3	0	3	3
3	MTEC-509	Pre-Thesis Seminar	Core	0	1	1	1
4	MTEC-510	Pre-Thesis Project	Core	0	3	3	3
Total				6	4	10	10

Semester-IV

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-511	Thesis	Core	-	-	-	15
Total				-	-	-	15

List of Department Core Subjects

MTEC-501	Advanced Mathematics for Engineers
MTEC-502	Advanced Communication System
MTEC-503	Advanced Optical Communication System
MTEC-504	Advanced Digital Signal Processing
MTEC-505	Engineering Design and Project Management
MTEC-506	Advanced Microwave Engineering

List of Department Electives Subjects

MTEC-601	Semiconductor Devices Theory & Modeling
MTEC-602	Multimedia Communication
MTEC-603	Advanced Wireless Networks
MTEC-604	Advanced Wireless & Mobile Communication
MTEC-605	Soft Computing
MTEC-606	Error Control Coding Techniques
MTEC-607	Databases and Data Mining
MTEC-608	Bio-medical Electronics
MTEC-609	Organic Electronics
MTEC-610	VLSI Design, Verification & Testing
MTEC-611	VLSI Design Automation
MTEC-612	Low Power VLSI Design
MTEC-613	Nano-Electronics

MTEC-614	Speech & Image Processing
MTEC-615	Advanced Digital System Design
MTEC-616	Computer Communication & Networks
MTEC-617	Advanced Embedded System Design
MTEC-618	Modeling and Simulation of Communication Systems
MTEC-619	Cloud Computing

COURSE NAME: ADVANCED MATHEMATICS FOR ENGINEERS

COURSE CODE: MTEC-501

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 70-80%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Apply Fourier transforms in the design of analogue filters, modulation, demodulation and frequency domain filtering.
- CO2 Use statistics in the analysis of engine performance data, difference in mean running times, temperatures and also in cusum control charts.
- CO3 Use conformal mapping for solving the electric & magnetic fields in various applications and also, in various coplanar waveguide structures present in silicon substrate.
- CO4 Derive equations of catenary shape, isoperimetric problems and other multivariable functions using calculus of variations.
- CO5 Apply wavelet transform for signal processing and different applications to divide given function into different scale components.
- CO6 Apply concepts of discrete algebra for problem solving.

Syllabus

Unit 1. Fourier Integral and Transform

The Fourier integral, The Fourier transform, Fourier sine and cosine transform, properties of fourier transform, Convolution theorem, Parseval's Identities, application of Fourier transform, The windowed fourier transform, The sharinon sampling theory, low pass and band pass filters.

Unit 2. Conformal Mapping

Conformal mapping and application to boundary value problems, linear Fractional transformation, Schwarz-Christoffel transformation, harmonic functions and Dirichlet's problem, solution of Dirichlet's problem by conformal mapping.

Unit 3. Statistics

Measure of central tendency, measure of variability, skewness, kurtosis, correlation, regression, sampling, level of significance, Chi square distribution, t, F, Z distribution, Theory of estimation, types of hypothesis, hill Climbing

Unit 4. Wavelets

The idea behind the wavelet, the Haar wavelet, a wavelet expansion, multiresolution analysis and Haar wavelets, general construction of wavelets and multi resolution analysis, Shannon wavelets.

Unit 5. Calculus of Variation

Euler's Lagrange's differential equation, The Brachistochrone problem, Hamilton's principle and other applications, isoperimetric problem, Rayleigh-Ritz method, Galerkin's method.

Unit 6. Discrete Algebra

Mathematical logic, Boolean algebra, logic gates, finite state machines, coding theory.

Text Books:

1. I. M. Gelfand and S.V. Fomin, "Calculus of Variation", Prentice Hall.
2. A. Jaffery, "Advance Engineering Mathematics", Elsevier.
3. S. C. Gupta and V. K. Kapoor, "Fundamental of Mathematical Statistics", S. Chand & Sons.
4. Robert X Gao and Ruqiang Yan, "Wavelets", Springer Verlag.

Reference books and other resources:

1. E. Hernandez and Guido L. Weiss, "A First Course on Wavelets", CRC Press.
2. K. H. Rosen, "Discrete Mathematics", MGH Publication.
3. John A. Dossey, "Discrete Mathematics", Addison Wesley Publishing Company.
4. T. Sengadir, "Discrete Mathematics", Pearson Education.
5. G. Shanker Rao, "Discrete Mathematics", New Age International Pvt. Ltd Publishers.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO5
Unit 1	H	-	-	-	-	-
Unit 2	L	H	-	-	-	-
Unit 3	L	-	H	-	-	-
Unit 4	-	-	-	H	-	-
Unit 5	L	-	-	-	H	-
Unit 6	-	-	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ADVANCED COMMUNICATION SYSTEM

COURSE CODE: MTEC-502

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 10%-20 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend various modulation, demodulation and orthogonal techniques of communication system.
- CO2 Analyze errors in system using optimum receivers and detectors.
- CO3 Discuss digital technology, software define radio and cognitive radio.
- CO4 Explain MIMO and channel modeling.

Syllabus

Unit 1. Digital Communication Systems

Introduction to communications systems, digital communication systems, review of digital modulation techniques, BPSK, QPSK, PCM, DPCM, Delta modulation, multicarrier modulation, OFDM working and mathematical representation of OFDM signal, pulse shaping and windowing in OFDM signal and spectral efficiency.

Unit 2. Optimum Receivers

Optimum receivers for signals corrupted by additive White Gaussian noise, correlation demodulator, optimum detector. ML sequence detector, probability of error for binary modulation techniques.

Unit 3. Broadcast Networks

Introduction to broadcast networks, digital audio broadcasting, HD digital technology, direct to home (DTH).

Unit 4. Software Defined Radio

Need for software radio, general structure for transceiver for SDR, third generation SDR system architecture, trends in SDR, cognitive radio, spectrum sensing in cognitive radio.

Unit 5. MIMO Systems

Introduction, space diversity and systems based on space diversity, smart antenna system and MIMO, MIMO based system architecture, multipath and space time processing in MIMO, Antenna considerations for MIMO, channel modelling, measurement and capacity in MIMO, cyclic delay diversity.

Text Books:

1. John G. Proakis, "Digital Communication", Prentice Hall India.

Reference books and other resources:

1. Upena Dalal, “Wireless Communication”, Oxford University Press.
2. Wayne Tomasi, “Advanced Communication Systems”, Pearson Education.
3. Related IEEE/IEE/ Science Direct publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	-
Unit 4	-	-	H	-
Unit 5	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ADVANCED OPTICAL COMMUNICATION SYSTEM

COURSE CODE: MTEC-503

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 20%-30 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain the various signal propagation concepts (including losses, dispersion, scattering, nonlinear effects etc.) related to optical fibers.
- CO2 Explain the basic structure design of different optical amplifier and analyze their characteristics to determine performance.
- CO3 Explain the concepts related to different dispersion management techniques used in optical fiber communication.
- CO4 Define the soliton system and analyze the design of soliton system in different conditions (loss, dispersion, high speed and multichannel).
- CO5 Explain the modulation formats and demodulation schemes used in coherent light wave systems and analyze their performance.
- CO6 Describe basic concepts related to radio over fiber system and analyze its performance in different conditions

Syllabus

Unit 1. Introduction to Optical Fibers

Wave propagation, Dispersion and its limitations, losses and non-linear effects.

Unit 2. Optical Amplifiers

Semiconductor optical amplifier, Raman amplifier, EDFA.

Unit 3. Dispersion Management

Need pre-compensation schemes, best compensation techniques, dispersion compensating fibers, optical filters, fiber Bragg grating

Unit 4. Soliton Systems

Fiber soliton, soliton based communications, loss managed solitons, dispersion-managed solitons, high speed soliton systems, WDM soliton systems.

Unit 5. Coherent Light Wave Systems

Basic concepts, modulation formats, demodulation schemes, bit error rate, sensitivity degradation.

Unit 6. Radio over Fiber

Concept, advantages of RoF in mobile communication networks, macro diversity and micro diversity in RoF, RoF for hyper LAN 2 microcellular communication networks, RoF multiplexing techniques.

Text Books:

1. G. P. Aggarwal, “Fiber-Optic Communication Systems”, John Wiley & Sons.

Reference books and other resources:

1. Djafar K. Mynbaev, “Fiber-Optic Communication Systems”, John Wiley & Sons.
2. Leonid Kazovsky, Sergio Benedetto and Alan Willner, “Optical Fiber Communication Systems”, Artech House.
3. Hamed Al-Raweshidy and Shozo Komaki, “Radio Over Fiber Technologies for Mobile Communication Networks”, Artech House.
4. Related IEEE/IEE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	L	H	-	-	-	-
Unit 3	L	-	H	-	-	-
Unit 4	-	-	-	H	-	-
Unit 5	L	-	-	-	H	-
Unit 6	-	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	-	-	-	-	-	-	-	-	-	-
CO2	M	-	H	-	M	-	-	-	L	-	-
CO3	M	-	H	-	M	-	-	-	L	-	-
CO4	M	-	H	M	M	-	-	-	L	-	-
CO5	M	-	H	-	M	-	-	-	L	-	-
CO6	M	-	H	M	M	-	-	-	L	-	-

COURSE NAME: ADVANCED DIGITAL SIGNAL PROCESSING

COURSE CODE: MTEC-504

Internal Marks: 50

L T P

External Marks: 100

4 - -

Numerical & Design Problems Content: 20%-30%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Design FIR & IIR filters using appropriate method depending upon the given specification.
- CO2 Explain sampling rate conversion methods and design the sampling rate converters.
- CO3 Adaptive filters design using LMS & RLS algorithms.
- CO4 Discuss different methods of spectrum estimation and analysis.
- CO5 Analyze the effects of finite-word length in DSP systems.
- CO6 Explain applications of multi-rate DSP & adaptive filters.

Syllabus

Unit 1. Design of IIR Filters

Introduction to digital filters; Types of digital filters: FIR and IIR filters; Choosing between FIR and IIR filters; Filter design steps; Features of IIR filters; coefficient calculation methods for IIR filters; Pole-zero placement method of coefficient calculation, Impulse invariant method of coefficient calculation, Matched z-transform (MZT) method of coefficient calculation, Bilinear z-transform (BZT) method of coefficient calculation.

Unit 2. Design of FIR Filters

Features of FIR Filters; FIR coefficient calculation methods; Window methods; The Optimal method; Frequency sampling method; Special FIR Filter design topics.

Unit 3. Multirate Digital Signal Processing

Introduction; Concepts of multirate signal processing: Sampling rate reduction: decimation by integer factors, Sampling rate increase: interpolation by integer factors, Sampling rate conversion by non-integer factors, Multistage approach to sampling rate conversion;

Design of practical sampling rate converters; Sample rate conversion using polyphase filter structure; Applications of multirate signal processing.

Unit 4. Adaptive Digital Filters

Concepts of adaptive filtering, Basic Wiener filter theory, Basic LMS adaptive algorithm, Recursive least squares algorithm, Applications of adaptive filters.

Unit 5. Spectrum Estimation and Analysis

Principles of spectrum estimation, Traditional methods: pitfalls, windowing, The periodogram method and periodogram properties, Modified periodogram methods, The Blackman-Turkey method, and The fast correlation method, Comparison of the power spectral density estimation methods, Modern parametric estimation methods.

Unit 6. Analysis of Finite Word-length Effects in Fixed-Point DSP Systems

DSP arithmetic: Fixed-point arithmetic, Floating-point arithmetic, ADC quantization noise and signal quality, Finite word length effects in IIR and FIR digital filters.

Text Books:

1. E. C. Ifeachor and B. W. Jervis, “Digital Signal Processing”, Second Edition, Pearson Education, 2002.
2. J. G. Proakis and D. K. Manolakis, “Digital Signal Processing”, Third Edition, Pearson Education, 2003.

Reference books and other resources:

1. J. G. Proakis, C. M. Rader, F. Ling, C. L. Nikias, M. Moonen, and I. K. Proudler, “Algorithms for Statistical Signal Processing”, Pearson Education, 2002.
2. A. V. Oppenheim and R. W. Schaffer, “Digital Signal Processing”, Prentice Hall, 1975.
3. Monson H. Hayes, “Statistical Digital Signal Processing and Modeling”, Wiley Publications, 1999.
4. Simon Haykin, “Adaptive Filter Theory”, Fourth Edition, Pearson Education, 2008.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	H	-	-	-	-	-
Unit 3	-	H	-	-	-	H
Unit 4	-	-	H	-	-	H
Unit 5	-	-	-	H	-	-
Unit 6	-	-	-	-	H	-

Mapping of CO with PO

[illegible]

COURSE NAME: ENGINEERING DESIGN AND PROJECT MANAGEMENT

COURSE CODE: MTEC-505

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 5%-10 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Develop ability to analyze and solve problems methodically as well as manage individual and team projects with appropriate consideration of engineering and financial aspects.
- CO2 Have an understanding of professional, ethical and social responsibilities as professional Engineer and manager.
- CO3 Develop an ability to communicate effectively through oral and written presentation.
- CO4 Perform effectively in groups and teams as a member / leader.

Syllabus

Unit 1. Introduction to Engineering Design

Definition, Identifying requirements & analyzing needs, Exploring and evaluating concepts, Prototyping and modeling systems, Testing, Deploying and validating a design, Documentation.

Unit 2. Introduction to Project Management

Definition of a project, Why project management, Project life cycle, Organization structures (functional vs. matrix and borrowed resources), Translating needs into requirements, Survey of local & global industrial economic scenario.

Unit 3. Project Selection and Planning

Project selection approaches, Decision methodologies (decision trees, analytical hierarchy process), Project evaluation techniques, Estimation (costs, schedule and requirements), Project financing.

Unit 4. Project Management and Leadership

Special demands on project managers, selecting the project manager and the project team, Project communications, Teams and team development, Characteristics of successful project management.

Unit 5. Project Planning and Estimating

Work breakdown structure, Scheduling techniques (precedence diagrams, PERT/CPM, Gantt and milestone charts), Budgeting techniques (S-curve, earned value) Resource allocation techniques (resource loading and leveling)

Unit 6. Risk and Quality Management

Fundamentals of risk (e.g., what is risk?), Methods for dealing with risk and uncertainty, Historic roots of quality management, Current approaches to quality

Unit 7. Project Execution and Control

Project execution (configuration management), Project control (measuring work performance), Financial control (activity based accounting), Integrated cost and schedule control (Earned value).

Unit 8. Ethical Project Management

Professional ethics & values, Corporate social Responsibility, Dealing within an ethical selection, Group case study & task.

Text Books:

1. K. Nagarajan, "Project Management, New Age International Publishers", New Delhi.

Reference books and other resources:

1. Kathy Schwalbe, "An Introduction to Project Management", Kathy Schwalbe LLC.
2. Paromeshwar P. Iyer, "Engineering Project Management with case studies", Vikas Publishing House Pvt. Limited, New Delhi.
3. B. Blanchard and W. Fabrycky, "Systems Engineering and Analysis", Prentice Hall.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	M	-	-	-
Unit 2	H	-	M	-
Unit 3	H	-	-	-
Unit 4	-	-	-	H
Unit 5	H	-	-	-
Unit 6	M	-	-	-
Unit 7	H	-	-	-
Unit 8	-	H	H	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	H	H	H	H	H	H	-	M	-	-
CO2	-	-	-	-	-	-	-	-	M	H	M
CO3	-	-	-	-	-	-	-	H	M	-	-
CO4	-	-	-	-	-	H	H	M	-	-	L

COURSE NAME: ADVANCED MICROWAVE ENGINEERING

COURSE CODE: MTEC-506

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 5%-10 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Analyze microwave networks using S and mixed mode S parameters.
- CO2 Design microwave filters using various methods.
- CO3 Design advanced microwave amplifiers based on MIC
- CO4 Explain the operation of microstrip antenna, parameters and performance improvement techniques.

Syllabus

Unit 1. Microwave Network Analysis

Concept of differential signal, coupling and crosstalk, Introduction to S parameters, properties of S parameters, Single ended, mixed mode, Single ended to mixed mode conversion.

Unit 2. Design of Microwave filters

Introduction, Microwave filter structures, Planar, Active, Superconductive, SAW and micro-machined filters etc., Pseudo-elliptic Filters, Prototype Synthesis Example, Design of Hilbert Filters, Realizations and Measured Performance.

Unit 3. Advanced Microwave Integrated Circuits

Multi-Standard Multi-Band Reconfigurable LNA, LNA Inventions, Multiband Multi-Standard LNA with CPW Transmission Line Inductor.

Unit 4. Microstrip Antenna

Microstrip Patch antennas, variations of shorted patch antenna, dual frequency shorted patch antennas, low cross polarized antennas, dual arm printed monopole antenna: Coplanar Waveguide Feeding.

Unit 5. Antennas on Impedance Substrates

High Impedance Surface (HIS), surface wave bends, reflection phase, bandwidth, Antennas on HIS, diffraction control, tunable impedance substrate, holographic artificial impedance substrate.

Text Books:

1. Allan Huynh, Magnus Karlsson and Shaofang Gong, “Advanced Microwave Circuits and Systems”, In Tech.
2. Pierre Jarry and Jacques Beneat, “Design and Realizations of Miniaturized Fractal Microwave and RF Filters”, Wiley-Blackwell.
3. Arjuna Marzuki, Ahmad Ismat Abdul Rahim and Mourad Loulou, “Advances in Monolithic Microwave Integrated Circuits for Wireless Systems: Modeling and Design Technologies”, Information Science Reference.
4. Rod Waterhouse, “Printed Antennas for Wireless Communications”, John Wiley & Sons.

Reference books and other resources:

1. Related IEEE publications

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	
Unit 4	-	-	-	H
Unit 5	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	M	M	-	-	-	-	-	H	-	-
CO2	M	-	H	-	H	-	-	-	H	-	-
CO3	M	-	H	-	H	-	-	-	H	-	-
CO4	M	-	H	-	H	-	-	-	H	-	-

COURSE NAME: SEMICONDUCTOR DEVICES THEORY & MODELING

COURSE CODE: MTEC 601

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 20%-30 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Apply basic equations like Poisson's equations, continuity equation etc. for the operation of semiconductor devices.
- CO2 Explain the current-voltage characteristics and switching characteristics of p-n junctions with the use of mathematical equations.
- CO3 Model low frequency and high frequency capacitance-voltage characteristics and other depletion effects on device performance.
- CO4 Derive bipolar device models for circuit and time-dependent analysis.
- CO5 Differentiate between long-channel and short-channel MOSFETs on the basis of characteristics and non-linear parameters.

Syllabus

Unit 1. Physics of Semiconductors

Energy bands in solids- carrier concentration in intrinsic and extrinsic semiconductors, Carrier transport in silicon-drift and diffusion current, velocity saturation, Basic equations for device operation-Poisson's equation, current-density equations, continuity equation.

Unit 2. P-N Junctions

Built-in potential, Diode equation, current-voltage characteristics-temperature dependence and diode leakage currents, Time-dependent and switching characteristics- excess charge carriers, Diffusion Capacitance.

Unit 3. MOS capacitors

Surface Potential, electrostatic Potential and charge distribution in Silicon, Capacitances in MOS structure-low frequency and high frequency C-V characteristics, polysilicon work

function and depletion effects, charge in Si-SiO₂ interface, effects of interface traps on device characteristics-surface generation and recombination.

Unit 4. Bipolar Transistors

NPN & PNP Transistors, Ideal Current-Voltage Characteristics, Bipolar Device Models for Circuit and Time-Dependent Analysis.

Unit 5. MOSFET Devices

Long-channel MOSFETs: drain current model, I-V characteristics, subthreshold characteristics, Temperature dependence of Threshold voltage, channel mobility. Short-Channel MOSFETs: short channel effects, velocity saturation, channel length modulation, source-drain series resistance.

Text Books:

1. Y. Taur and T. H. Ning, “Fundamentals of Modern VLSI Devices”, Second Edition, Cambridge University Press, 2013.
2. N. Arora, “MOSFET Modeling for VLSI simulation: Theory and Practice”, World Scientific, 2007.

Reference books and other resources:

1. S. M. Sze, “Physics of Semiconductor Devices”, John Wiley & Sons, 3rd Edition, 2007.
2. B. G. Streetman and S. Banerjee, “Solid State Electronic Devices”, Pearson Prentice Hall, 2006.
3. T. A. Fjeldly, T. Ytterdal and M. S. Shur, “Introduction to Device Modeling and Circuit Simulation”, Wiley.
4. Y. Tsividis, “Operation and Modeling of the MOS Transistor”, Second Edition, Oxford.
5. R. F. Pierret, “Semiconductor Device Fundamentals”, Addison Wesley Publishers, 1996.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	H	L	-	-	-	-	-	-	-	-
CO3	H	H	L	-	H	-	-	-	-	-	-
CO4	H	H	L	-	H	-	-	-	-	-	-
CO5	H	H	L	-	H	-	-	-	H	-	-

COURSE NAME: MULTIMEDIA COMMUNICATION

COURSE CODE: MTEC-602

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Comprehend the concepts of multimedia representation

CO2 Explain various audio, video, text and image file standards.

CO3 Apply various audio, video, text and image compression techniques

CO4 Study and analyze various security issues related to multimedia.

Syllabus

Unit 1. Multimedia Information Representation

Different types of multimedia information, Information representation: Text, Image, Audio, Video.

Unit 2. Multimedia systems and file formats/standards

Distributed MM Systems, Multimedia processors, Multimedia OS, Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/Video Standards, MPEG-1, MPEG-2, MPEG-4, MPEG-7.

Unit 3. Text and Image Compression

Introduction, compression principles, Text compression techniques: GIF, TIFF, JPEG, PNG, Image compression techniques: static Huffman coding, dynamic Huffman coding, arithmetic coding, Lempel-Ziv coding.

Unit 4. Audio and Video Compression

Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression techniques, Huffman, Run length, Variable length, Lossy /lossless compression.

Unit 5. Security Issues

Transform audio coders, Image coding, video coding, Water marking techniques, Steganography techniques, Organization, Storage and retrieval, ANNs for MMSP.

Text Books:

1. Fred Halsall, "Multimedia communications", Prentice Hall.
2. Proakis, "Digital communications", Prentice Hall.

Reference books and other resources:

1. P. K. Andleigh and K. Thakkar, "Multimedia Systems Design", PHI, 2002.
2. Tay Vaughan, "Multimedia", 5/e, TMH, 2001.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	-
Unit 4	-	-	H	-
Unit 5	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ADVANCED WIRELESS NETWORKS

COURSE CODE: MTEC-603

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the basics of wireless area networks.
- CO2 Describe and analyse the advancements in wireless internet.
- CO3 Identify and resolve issues in AD-hoc networks.
- CO4 Analyze various design challenges in wireless sensor networks.
- CO5 Contrast and analyze emerging ultra wideband technologies

Syllabus

Unit 1. Wireless Area Networks

WiMAX: Network architecture , protocol stack of IEEE 802.16 , physical layer, MAC layer schemes ,differences between IEEE 802.11 and IEEE 802.16; WLAN: Fundamentals, network architecture, protocol stack of IEEE 802.11 , physical layer, MAC layer mechanism; WPAN: System model, protocol stack of IEEE802.15; Bluetooth: Network architecture, operation, protocol stack, physical and MAC layer ; Radio Frequency Identification (RFID): Types and specifications.

Unit 2. Wireless Internet

Mobile IP - IPv6 advancements ,mobility management ,functions ,location management, registration and handoffs ,wireless security and standards; TCP in Wireless Domain: TCP over wireless , types , traditional , snoop , indirect , mobile , transaction oriented , impact of mobility.

Unit 3. AD-hoc Network

Ad-hoc Network: Introduction - characteristics , medium access scheme , routing schemes, multicasting , transport layer protocol , pricing scheme , QoS provisioning , self organization, security , energy management and deployment consideration.

Unit 4. Wireless Sensor Network

Wireless Sensor Network: Characteristics and architecture of wireless sensor network, layered and clustered , data dissemination , data gathering , MAC protocols , routing schemes, security , enabling technologies for sensor network and applications ,comparison with MANET - ZIGBEE standard and architecture ,WBAN standard and architecture.

Unit 5. Emerging Technologies

UWB Radio Communication: Fundamentals of UWB , operation of UWB systems, comparison with other technologies, advantages and disadvantages; Multimode 802.11 - IEEE 802.11a/b/g - software radio based multimode system, meghadoot architecture - 802.11VoIP phone - IEEE 802.11n.

Text Books:

1. William Stallings, “Wireless Communication and Networks”, Second Edition, Prentice Hall, 2005.
2. K. Pahlavan and P. Krishnamurthy, “Principle of Wireless Networks - A Unified Approach”, Prentice Hall of India, 2006.

Reference books and other resources:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad-hoc Wireless Networks-Architecture and Protocols”, 2nd Edition, Pearson education, 2007.
2. Vijay K. Garg, “Wireless Communications and Networks”, Second Edition, Morgan Kaufmann Publishers (Elsevier), 2007.
3. C. K. Toh, “Ad Hoc Mobile Wireless networks”, First Edition, Pearson education, 2002.
4. Upena Dalal , “Wireless Communication”, Oxford University Press, 2009.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	
Unit 2	-	H	-	-	
Unit 3	-	-	H	-	
Unit 4	-	-	-	H	
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	L	L	-	-	-	-	-	-	-	-	-
CO3	L	L	H	-	-	-	-	-	-	-	-
CO4	L	L	-	-	-	-	-	-	-	-	-
CO5	H	L	H	H	-	-	-	-	H	-	H

COURSE NAME: ADVANCED WIRELESS & MOBILE COMMUNICATION

COURSE CODE: MTEC-604

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the basic terminology and various generations of wireless communication systems.
- CO2 Explain various types of fading techniques and associated parameters.
- CO3 Explain various techniques to combat fading.
- CO4 Describe multiple accesses using CDMA.
- CO5 Explain latest wireless communication standards.

Syllabus

Unit 1. Review of Wireless Communication Systems

The cellular concept, handoff and system capacity, trunking and grade of service, capacity improvement techniques, Evolution and enabling technologies of cellular networks: 2G, 2.5 G, 3G-WCDMA, 3G CDMA 2000, 3G TD-SCDMA, 4G, and 5G cellular networks.

Unit 2. Small Scale Fading and Multipath

Wireless channel and fading, types of fading, Parameters of mobile multipath channels, ISI and its reduction using Pulse shaping techniques, Rayleigh fading, Rician fading and Nakagami fading distributions.

Unit 3. Diversity and Channel equalization

Introduction to diversity, types of diversity, multi antenna maximal ratio combiner, BER with diversity, fundamentals of equalization, algorithms for adaptive equalization.

Unit 4. Multiple Access

Introduction to CDMA, spread spectrum and linear feedback shift register, generation and properties of PN sequences, correlation of PN sequences and jammer margin, CDMA advantage and RAKE Receiver, Multi user CDMA.

Unit 5. Latest Wireless Standards

IEEE 802.15.6 Body area network, IEEE 802.20 Mobile Broadband Wireless Access, IEEE 802.22 Wireless Regional Area Networks, evolving IEEE 802.25 Omni-Range Area Network.

Text Books:

1. T. S. Rappaport, “Wireless Communications”, Pearson Education.
2. William Stallings, “Wireless Communication and Networks”, Pearson Prentice Hall.

Reference books and other resources:

1. NPTEL, “Advanced 3G and 4G Wireless Mobile Communications”, <http://nptel.ac.in/courses/117104099/>.
2. Jochen Schiller, “Mobile Communications (2nd Edition)”, Addison-Wesley.
3. Research Papers from IEEE Journals.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	-	-	-	-	-	-	-	-	-	-
CO3	M	-	H	-	H	-	-	-	-	-	-
CO4	M	-	H	-	M	-	-	-	-	-	-
CO5	M	-	-	-	-	-	-	-	H	-	-

COURSE NAME: SOFT COMPUTING

COURSE CODE: MTEC-605

Internal Marks: 50

L T P

External Marks: 100

3 - -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain the concepts of soft computing, artificial intelligence and optimization problems.
- CO2 Explain the principles of Artificial Neural Networks and design Artificial Neural Networks models for given problems.
- CO3 Apply the fuzzy techniques for the analysis and design of specified systems.
- CO4 Utilize the Genetic Algorithms and PSO Algorithm for the optimization of given problems.
- CO5 Design hybrid soft computing algorithms for solving the different problems.

Syllabus

Unit 1. Soft Computing and Artificial Intelligence

Hard vs. Soft computing, constituents of soft computing, scope of soft computing, meaning of optimization, local optima, global optima, heuristic methods, stochastic methods, constrained optimization, design variables, objective function, and variable bounds. Artificial intelligence: definitions, programming models and techniques, fundamental issues, progress of artificial intelligence.

Unit 2. Artificial Neural Networks

Biological neural networks, history of development in neural networks principles, artificial neural net terminology, models of neuron, activation functions, topology, learning, types of learning: supervised, unsupervised, Reinforcement learning, learning Rules/Methods. Back-propagation learning algorithm, architecture of back propagation networks, selection of various parameters in back propagation networks, multilayer perceptron networks, radial basis function network, Kohonen's self-organizing networks, Hopfield network, applications/case-studies.

Unit 3. Fuzzy Logic Systems

Crisp & fuzzy sets; properties, operations, and relations, membership functions, fuzzification, fuzzy rule based systems, fuzzy-inference systems, defuzzification techniques, applications/ case-studies.

Unit 4. Genetic Algorithm (GA)

GA history, biological background of GA, working principle, basic terminologies, operators: encoding, selection, cross over, mutation, stopping criteria, problem solving using GA.

Unit 5. PSO Algorithm

Biological background of PSO, working principle, basic terminologies, operators, PSO equations, problem solving using PSO.

Unit 6. Hybrid Soft Computing Techniques

Neuro-fuzzy hybrid algorithm, genetic neuro-hybrid algorithm, fuzzy genetic-hybrid algorithm, genetic fuzzy hybrid algorithm, GA-PSO hybrid algorithm.

Text Books:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", PHI, 2010.
2. F. O. Karray and C. D. Silva, "Soft Computing and Intelligent Systems Design", Pearson Education, 2009.

Reference books and other resources:

1. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing", Second Edition, Wiley Publications, 2007.
2. J.-S R. Jang, C.-T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", Prentice Hall India, 2010.
3. S. K. Valluru and T. N. Rao, "Introduction to Neural Networks, Fuzzy Logic & Genetic Algorithms", First Edition, Jaico, 2010.
4. N. P. Padhy, "Artificial Intelligence and Intelligent Systems", Second Edition, Oxford University Press, 2005.
5. Related IEEE/IEE/ Science Direct publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	H	-
Unit 6	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	-	M	-	M	-	-	-	-	-	-
CO3	H	-	M	-	M	-	-	-	-	-	-
CO4	H	-	M	-	M	-	-	-	-	-	-
CO5	H	M	M	M	M	-	-	-	-	-	-

COURSE NAME: ERROR CONTROL CODING TECHNIQUES

COURSE CODE: MTEC 606

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 20%-30 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain basic parameters and terminology related to coding theory.
- CO2 Coding and decoding of data using Linear Codes.
- CO3 Coding and decoding of data using Convolutional Codes.
- CO4 Coding and decoding of data using Viterbi Codes.
- CO5 Coding and decoding of data using LDPC Codes.
- CO6 Coding and decoding of data using Turbo Codes.

Syllabus

Unit 1. Mathematical Preliminaries and Introduction

Groups, subgroups and equivalence relations, cosets, rings and fields, vector spaces, linear independence and basis, linear codes and independence, spanning, Basics of binary block codes for the binary symmetric channel.

Unit 2. Linear Block Codes

Linear block codes; The dual code, Systematic generation matrix, minimum distance of a linear code, Hamming distance, Bounds on the size of a block code; Bounded and maximum-likelihood decoding of binary block codes.

Unit 3. Convolutional and Viterbi Codes

Basics of convolutional codes; states and trellis, the Viterbi decoding algorithm. Catastrophic error propagation, path enumeration, viterbi decoder over AWGN channel.

Unit 4. Low Density Parity Check (LDPC) Codes

LDPC Codes terminology, Gallager decoding algorithm, BP decoding of LDPC codes, density evolution under BP decoding, convergence and concatenation theorem, turbo codes.

Unit 5. Turbo Codes

Turbo Codes, Implementation of Turbo Decoder, From Turbo Code to Advanced Iterative Receivers, Turbo-Based Interleaving Techniques, Turbo-MIMO Techniques.

Text Books:

1. R. Bose, "Information Theory, Coding and Cryptography", Tata McGraw-Hill Education, 2008.
2. Thierry Lestable (Editor) and Moshe Ran (Editor), "Error Control Coding for B3G/4G Wireless Systems: Paving the Way to IMT-Advanced Standards", John Wiley, April 2011.

Reference books and other resources:

1. P. V. Kumar, M. Win, H-F. Lu and C. Georgiades, "Error-Control Coding Techniques and Applications", Chapter 17 in Optical Fiber Telecommunications IV-B: Systems and Impairments, Editors: Ivan P. Kaminow and Tingye Li, Elsevier Science Press, 2002.
2. F. J. MacWilliams and N. J. A. Sloane, "The Theory of Error-Correcting Codes", North-Holland, 1977.
3. NPTEL website: Error Control Code : <http://nptel.ac.in/syllabus/117108044/>.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	L	H	-	-	-	-
Unit 3	L	-	H	H	-	-
Unit 4	L	-	-	-	H	-
Unit 5	L	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	M	-	H	-	M	-	-	-	L	-	-
CO3	M	-	H	-	M	-	-	-	L	-	-
CO4	M	-	H	-	M	-	-	-	L	-	-
CO5	M	-	H	-	M	-	-	-	L	-	-
CO6	M	-	H	H	M	-	-	-	H	-	-

COURSE NAME: DATABASES AND DATA MINING

COURSE CODE: MTEC-607

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe the concepts of database systems.
- CO2 Analyze different types and characteristics involved in distributed systems.
- CO3 Explain architecture and tools of data warehousing and Online Analytical Processing (OLAP).
- CO4 Apply tasks and techniques of data mining.
- CO5 Explain different clustering and classification techniques.

Syllabus

Unit 1. Basics of Database System

Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Decision Support Systems, Components of a Database management, Distributed Processing and Client Basic Concepts, Keys, Design Issues, ER Diagrams, Types of databases.

Unit 2. Distributed Database Management System (DDBMS)

Introduction to distributed database, Advantages and disadvantages of distributed database, Homogenous and Heterogeneous distributed databases, Functions and architecture of DDBMS, Data fragmentation, Data allocation, Distributed transactions, Distributed concurrency control, Distributed deadlock management and Distributed database recovery.

Unit 3. Data Warehousing and Online Analytical Processing (OLAP)

Introduction to data warehousing, Data ware architecture, Data flows, warehousing tools, Data marts, Data warehouse design, Online Analytical Processing (OLAP benchmarks,

benefits, representation of multi-dimensional data applications of OLAP, OLAP tools, categories of OLAP tools).

Unit 4. Data Mining

Introduction, Process of data mining, Data mining goals, Tasks and techniques (Prediction modeling, Database segmentation, Link analysis, Deviation detection), Applications of data mining.

Unit 5. Clustering and Classification

Introduction, Issues in clustering, Types of clustering: Hierarchical and partitioning clustering, K-means clustering, Applications of clustering, Applications of classification, Classification techniques: Decision trees, Nearest neighbour.

Textbooks:

1. B. Connolly, "Database Systems: A Practical Approach to Design, Implementation and Management." Pearson Education, 2007.
2. A. K. Pujari, "Data Mining Techniques", Universities Press, 2013.

Reference books and other resources:

1. V. Pudi and P. R. Krishna "Data Mining", Oxford University Press India, 2009.
2. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Pearson Education, 2007.
3. H. F. Korth and A. Silberchatz, "Database Concepts", Tata McGraw Hill, 2010.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	L	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	L	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: BIOMEDICAL ELECTRONICS

COURSE CODE: MTEC-608

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Describe the methods of recording and measuring various bio potentials.

CO2 Analyze medical imaging systems.

CO3 Classify and describe therapeutic equipments.

Syllabus

Unit 1. Measuring, Recording and Monitoring Instruments

Biomedical signals and electrodes, Biomedical recorders, Oximeters, Biomedical telemetry, Telemedicine technology, Blood cell counters.

Unit 2. Modern Imaging Systems

X-ray machine, Visualization of X-rays, Physical parameters for X-ray Detectors, Principle of NMR Imaging system, Image reconstruction techniques, Basic NMR components, Biological effect of NMR imaging, Advantages of NMR imaging system.

Unit 3. Ultrasonic Systems

Basics of diagnostic radiology, Diagnostic Ultrasound, Physics of Ultrasonic waves, Medical ultrasound, Three-dimensional ultrasound imaging systems, Portable ultrasound systems.

Unit 4. Therapeutic Equipment

Cardiac pacemakers, Cardiac defibrillators, Electrotherapy equipment, Capnography, Radiotherapy equipment, Laser applications in Biomedical field.

Text Book:

1. R. S. Khandpur, "Magnetic Resonance Imaging System", in Handbook of Biomedical Instrumentation, Third Edition, New Delhi, India: McGraw Hill Education, 2014.

Reference books and other resources:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.
2. Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.

Mapping of course contents with CO

Contents	CO1	CO2	CO3
Unit 1	H	-	-
Unit 2	-	H	-
Unit 3	-	H	-
Unit 4	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	M	-	-
CO2	H	-	-	-	-	-	-	-	M	-	-
CO3	H	-	-	-	-	-	-	-	M	-	-

COURSE NAME: ORGANIC ELECTRONICS

COURSE CODE: MTEC-609

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe the architecture, fabrication and properties of organic electronic transistor.
- CO2 Summarize advanced materials for organic electronics.
- CO3 Comprehend different manufacturing methods in organic electronics.
- CO4 Describe the fabrication and characterization of Integrated Circuits.

Syllabus

Unit 1. Introduction to Organic Electronic Materials

Organic Electronic Materials – Classification, Organic Thin-Film Transistor – Architecture, Operating Mode, Fabrication Techniques, Structure - Property Relationships, Methods of Improving Performance – Structural Perfection, Device Architecture, Electrical and Environmental Stability – Chemical Effects on Stability, Gate Dielectrics on Electrical Functionality.

Unit 2. Advanced Materials for Organic Electronics

Pentacene Transistors– Performance, Engineered Pentacenes – Reversible Functionalization–End-Substituted Derivatives, Peri-functionalized Pentacenes, Heteropentacenes, Semiconductors Based on Polythiophene and Indolo [3,2-*B*] Carbazole– Polydialkylterthiophenes, Polydialkylquaterthiophenes, Polythiophene Nanoparticles, Indocarbazole Designs.

Unit 3. Manufacturing Methods

Production of Substrates for Organic Electronics- Reel-to-Reel Vacuum Metallization, Organic Vapor Phase Deposition – Production of TFTs, OLED, Organic Photovoltaics,

Micro- and Nanofabrication Techniques – Thermal Imaging, Printing, Digital Lithography for TFT Fabrication, Solution Based Printing.

Unit 4. Devices, Applications and Products

Transistors to Integrated Circuits – Fabrication and Characterization of ICs, Non-Rigid Display – Roll-Up Active-Matrix Displays Design, Active–Matrix Light-Emitting Displays – Advantages Over LCDs, Fabrication Process, Large-Area Detectors and Sensors – Future Prospects, Organic Semiconductor-Based Chemical Sensors.

Text Book:

1. H. Klauk, “Organic Electronics: Materials, Manufacturing, and Applications” Wiley-VCH Verlag GmbH & Co. KGaA, 2006.

Reference Books and Other Resources:

1. M. Pope and C. E. Swenberg, "Electronics Processes in Organic Crystals and Polymers", Second Edition, Oxford Science Publications, 1999.
2. W. Brutling, "Physics of Organic Semiconductors", Wiley- YCH, 2005.
3. Z. H. Kafafi, "Organic Electroluminescence", CRC Press, 2005.
4. S. Sun and N. S. Sarciftci, "Organic Photovoltaics -Mechanisms, Materials and Devices", CRC Press, 2005.
5. Related IEEE/IE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	-
Unit 4	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	L	-	-	-	-	L	-	-
CO2	M	-	-	M	-	-	-	-	L	-	-
CO3	M	-	-	M	-	-	-	-	L	-	-
CO4	M	-	-	H	-	-	-	-	L	-	-

COURSE NAME: VLSI DESIGN, VERIFICATION & TESTING

COURSE CODE: MTEC-610

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe digital VLSI design flow and high level design representations.
- CO2 Explain high level synthesis algorithms like scheduling, allocation and binding along with the logic optimization.
- CO3 Implement Binary Decision Diagram for verification of circuits.
- CO4 Apply temporal logic for verification and use model checking algorithms.
- CO5 Apprehend testing of combinational and sequential circuits, fault simulations and BIST mechanism.

Syllabus

PART-A (Design)

Unit 1. Introduction

Introduction to Digital VLSI Design Flow, High Level Design Representation, Transformations for High Level Synthesis.

Unit 2. Scheduling, Allocation and Binding

Introduction to HLS: Scheduling, Allocation and Binding Problem, Scheduling Algorithms, Binding and Allocation Algorithms.

Unit 3. Logic Optimization and Synthesis

Two level Boolean Logic Synthesis, Heuristic Minimization of Two-Level Circuits, Finite State Machine Synthesis, Multilevel Implementation.

PART-B (Verification)

Unit 4. Binary Decision Diagram

Binary Decision Diagram: Introduction and construction, Ordered Binary Decision Diagram, Operations on Ordered Binary Decision Diagram, Ordered Binary Decision Diagram for Sequential Circuits.

Unit 5. Temporal Logic

Introduction and Basic Operations on Temporal Logic, Syntax and Semantics of Computational Tree Logic (CTL), Equivalence between CTL Formulas.

Unit 6. Model Checking

Verification Techniques, Model Checking Algorithm, Symbolic Model Checking.

PART-C (Testing)

Unit 7. Introduction to Digital Testing and Fault Simulation

Introduction to Digital VLSI Testing, Functional and Structural Testing, Fault Equivalence, Fault Simulation, Testability Measures (SCOAP).

Unit 8. Combinational Circuit and Sequential Circuit Testing

Introduction to Automatic Test Pattern Generation (ATPG) and ATPG Algorithms, D-Algorithm, ATPG for Synchronous Sequential Circuits, Scan Chain based Sequential Circuit Testing.

Unit 9. Built in Self test (BIST)

Components of BIST, Memory Testing.

Text Books:

1. L. T. Wang, Y. W. Chang and K. T. Cheng, "Electronic Design Automation: Synthesis, Verification and Test", Elsevier, 2009.
2. M. L. Bushnell and V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory & Mixed-Signal Circuits", Kluwer Academic Publishers, 2002.

Reference Books and Other Resources:

1. L.T. Wang, C. W. Wu and X. Wen, "VLSI Test Principles and Architectures: Design for Testability", Elsevier, 2006.
2. L. Scheffer, L. Lavagno and G. Martin, "EDA for IC System Design, Verification, and Testing", Taylor & Francis Group, 2006.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	H	-	-	-
Unit 4	-	-	H	-	-
Unit 5	-	-	-	H	-
Unit 6	-	-	-	H	-
Unit 7	-	-	-	-	H
Unit 8	-	-	-	-	H
Unit 9	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	L	-	-	-	-	-	-	-
CO2	H	H	-	H	L	M	-	-	H	-	-
CO3	H	H	-	H	L	M	-	-	H	-	-
CO4	H	H	-	H	L	M	-	-	H	-	-
CO5	H	H	-	H	L	M	-	-	H	-	-

COURSE NAME: VLSI DESIGN AUTOMATION

COURSE CODE: MTEC-611

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe the various steps involved in VLSI Design Cycle and discuss the basic algorithms of data structures.
- CO2 Design the VLSI devices and explain their Fabrication process.
- CO3 Understand the issues related to fabrication process, cost and power dissipation.
- CO4 Analyze and Apply different algorithms for Partitioning, Floorplanning and Placement.
- CO5 Classify the various Routing Algorithms and explain the Clock and power routing in Physical Design.

Syllabus

Unit 1. Introduction

VLSI Design Cycle, Physical Design Cycle, New Trends in Physical Design Cycle, Design Styles and System Packaging Styles, Basic Data Structure and basic algorithm techniques.

Unit 2. Design and Fabrication of VLSI Devices

Fabrication of VLSI Circuits: NMOS Fabrication Process, CMOS Fabrication Process, Details of Fabrication Process, Design Rules and Layout of basic devices.

Unit 3. Fabrication Process and its impact on Physical Design

Scaling Methods, Comparison of fabrication process, Issues related to Fabrication Process and other issues in interconnect power dissipation, yield and fabrication costs.

Unit 4. Partitioning, Floorplanning, Placement and Pin Assignment

NP-hard problems, design style specific partitioning problems, Partitioning algorithms:

Group migration algorithms, Floorplanning, floorplanning algorithms , floorplanning algorithms for mixed block and cell designs, Placement, Placement algorithms, Partitioning based Placement algorithms, Pin assignment, advanced heuristic soft computing techniques for Partitioning, Floorplanning and Placement.

Unit 5. Various Routing Techniques

Global Routing, Global Routing Algorithms, Detailed Routing, routing considerations, routing models, channel routing problems, switchbox routing problems, Detailed Routing Algorithms, Over –the- cell routing: cell models, Overview of Two, Three and multilayer layer over –the- cell routers and performance driven OTC routing, Clock and power routing: clocking schemes, design considerations for the clocking system, power and ground routing.

Text Books:

1. N. A., “Algorithms for VLSI Physical Design Automation”, Third Edition, Springer, 2013.
2. M. Sarrafzadeh and C. K. Wong, “Introduction to VLSI Physical Design”, Fourth Edition, McGraw-Hill., 1996

Reference Books and Other Resources:

1. Charles J. Alpert, Dinesh P. Mehta and Sachin S. Sapatnekar, “Handbook of Algorithms for Physical Design Automation”, Auerbach Publications (CRC Press), 2008.
2. R. Dreschler, “Evolutionary Algorithms for VLSI CAD”, Third Edition, Springer, 2002.
3. S. K. Lim, “Practical Problems in VLSI Physical Design Automation”, Springer, 2008.
4. S. M. Sait and H. Youssef, “VLSI Physical Design Automation: Theory and Practice”, World Scientific, 1999.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	L	H	-	-	-
Unit 3	L	H	H	-	-
Unit 4	L	-	-	H	-
Unit 5	L	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	M	-	-	-	-	-	-	H	-	-
CO2	H	H	-	H	M	-	-	-	H	-	-
CO3	H	M	-	H	-	-	-	-	H	-	-
CO4	H	H	-	H	H	-	-	-	H	-	-
CO5	H	M	-	H	M	-	-	-	H	-	-

COURSE NAME: LOW POWER VLSI DESIGN

COURSE CODE: MTEC-612

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the sources of power dissipation and important parameters and apply design approaches for low power VLSI.
- CO2 Analyze the impact of device parameters and technology on performance of low power electronics.
- CO3 Optimize dynamic power and static power at circuit level during standby and runtime using various techniques.
- CO4 Estimate and solve power related issues during clock distribution.
- CO5 Apply power analysis methodology and power estimation and power minimization techniques for the design of memory and arithmetic circuits.

Syllabus

Unit 1. Introduction

Power and Energy basics, Sources of power dissipation in Digital Integrated circuits, important parameters for low power design, Low power design approaches.

Unit 2. Device and Technology Impact on Low Power Electronics

Dynamic dissipation in CMOS, transistor Sizing & gate oxide thickness, impact of technology Scaling, Technology & Device innovation.

Unit 3. Circuit Level Power Optimization Techniques

Dynamic Power Optimization: multiple supply voltages, transistor sizing, technology mapping. Static power Optimization: Multiple thresholds, transistor stacking, Introduction to energy recovery CMOS.

Unit 4. Power Optimization at Standby and Runtime

Clock gating, power gating, body biasing, supply voltage ramping, Power reduction of memory in standby mode using voltage scaling and body biasing. Dynamic voltage and frequency scaling, adaptive body biasing, Power domains and power management.

Unit 5. Low Power Clock Distribution

Power Dissipation in Clock Distribution, Single driver vs. Distributed buffers, Buffer and device sizing, Zero skew vs. tolerant skew, chip and package co-design of clock network.

Unit 6. Logic Synthesis for Low Power

Low power design flow, power analysis methodology, Power estimation Techniques, Power Minimization Techniques.

Unit 7. Design of Low Power Memory and Arithmetic Elements

Memory architecture, SRAM cell metrics, power in cell array, power for read and write access. Design of circuits for addition, Multiplication and Division.

Text Books:

1. J. M. Rabaey and M. Pedram, “Low Power Design Methodologies”, Kluwer-Academic Publishers.
2. A. Pal, “Low Power VLSI Circuits and Systems”, Springer.

Reference Books and Other Resources:

1. N. H. Weste and D. M. Harris, “CMOS VLSI Design: A Circuits and System Perspective”, Fourth Edition, Pearson.
2. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, “Digital Integrated Circuits: A Design Perspective”, Second Edition, PH/Pearson.
3. K. Roy and S. C. Prasad, “Low-Power CMOS VLSI Circuit Design”, Wiley.
4. P. Chandrakasan and R. W. Broderson, “Low-Power CMOS Design”, IEEE Press.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	H	-	-
Unit 5	-	-	-	H	-
Unit 6	-	-	-	-	H
Unit 7	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	M	-	H	L	-	-	-	M	-	-
CO2	H	H	-	H	-	-	-	-	M	-	-
CO3	H	H	-	H	L	-	-	-	H	-	-
CO4	H	H	-	H	-	-	-	-	H	-	-
CO5	H	H	-	H	L	-	-	-	H	-	-

COURSE NAME: NANO ELECTRONICS

COURSE CODE: MTEC-613

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Express the fundamentals of nanoelectronics.
- CO2 Illustrate Silicon MOSFETs and Quantum Transport Devices in nanoelectronics.
- CO3 Identify the structure and applications of Carbon nanotubes.
- CO4 Discuss molecular electronics and mass storage devices

Syllabus

Unit 1. Fundamentals of Nanoelectronics

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation: power dissipation limit – dissipation in reversible computation – the ultimate computer.

Unit 2. Silicon Mosfets & Quantum Transport Devices

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

Unit 3. Carbon Nanotubes

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of all carbon nanotube nanoelectronics.

Unit 4. Molecular Electronics

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

Text Books:

1. K. Gosser, JanDienststuhl and others, “Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices”, Springer, 2004.
2. R. Waser(Ed.), “Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices” Wiley-VCH , 3rd edition.

Reference Books and other resources:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons and B. Raguse, “Nanotechnology: Basic Science and Emerging Technologies”, Chapman & Hall/CRC, 2002.
2. T. Pradeep, “NANO: The essentials – Understanding Nanoscience and Nanotechnology”, Mc-Graw Hill Education.
3. Related IEEE/IE Publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	L	H	-	-
Unit 3	-	-	H	-
Unit 4	M	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	-	-	-	-	-	-	-	L	-	-
CO2	M	-	-	M	-	-	-	-	L	-	-
CO3	M	-	-	M	-	-	-	-	L	-	-
CO4	M	-	-	H	-	-	-	-	L	-	-

COURSE NAME: SPEECH AND IMAGE PROCESSING

COURSE CODE: MTEC 614

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain basic parameters and quality metrics in speech and image processing.
- CO2 Analyze speech signals using LPC.
- CO3 Discuss digital coding of speech and speech synthesis.
- CO4 Discuss various image enhancement and restoration techniques.
- CO5 Discuss image segmentation and image compression techniques.
- CO6 Describe speech and image processing using wavelets and curvelets.

Syllabus

Unit 1. Introduction to Digital Speech Processing

The process of speech production, acoustic phonetics, auditory models, the acoustic theory of speech production, digital models for sampled speech signals.

Unit 2. Speech Coding

linear predictive analysis of speech signals, computation of gain of model, frequency domain representation, solution of LPC equations, properties of LPC polynomial, alternative representations of LP, digital coding of speech signals, sampling speech signal, statistical model, quantization, differential quantization, delta modulation, DPCM, applications of speech coders.

Unit 3. Speech Synthesis

Sound Capturing, phonemes, Prosody, Speech Synthesis with Phonemes, Text Processing for Speech Synthesis, Letter-to-Phoneme Rules, Text-to-Phoneme Transcription, Generating Prosody, text to speech synthesis.

Unit 4. Introduction to Digital Image Processing

Image as a 2D signal, Fundamental steps in digital image processing, applications of digital image processing, quality metrics for image processing.

Unit 5. Image enhancement and restoration

Image enhancement in spatial and frequency domains, gray scale modifications, histogram equalization, image restoration, types of noises corrupting the images, denoising methods, median filtering, wiener filtering.

Unit 6. Image Compression and Image Segmentation

Image compression in spatial and transform domains, image segmentation, segmentation algorithms, edge and boundary detection, pattern recognition.

Unit 7. Advanced topics

Wavelets and curvelets in speech and image processing.

Text Books:

1. L. Rabiner and R. Schafer, “Digital speech processing”, Pearson, 2011.
2. T. F. Quatieri, “Discrete time speech signal processing”, Pearson education, 2004

Reference books and other resources:

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”, Pearson Education.
2. Related IEEE/IEE/Sciadirect publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	-	H	H	-	-	-
Unit 3	-	-	H	-	-	-
Unit 4	H	-	-	-	-	-
Unit 5	-	-	-	H	-	-
Unit 6	-	-	-	-	H	-
Unit 7	-	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	-	H	-	M	-	-	-	L	-	-
CO3	H	-	H	-	M	-	-	-	L	-	-
CO4	H	-	H	-	M	-	-	-	L	-	-
CO5	H	-	H	-	M	-	-	-	L	-	-
CO6	M	-	M	H	M	-	-	-	H	-	-

COURSE NAME: ADVANCED DIGITAL SYSTEM DESIGN

COURSE CODE: MTEC-615

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 50%-60 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Design the different standard combinational circuits and uses these standard circuits to implement other digital circuits.
- CO2 Analyze and design the different standard synchronous sequential logic (Flip Flop, counters etc.) and other user defined synchronous sequential digital circuits using traditional approach.
- CO3 Analyze and design the different multi-input system controllers.
- CO4 Analyze different asynchronous sequential machines and design the standard and user-defined Asynchronous sequential logic.
- CO5 Design of different combinational and sequential circuits using VHDL.

Syllabus

Unit 1. Review of Digital Electronics Concept

Design and analysis of combinational circuits (Arithmetic Circuits, Comparators, Multiplexers, Code Converters) and sequential machines (State Diagram, Design Steps For Traditional Synchronous Sequential Circuits, Counters, Shift Registers and Memory)

Unit 2. Multi Input System Controller Design

System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

Unit 3. Asynchronous Finite State Machines

Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method, Electromagnetic Interference And Electromagnetic Compatibility Grounding And Shielding of Digital Circuits. Interfacing digital system with different media like fiber cable, co-axial cable etc.

Unit 4. Digital Logic Design with VHDL

Combinational Logic Design-complex Logic Gates, One-bit Half Adder, multiplexer, Thermometer-to- binary encoder, Seven-segment display driver, tri-state buffer, Sequential Logic Design-Latches and Flip-Flops, counter design, state machine design, Memories-Random Access Memory, Read-Only Memory

Text Books:

1. W. I. Fletcher, “An Engineering Approach to Digital Design”, Prentice Hall India, 1990.

Reference books and other resources:

1. Robert L. Miller, “Designing with TTL Circuits”, McGraw Hill.
2. Richard F. Tinder, “Engineering Digital Design”, Academic Press.
3. John F. Wakerly, “Digital Design- Principles and Practices”, Pearson Education.
4. David J. Comer, “Digital Logic and State Machine Design”, Oxford University Press.
5. Stephen Brown and Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL Design”, McGraw-Hill.
6. Related IEEE/IEE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	H	-	-	-
Unit 2	-	L	H	-	-
Unit 3	-	-	-	H	-
Unit 4	L	L	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M	-	H	-	M	-	-	-	L	-	-
CO2	M	-	H	-	M	-	-	-	L	-	-
CO3	M	-	H	-	M	-	-	-	L	-	-
CO4	M	-	H	-	M	-	-	-	L	-	-
CO5	M	-	H	-	M	-	-	-	L	-	-

COURSE NAME: COMPUTER COMMUNICATIONS AND NETWORKS

COURSE CODE: MTEC-616

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe communication protocols and their operation.
- CO2 Comprehend the structure of internetworking and its applications.
- CO3 Classify the ATM networks and LAN technology.
- CO4 Outline the techniques related to network security.
- CO5 Model and analyze the communication networks.

Syllabus

Unit 1. Review of Network Protocols

Review of Data Communication and Networking, OSI and TCP/IP Protocol Suite, Error Control, Flow Control, Bit Oriented and Character Oriented Protocol, Data Link Layer Services, X.25, Virtual Circuits and Datagram's, Medium Access Control Protocols (CSMA/CD, Token Ring, FDDI, DQDB).

Unit 2. Computer Communication Structure and Networks

Internetworking, IP addressing, Structure of IP, IPv4, IPv6, Transport Layer Protocols (TCP, UDP), Application Layer Services (DNS, e-mail, www).

Unit 3. ATM Networks and LAN's

Concept and History of ATM, ATM Architecture and its Convergence, Challenges, LAN Technology: Applications, Architecture, Bus LANs, Ring LANs, Star LANs, Wireless LANs.

Unit 4. Network Security

Security Issues, Cryptography: Symmetric Key Algorithms, Public-Key Algorithms, Concept of Firewalls, Digital Signatures, Intrusion Detection Systems.

Unit 5. Modelling and Analysis of Computer Communication Networks

Pure Birth and Birth-Death Process, Bernouli Trials-Markov Chains, Poisson Process, Calculation of Delay-Little's Formula, Burke's Theorem, Queueing Models: M/M/1, M/M/1/N, M/M/S, M/M/S/N Queues, Imbedded Markov Chains-M/G/1 Queue, Network Layout and Reliability Considerations.

Text Books:

1. W. Stallings, "Data and Computer Communication", Sixth Edition, Prentice Hall, 2002.
2. J. F. Hayes, "Modelling and Analysis of Computer Communication Networks", First Edition, Springer, 1984.

Reference books and other resources:

1. A. S. Tanenbaum, "Computer Networks", Fourth Edition, Pearson Education, 2011.
2. B. A. Forouzan, "Data Communications and Networking", Third Edition, Tata Mcgraw-Hill, 2004.
3. S. Keshav, "An Engineering Approach to Computer Networking: ATM Networks, The Internet and the Telephone Network", First Edition, Pearson Education, 1987.
4. D. P. Bertsekas, "Data Networks", Second Edition, Prentice Hall, 1992.
5. Related IEEE/IE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	-	-	-	-	-	-	-	L	-	-
CO2	L	-	-	-	-	-	-	-	L	-	-
CO3	L	-	-	-	-	-	-	-	L	-	-
CO4	L	-	-	-	-	-	-	-	L	M	-
CO5	H	-	-	-	-	-	-	-	L	-	-

COURSE NAME: ADVANCED EMBEDDED SYSTEM DESIGN

COURSE CODE: MTEC-617

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 20%-30%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe, classify and illustrate the use of Embedded Systems.
- CO2 Explain the architecture and programmer's model of ARM microcontrollers.
- CO3 Apply the embedded networking concepts.
- CO4 Comprehend Real-Time Embedded System concepts.
- CO5 Develop applications based on Embedded System hardware and software.

Syllabus

Unit 1. Review of Embedded Systems

Overview of embedded systems, Embedded processors in systems, Embedded hardware units and devices, Design process in embedded systems, Classification of embedded systems, Real life examples.

Unit 2. ARM 32-Bit Microcontroller Architecture

Architecture, Registers, Pipeline, Interrupts and the vector table, Architecture revisions, ARM processor families.

Unit 3. ARM Instruction Set

Instruction Set: Data processing instructions, Branch instructions, Load-store instructions, Software interrupt instruction, Program status register instructions, Conditional execution.

Unit 4. Networked Embedded Systems

Serial bus communication protocols: I²C Bus, CAN Bus, USB Bus; Parallel Bus Communication Protocols: ISA, PCI and advanced buses; Internet Enabled Systems; Wireless and Mobile System Protocols.

Unit 5. Design Examples Using ARM7

ARM7 I/O Port Description, Interfacing Programs for UART, Timer, ADC and DAC.

Unit 6. Real-Time Embedded Systems Software

Real-time Embedded Systems, Real-Time Operating Systems (RTOS)– Key characteristics, The Scheduler, Tasks, Semaphores, Message Queues, Basic design using RTOS.

Text Books:

1. R. Kamal, “Embedded Systems, Architecture Programming and Design”, Second Edition, Tata McGraw Hill, 2008.
2. N. Sloss, D. Symes, C. Wright and J. Rayfield, “ARM System Developer’s Guide, Designing and Optimizing System Software”, Elsevier, 2004.

Reference books and other resources:

1. T. Martin, “The Insider's Guide to The Philips ARM7-Based Microcontrollers, An Engineer's Introduction to The LPC2100 Series”, Hitex, 2005.
2. Q. Li, “Real Time Concepts for Embedded Systems”, CMP Books, 2003.
3. UM10139 LPC214x User manual.
4. Website: www.arm.com.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	M
Unit 3	-	H	-	-	M
Unit 4	-	-	H	-	-
Unit 5	-	-	-	-	H
Unit 6	-	-	-	H	-

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	H	L	L	L	-	-	-	-	-	-	-
CO 2	M	M	-	M	M	-	-	-	-	-	-
CO 3	M	-	M	M	M	-	-	-	-	-	-
CO 4	M	-	H	M	M	-	-	-	-	-	-
CO 5	H	H	H	H	H	-	-	-	-	-	-

**COURSE NAME: MODEING AND SIMULATION OF COMMUNICAION
SYSTEMS**

COURSE CODE: MTEC- 618

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Minimum Numerical Content: 30-40%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the concept of simulation and modeling of communication system.
- CO2 Explain models involved in analog channels, digital channels and light wave systems.
- CO3 Apply Random Process models on random variables.
- CO4 Estimate performance metrics of analog and digital communication system.
- CO5 Analyze different case studies of various communication links.

Syllabus

Unit 1. Introduction

Concept of simulation and modeling, Roles of Simulation, Types of Simulation, Limits of Simulation, Simulation Languages (High Level versus Low Level), Real-time Simulation.

Unit 2. Modeling of Communication System

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bustry channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system Models.

Unit 3. Simulation of Random Variables And Random Process

Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov and ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

Unit 4. Estimation of Performance Measures

Quality of an estimator, estimator of SNR, Probability density functions of analog communication system, BER of Digital communication systems, Monte Carlo method and Importance sampling method, estimation of power, Spectral density of a process.

Unit 5. Case Studies

Case Study I: 64-QAM equalized Digital Radio link in a Fading environment.

Case Study II: Lightwave communication links

Case Study III: A Satellite system Example

Text Books:

1. M. C. Jeruchim, Philip Balaban and K. Sam Shanmugam, "Simulation of communication systems", Plenum Press, New York, 1992.
2. M. Law and W. David Kelton, "Simulation Modelling and analysis", Tata McGraw Hill, New York, 2008.

Reference books and other resources:

1. M.C. Jeruchim, Philip Balaban and K. Sam shanmugam, Simulation of communication systems: Modeling, Methodology and Techniques, Kluwer academic/Plenum press, New York, 2000.
2. K. C. Raveendranathan, "Communication Systems Modelling and Simulation Using MATLAB and Simulink", Universities Press, 2011.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	H	-	-	-	-	-	-	-	-	-
CO2	H	H	H	H	H	-	-	-	-	-	-
CO3	-	-	H	H	H	-	-	-	-	-	-
CO4	-	H	H	H	H	-	-	-	-	-	-
CO5	-	-	H	H	H	-	-	-	H	-	-

COURSE NAME: CLOUD COMPUTING

COURSE CODE: MTEC-619

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Discuss cloud computing paradigms and its challenges.
- CO2 Explain cloud computing model, its services and deployment.
- CO3 Describe concept of virtualisation and its different types.
- CO4 Analyze various challenges/security issues and their possible solutions.
- CO5 Explain mobile cloud computing.

Syllabus

Unit 1. Introduction of Computing Paradigms

Overview of existing computing paradigms, Cluster computing, Grid computing, Utility computing, Autonomic computing, Introduction to cloud computing, Cloud computing history and evolution, Essential characteristics of cloud computing, Cloud benefits, The NIST model of cloud computing.

Unit 2. Cloud Computing Architecture

The cloud reference model architecture, Cloud based services, Infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a service (SaaS), Cloud deployment scenarios, Public cloud, Private cloud, Hybrid cloud and Community cloud.

Unit 3. Virtualization

Virtualization, Characteristics of virtualization, Virtualization in cloud computing, Types of virtualization- Resource virtualization, Server storage and Network virtualization, Hypervisors. Data center- Classic data center, Virtualized data center.

Unit 4. Challenges and Security Issues

Cloud computing issues and challenges like security, Elasticity, Service level agreement, Resource management and scheduling, Cloud security, Understanding security risks,

[illegible]

M. Tech. (Electronics and Communication Engineering)

Curriculum Structure - 2019 Batch onwards

Semester-1 st										
S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Core-1	MEC-101	Modern Communication Systems	3	0	0	50	100	150	3
2	Core-2	MEC-102	VLSI Physical Design and Automation	3	0	0	50	100	150	3
3	Program Elective		Elective-1 (Any one)	3	0	0	50	100	150	3
		MEC-103	[1] Modelling and Simulation of Communication Systems							
		MEC-104	[2] Semiconductor Devices Theory and Modelling							
		MEC-105	[3] Soft Computing							
4	Program Elective		Elective-2 (Any one)	3	0	0	50	100	150	3
		MEC-106	[1] Antennas and Radiating Systems							
		MEC-107	[2] Computer Communication and Network Security							
		MEC-108	[3] Advanced Embedded System Design							
5	Lab-1	LMEC-101	Modern Communication Systems - Lab	0	0	4	50	50	100	2
6	Lab-2	LMEC-102	VLSI Physical Design and Automation - Lab	0	0	4	50	50	100	2
7	MLC	MRM-101	Research Methodology and IPR	3	0	0	50	100	150	3
8	Aud-1	MAC-XXX	Audit Course-1	2	0	0	50	0	50	S/US
Total				17	0	8	400	600	1000	19

Semester-2nd

S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Core-3	MEC-109	Advanced Digital Signal Processing	3	0	0	50	100	150	3
2	Core-4	MEC-110	Advanced Optical Communication Systems	3	0	0	50	100	150	3
3	Program Elective		Elective-3 (Any one)	3	0	0	50	100	150	3
		MEC-111	[1] Advanced Digital System Design							
		MEC-112	[2] Advanced Wireless and Mobile Communication							
		MEC-113	[3] Engineering Design and Project Management							
4	Program Elective		Elective-4 (Any one)	3	0	0	50	100	150	3
		MEC-114	[1] Advanced Microwave Engineering							
		MEC-115	[2] Internet of Things							
		MEC-116	[3] Biomedical Electronics							
5	Lab-3	LMEC-103	Advanced Digital Signal Processing - Lab	0	0	4	50	50	100	2
6	Lab-4	LMEC-104	Advanced Optical Communication Systems - Lab	0	0	4	50	50	100	2
7	Core	LMPEC-101	Project	0	0	4	50	50	100	2
8	Aud-2	MAC-XXX	Audit Course-2	2	0	0	50	0	50	S/US
Total				14	0	12	400	550	950	18

Semester-3rd

S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Program Elective		Elective-5 (Any one)	3	0	0	50	100	150	3
		MEC-117	[1] Machine Learning							
		MEC-118	[2] Advanced Wireless Sensor Networks							
		MEC-119	[3] Multimedia Communication							
		MEC-120	[4] Low Power VLSI Design							
2	Open Elective	MOZZ-XXX	^Open Elective	3	0	0	50	100	150	3
3	Dissertation	MPTEC-101	Pre-Thesis	0	0	#2+*18	100	100	200	10
Total				6	0	20	200	300	500	16

^ - Open Elective for ECE students will be offered by other departments; # - Maximum hours for teacher; * - Independent study hours

Semester-4th

S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Dissertation	MTEC-101	Thesis	0	0	#4+*28	100	200	300	16
Total				0	0	32	100	200	300	16

- Maximum hours for teacher; * - Independent study hours

List of Audit Courses

Sr. No.	Course Code	Course Title
1	MAC-101	English for Research Paper Writing
2	MAC-102	Disaster Management
3	MAC-103	Sanskrit for Technical Knowledge
4	MAC-104	Value Education
5	MAC-105	Constitution of India
6	MAC-106	Pedagogy Studies
7	MAC-107	Stress Management by Yoga
8	MAC-108	Personality Development through Life Enlightenment Skills

List of Open Elective Subjects offered to Other Departments

Sr. No.	Course Code	Course Title
1	MOEC-101	Probability and Stochastic Processes
2	MOEC-102	Microelectromechanical Systems
3	MOEC-103	Bio Signal Processing
4	MOEC-104	Engineering Design and Project Management
5	MOEC-105	E-Waste Management

Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Minutes of Meeting

The 2nd meeting of Board of Studies (Civil Engineering) was held on 6th September, 2014 in the office of Head of Department, Civil department and chaired by Dr. J N Jha (Professor & Head).

Following members were present in the meeting:

- Dr. J.N.Jha – Chairman - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harpal Singh – Member - Guru Nanak Dev Engineering College, Ludhiana,
- Dr. H S Rai –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. B S Walla –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. K S Gill – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harvinder Singh – Member - Guru Nanak Dev Engineering College, Ludhiana
- Er. Inderpreet Kaur – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Sanjeev Aggarwal – Member- GZSPTU Campus, Bathinda- Subject Expert- VC Nominee
- Dr. S P Singh – Member- NIT Jalandhar- Subject Expert
- Dr. Siby John – Member- PEC University of Technology, Chandigarh-Subject Expert- Director's Nominee
- Er. Satish Kumar Tanwar –Member- Ultratech- Industry Representative,
- Er. T S Chahal –Member- Supt. Engg.-PWD, B&R, Govt. of Punjab – alumina
- Er. Gurdeepak Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Harjinder Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana

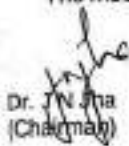
The Following decisions were taken:

1. The proposed credit system for B.Tech (Civil Engg.) -UG course (2014 admission batch onwards and to be implemented from 3rd semester i.e. Aug.2015 session) were discussed and are accepted with minor changes. The credits of two subjects (BTCE-501, BTCE502) of 5th semester were reduced from 5 to 4 and are added to subject 'Survey Camp Training' credits of same semester.
2. It was also suggested that concept of open elective should be started at UG level. This suggestion will be forwarded to Academic Council for further discussion.
3. In light of UGC recommendations the subject 'Research methodology' was made core subject in all PG courses offered in Civil Engineering Department.
4. Subject 'Air Pollution & Control' was included in the list of core subjects for the scheme of M.Tech Environmental Science & Engineering.

2014/9/6

5. The subjects 'Water & Waste Water Treatment Technologies-I' and 'Water & Waste Water Treatment Technologies-II' has been renamed as 'Physico-Chemical Treatment Methods' and 'Biological Treatment Methods' respectively in the scheme of M.Tech Environmental Science & Engineering.
6. The subject 'Advanced Solid Mechanics' has been included as a core subject for the scheme of M.Tech. Structural Engineering Scheme. 'Advanced Structural Analysis' and 'Advanced Solid mechanics' subjects were merged together to accommodate 'Research methodology' as a core subject for the scheme of M.Tech. Structural Engineering Scheme.
7. BOS was of unanimous view that the list of 'Program Electives' and 'Open Electives' should be separate and accordingly the list of 'Program Electives' and 'Open Electives' were prepared separately for all PG courses currently running in the Civil Engineering Department.
8. The proposed syllabus of 1st semester for all PG courses was approved.

The meeting ended with vote of thanks.


Dr. J.N. Jha
(Chairman)



Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Batch 2014 & onward

Scheme: M. Tech (Environmental Science & Engineering)—Full Time

Schedule of Teaching and Study Scheme

Semester	Subjects	Credits	Contact Hours/week			No. of subjects	Distribution of marks		Total Credits
			L	T	P		Ext	Int	
1	Core subjects	4	4	-	-	3	100	50	20
	Program elective	3	3	-	-	1	100	50	
	Open elective	3	3	-	-	1	100	50	
	Laboratory-1	2	--	-	4	1	50	50	
2	Core subjects	4	4	-	-	3	100	50	20
	Program elective	3	3	-	-	1	100	50	
	Open elective	3	3	-	-	1	100	50	
	Laboratory -2	2	--	-	4	1	50	50	
3	Program elective	3	3	-	-	1	100	50	14
	Program elective	3	3	-	-	1	100	50	
	Pre-thesis seminar	4	-	-	4	1	50	50	
	Pre-thesis project	4	-	-	4	1	50	50	
4	Thesis/Dissertation	14	14	-	-	--	100	200	14
Total Marks and credits							1500	1000	68

List of Core Subjects

S. No.	Subject	Subject Code
1	Physico-Chemical Treatment Methods	MTEV-501
2	Environmental Chemistry and Microbiology	MTEV-502
3	Biological Treatment Methods	MTEV-503
4	Research Methodology	MTEV-504
5	Solid and Hazardous Waste Management	MTEV-505
6	Air Pollution and Control	MTEV-506

List of Laboratory/Practical work

S. No.	Subject	Subject Code
1	Laboratory-1	MTEV-507
2	Laboratory-2	MTEV-508
3	Pre-thesis seminar	MTEV-509
4	Pre-thesis project	MTEV-510
5	Thesis	MTEV-511

List of Program Electives

S. No.	Subject	Subject Code
1	Environmental Systems Engineering	MTEV-601
2	Physics of Environment	MTEV-602
3	Environmental Hydraulics and Hydrology	MTEV-603
4	Environmental Remote Sensing and GIS	MTEV-604
5	Urban Water Management	MTEV-605
6	Biodegradation and Bioremediation	MTEV-606
7	Climate Change and Sustainable Development	MTEV-607
8	Rural Water Supply and Environmental Sanitation	MTEV-608
9	Environmental Geotechnology	MTEV-609
10	Energy Technology and Alternate Energy Systems	MTEV-610
11	Strength of Materials	MTEV-611
12	Buried Structures	MTEV-612
13	Environmental Impact Assessment and Management	MTEV-613
14	Disaster Reduction and management	MTEV-614
15	Site Investigations	MTEV-615
16	Environmental Legislation and Auditing	MTEV-616
17	Air and Water Quality Modeling	MTEV-617
18	Environmental Biotechnology	MTEV-618
19	Industrial Waste Management	MTEV-619
20	Pollution Monitoring techniques	MTEV-620

List of subjects to be offered as ‘Open Electives’

1	Experimental Methods in Engineering	MTCE-621
2	Numerical Methods in Engineering	MTCE-622
3	Instrumentation and model simulation	MTCE-623
4	Advanced Engineering Mathematics	MTCE-624
5	Probabilistic Methods in Engineering	MTCE-625
6	Limit Analysis	MTCE-626

Minutes of Meeting

The 11th BOS meeting was held in the HoD office (Civil) on 17 July, 2019 under the chair of Dr. H. S. Rai (Professor and BOS Chairman), whereby following members were present:

Dr. H. S. Rai – Chairman - GNDEC, Ludhiana

Dr. K. S. Gill – Member - GNDEC, Ludhiana

Dr. Harpal Singh – Member- GNDEC, Ludhiana

Dr. Harvinder Singh – Member - GNDEC, Ludhiana

Dr. Jagbir Singh – Member- GNDEC, Ludhiana

Dr. Gurdeepak Singh – Member- GNDEC, Ludhiana

Dr. Prashant Garg – Member- GNDEC, Ludhiana

Dr. Puneet Pal Singh Cheema – Member- GNDEC, Ludhiana

Dr. Inderpreet Kaur – Special Invitee – GNDEC, Ludhiana

Dr. Jaspal Singh – Special Invitee – Professor, PAU, Ludhiana

Er. Rakesh Garg – Special Invitee – Xen, PWD (B&R) – Industry Expert

Dr. Akshay Girdhar – Nominated Member (COE) - GNDEC, Ludhiana

Dr. N. S. Bhangu – Nominated Member (Academic Branch) - GNDEC, Ludhiana

Er. Charnjeet Singh – Special Invitee – GNDEC, Ludhiana

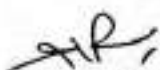
Dr. K. S. Gill relinquished the charge of BOS chairman after providing his services for three years. The department extended gratitude to him for his valuable contribution as BOS chairman.

Following decisions were taken against the agenda items:

1. Department proposed new study schemes for different M.Tech. Programs (Structural Engineering-Full Time, Geotechnical Engineering-Full Time, Environmental Science and Engineering-Full Time, Soil Mechanics & Foundation Engineering-Part Time) starting year 2019 (for Batch 2019 & onward) which were discussed & approved.
2. The syllabus for first semester pertaining to the above mentioned schemes was also discussed and approved.

3. The contents of course named "Building Information Modelling (BIM) 1425106" was proposed and approved for batch B.Tech 2017 and onward.
4. A list of 05 theory subjects (03 credits each) and 01 laboratory (01 credit) was finalized for B.Tech. (Batch 2018 & onward) students to select from, for class room study to qualify for "Civil Engineering" as Minor Engineering Branch.
5. A list of MOOC courses for the session July - November 2019 was finalized for B.Tech. (Batch 2018 & onward) students to qualify for "Civil Engineering" as Minor Engineering Branch.
6. A list of MOOC courses for the session July - November 2019 was finalized for B.Tech. (Batch 2018 & onward) students to qualify for B.Tech. Civil Engineering (Honor) degree.
7. Considering the importance and need of short term certificate course for professionals and graduate students, department proposed a certificate course on 'Analysis & Design of RC Buildings' of 60 hours (04 credits) course spread over a period of 3 months and the same was approved by the BOS.
8. Department proposed mutual swapping of "Geotechnical Engineering Lab" (Sem 5th) subject with "Transportation Engineering Lab" (Sem 6th) subject without changing the credits & total marks for B.Tech. Civil Engineering 2017 scheme. It was approved by the BOS.
9. Department proposed change in the credits of course "Environmental Systems Engineering" (MTEV - 16601) from 03 to 04 for M.Tech. (Environmental Science and Engineering) Scheme 2016 and the same was approved by BOS.

The meeting ended with vote of thanks to all present.


Dr. H. S. Rai

Encl: Copy of Study Schemes, syllabus & other items



Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department
M.Tech. (Environmental Science & Engineering)

Program Outcomes (PO)

After completion of the program graduates will be able to

1. Develop environmental engineers and sensitize them towards environmental issues.
2. Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude.
3. Identify, formulate and solve engineering problems in the domain of Environmental Engineering field.
4. Acquire analytical skills in assessing environmental impacts through a multidisciplinary approach.
5. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work.

First Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MEV-101	Physico-Chemical Treatment Methods	3	0	0	50	100	150	3
Core Theory	MEV-102	Solid and Hazardous Waste Management	3	0	0	50	100	150	3
Elective	MEV- AAA	Program Elective I	3	0	0	50	100	150	3
Elective	MEV-BBB	Program Elective II	3	0	0	50	100	150	3
Core Lab I	LMEV-101	Advanced Water and Wastewater Laboratory	0	0	2	50	50	100	1
Core Lab II	LMEV-102	Environmental Chemistry Laboratory	0	0	2	50	50	100	1
Core Lab III	LMEV-103	Environmental Design Laboratory	0	0	2	50	50	100	1
MLC	MRM-101	Research Methodology and IPR	3	0	0	50	100	150	3
Audit 1	MAC-102	Disaster Management	2	0	0	50	-	50	0
Total			17	0	6	450	650	1100	18
Second Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MEV-103	Biological Treatment Methods	3	0	0	50	100	150	3

Core Theory	MEV-104	Air Pollution and Control	3	0	0	50	100	150	3
Elective	MEV- CCC	Program Elective III	3	0	0	50	100	150	3
Elective	MEV- DDD	Program Elective IV	3	0	0	50	100	150	3
Core Lab IV	LMEV-104	Environmental Computation Laboratory	0	0	4	50	50	100	2
Core Lab V	LMEV-105	Solid waste Analysis Laboratory	0	0	2	50	50	100	1
Core	LMPEV-101	Project	0	0	4	50	50	100	2
Audit 2	MAC-101	English for research report / paper writing	2	0	0	50	-	50	0
Total			14	0	10	400	550	950	17

Third Semester

Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Elective	MEV- EEE	Program Elective V	3	0	0	50	100	150	3
Open Elective	MOEV- XXX	Open Elective	3	0	0	50	100	150	3
Pre-thesis	MPTEV-101	Formulation of Research Problem	0	0	2*+ 18**	100	100	200	10
Total			6	0	20	200	300	500	16

Fourth Semester

Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Thesis	MTEV-101	Thesis	0	0	4*+ 28**	100	200	300	16
Total			0	0	32	100	200	300	16

* Max hours for Teacher

** Independent study hours

List of Electives

S No	Course Name	Course Code
1	Environmental Chemistry and Microbiology	MEV – 111
2	Environmental Change and Sustainable Development	MEV – 112

3	Environmental Hydraulics and Hydrology	MEV – 113
4	Environmental Policies and Legislation	MEV – 114
5	Rural Water Supply and Sanitation	MEV – 115
6	Urban Storm water Management	MEV – 116
7	Geo-environmental Engineering	MEV – 117
8	Environmental Impact Assessment and Management	MEV – 118
9	Life Cycle Analysis and Design for Environment	MEV – 119
10	Water Distribution and Sewerage network Design	MEV – 120
11	Watershed Management	MEV – 121
12	Environmental Quality Modelling	MEV – 122
13	Industrial Wastewater Management and Reuse	MEV – 123
14	Analytical Methods for Environmental Monitoring	MEV – 124
15	Groundwater Recharge	MEV – 125
16	Environmental Remote Sensing and GIS	MEV – 126
17	Biodegradation and Bioremediation techniques	MEV – 127
18	Environmental Systems Engineering	MEV – 128
19	Membrane Processes	MEV – 129

Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Minutes of Meeting

The 2nd meeting of Board of Studies (Civil Engineering) was held on 6th September, 2014 in the office of Head of Department, Civil department and chaired by Dr. J N Jha (Professor & Head).

Following members were present in the meeting:

- Dr. J.N.Jha – Chairman - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harpal Singh – Member - Guru Nanak Dev Engineering College, Ludhiana,
- Dr. H S Rai –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. B S Walla –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. K S Gill – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harvinder Singh – Member - Guru Nanak Dev Engineering College, Ludhiana
- Er. Inderpreet Kaur – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Sanjeev Aggarwal – Member- GZSPTU Campus, Bathinda- Subject Expert- VC Nominee
- Dr. S P Singh – Member- NIT Jalandhar- Subject Expert
- Dr. Siby John – Member- PEC University of Technology, Chandigarh-Subject Expert- Director's Nominee
- Er. Satish Kumar Tanwar –Member- Ultratech- Industry Representative,
- Er. T S Chahal –Member- Supt. Engg.-PWD, B&R, Govt. of Punjab – alumina
- Er. Gurdeepak Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Harjinder Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana

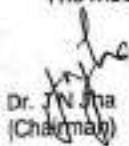
The Following decisions were taken:

1. The proposed credit system for B.Tech (Civil Engg.) -UG course (2014 admission batch onwards and to be implemented from 3rd semester i.e. Aug.2015 session) were discussed and are accepted with minor changes. The credits of two subjects (BTCE-501, BTCE502) of 5th semester were reduced from 5 to 4 and are added to subject 'Survey Camp Training' credits of same semester.
2. It was also suggested that concept of open elective should be started at UG level. This suggestion will be forwarded to Academic Council for further discussion.
3. In light of UGC recommendations the subject 'Research methodology' was made core subject in all PG courses offered in Civil Engineering Department.
4. Subject 'Air Pollution & Control' was included in the list of core subjects for the scheme of M.Tech Environmental Science & Engineering.

2014/9/6

5. The subjects 'Water & Waste Water Treatment Technologies-I' and 'Water & Waste Water Treatment Technologies-II' has been renamed as 'Physico-Chemical Treatment Methods' and 'Biological Treatment Methods' respectively in the scheme of M.Tech Environmental Science & Engineering.
6. The subject 'Advanced Solid Mechanics' has been included as a core subject for the scheme of M.Tech. Structural Engineering Scheme. 'Advanced Structural Analysis' and 'Advanced Solid mechanics' subjects were merged together to accommodate 'Research methodology' as a core subject for the scheme of M.Tech. Structural Engineering Scheme.
7. BOS was of unanimous view that the list of 'Program Electives' and 'Open Electives' should be separate and accordingly the list of 'Program Electives' and 'Open Electives' were prepared separately for all PG courses currently running in the Civil Engineering Department.
8. The proposed syllabus of 1st semester for all PG courses was approved.

The meeting ended with vote of thanks.


Dr. J.N. Jha
(Chairman)



Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Batch 2014 & onward

Scheme: M. Tech (Geotechnical Engineering)—Full Time

Schedule of Teaching and study scheme

Semester	Subjects	Credits	Contact Hours/week			No. of subjects	Distribution of marks		Total Credits
			L	T	P		Ext	Int	
1	Core subjects	4	4	-	-	3	100	50	20
	Program elective	3	3	-	-	1	100	50	
	Open elective	3	3	-	-	1	100	50	
	Laboratory-1	2	--	-	4	1	50	50	
2	Core subjects	4	4	-	-	3	100	50	20
	Program elective	3	3	-	-	1	100	50	
	Open elective	3	3	-	-	1	100	50	
	Laboratory -2	2	--	-	4	1	50	50	
3	Program elective	3	3	-	-	1	100	50	14
	Program elective	3	3	-	-	1	100	50	
	Pre-thesis seminar	4	-	-	4	1	50	50	
	Pre-thesis project	4	-	-	4	1	50	50	
4	Thesis/Dissertation	14	14	-	-	--	100	200	14
Total Marks and credits							1500	1000	68

List of Core Subjects

S. No.	Subjects	Subject Code
1	Soil Dynamics	MTGT-501
2	Advanced Foundation Engineering	MTGT-502
3	Applied Soil Mechanics	MTGT-503
4	Research Methodology	MTGT-504
5	Analysis of Settlement of Soils & Foundations	MTGT-505
6	Site Investigations	MTGT-506

List of Laboratory/Practical work

S. No.	Subject	Subject Code
1	Laboratory-1	MTGT-507
2	Laboratory-2	MTGT-508
3	Pre-thesis seminar	MTGT-509
4	Pre-thesis project	MTGT-510
5	Thesis	MTGT-511

List of Program Electives

S. No.	Subjects	Subject Code
1	Soil-Structure Interaction	MTGT-601
2	Rock Mechanics	MTGT-602
3	Geosynthetic Engineering	MTGT-603
4	Structural Design of Foundations	MTGT-604
5	Clay Mineralogy	MTGT-605
6	Retaining Structures	MTGT-606
7	Slope Stability Analysis	MTGT-607
8	Case Histories in Geotechnical Engineering	MTGT-608
9	Earth Anchors	MTGT-609
10	Design of Highway and Airport Pavements	MTGT-610
11	Strength of Materials	MTGT-611
12	Buried Structures	MTGT-612
13	Environmental Impact assessment & Management	MTGT-613
14	Advanced Soil Mechanics	MTGT-614
15	Disaster Reduction and management	MTGT-615
16	Environmental Geotechnology	MTGT-616
17	Ground Improvement	MTGT-617
18	Earthen Embankment	MTGT-618
19	Geomechanics	MTGT-619
20	Highway Materials & Construction	MTGT-620

List of subjects to be offered as ‘Open Electives’

1	Experimental Methods in Engineering	MTCE-621
2	Numerical Methods in Engineering	MTCE-622
3	Instrumentation and model simulation	MTCE-623
4	Advanced Engineering Mathematics	MTCE-624
5	Probabilistic Methods in Engineering	MTCE-625
6	Limit Analysis	MTCE-626

Minutes of Meeting

The 11th BOS meeting was held in the HoD office (Civil) on 17 July, 2019 under the chair of Dr. H. S. Rai (Professor and BOS Chairman), whereby following members were present:

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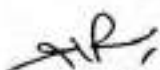
Dr. K. S. Gill relinquished the charge of BOS chairman after providing his services for three years. The department extended gratitude to him for his valuable contribution as BOS chairman.

Following decisions were taken against the agenda items:

1. Department proposed new study schemes for different M.Tech. Programs (Structural Engineering-Full Time, Geotechnical Engineering-Full Time, Environmental Science and Engineering-Full Time, Soil Mechanics & Foundation Engineering-Part Time) starting year 2019 (for Batch 2019 & onward) which were discussed & approved.
2. The syllabus for first semester pertaining to the above mentioned schemes was also discussed and approved.

3. The contents of course named "Building Information Modelling (BIM) 1425106" was proposed and approved for batch B.Tech 2017 and onward.
4. A list of 05 theory subjects (03 credits each) and 01 laboratory (01 credit) was finalized for B.Tech. (Batch 2018 & onward) students to select from, for class room study to qualify for "Civil Engineering" as Minor Engineering Branch.
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9. Department proposed change in the credits of course "Environmental Systems Engineering" (MTEV - 16601) from 03 to 04 for M.Tech. (Environmental Science and Engineering) Scheme 2016 and the same was approved by BOS.

The meeting ended with vote of thanks to all present.


Dr. H. S. Rai

Encl: Copy of Study Schemes, syllabus & other items



Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department
M.Tech. (Geotechnical Engineering)

Program Outcomes (PO)

After completion of the program graduates will be able to

1. Learn the behavior of soil and rock.
2. Perform various laboratory and in-situ tests on soil/rock to find out design parameters.
3. Design shallow/deep foundations, earth retaining structures, embankment and earthen dams, tunnel support systems for given site conditions.
4. Compute factor of safety to assess stability of slopes and apply preventive measures for stability.
5. Develop numerical models to estimate response of various geotechnical structures under different loadings.

First Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MGT-101	Advanced Soil Mechanics	3	0	0	50	100	150	3
Core Theory	MGT-102	Subsurface Investigations & Instrumentation	3	0	0	50	100	150	3
Elective	MGT- AAA	Program Elective I	3	0	0	50	100	150	3
Elective	MGT-BBB	Program Elective II	3	0	0	50	100	150	3
Core Lab I	LMGT-101	Soil Mechanics Laboratory - I	0	0	2	50	50	100	1
Core Lab II	LMGT-102	Soil Mechanics Laboratory - II	0	0	4	50	50	100	2
MLC	MRM-101	Research Methodology and IPR	3	0	0	50	100	150	3
Audit 1	MAC-102	Disaster Management	2	0	0	50	-	50	0
Total			17	0	6	400	600	1000	18
Second Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MGT-103	Advanced Foundation Engineering	3	0	0	50	100	150	3
Core Theory	MGT-104	Soil Dynamics	3	0	0	50	100	150	3
Elective	MGT- CCC	Program Elective III	3	0	0	50	100	150	3
Elective	MGT- DDD	Program Elective IV	3	0	0	50	100	150	3

Core Lab III	LMGT-103	Model Testing Laboratory	0	0	2	50	50	100	1
Core Lab IV	LMGT-104	Numerical Analysis Laboratory	0	0	4	50	50	100	2
Core	LMPGT-101	Project	0	0	4	50	50	100	2
Audit 2	MAC-101	English for research report / paper writing	2	0	0	50	100	150	0
Total			14	0	10	400	650	1050	17

Third Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Elective	MGT- EEE	Program Elective V	3	0	0	50	100	150	3
Open Elective	MOGT- XXX	Open Elective	3	0	0	50	100	150	3
Pre-thesis	MPTGT-101	Formulation of Research Problem	0	0	2*+ 18**	100	100	200	10
Total			6	0	20	200	300	500	16
Fourth Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Thesis	MTGT-101	Thesis	0	0	4*+ 28**	100	200	300	16
Total			0	0	32	100	200	300	16
* Max hours for teacher ** Independent study hours									

List of Electives		
S No	Course Name	Course Code
1	Soil Structure Interaction	MGT – 111
2	Ground Improvement Techniques	MGT – 112
3	Pavement Analysis and Design	MGT – 113
4	FEM in Geomechanics	MGT – 114
5	Environmental Geotechnology	MGT – 115
6	Critical Soil Mechanics	MGT – 116
7	Rock mechanics	MGT – 117
8	Computational Geomechanics	MGT – 118

9	Geosynthetics Engineering	MGT – 119
10	Earth retaining structures	MGT – 120
11	Design of underground excavations	MGT – 121
12	Clay Mineralogy	MGT – 122
13	Stability Analysis of Slopes	MGT – 123
14	Geotechnical Earthquake Engineering	MGT – 124
15	Design of Foundations on Weak Soils & Rocks	MGT – 125

BOS Minutes of Meetings

Minutes of Meeting, Board of Studies, 30.6.15

Minutes of the Board of Studies Meeting Of Electrical Engineering Department Held on 30th June, 2015 Venue: Committee Room

The following were present:

1. Dr. J.S.Dhillon
2. Dr. Pious Verma
3. Dr. Sanjay Marwaha
4. Dr. Lakhwinder Singh
5. Er. Pritam Singh
6. Pf. Jaswinder Singh
7. Dr. Y.S.Brar
8. Pf. Preetinder Singh
9. Dr. Kanwardeep Singh
10. Pf. Gagandeep Singh Sodhi
11. Pf. Arvind Dhillra
12. Pf. Navneet Singh Bhangu
13. Pf. Harneet Singh Gill

Pf. Jaswinder Singh, Chairman, BOS welcomed the participants to the meeting. The agenda which had already been circulated was placed before the board.

1. The new study scheme was put up for discussion and approval. The chairman apprised the board that as per the college norms credit based scheme was being introduced and the same was put for approval of the board. The board after certain amendments unanimously approved the same.

APPROVED

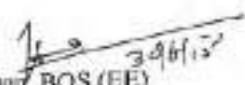
2. The syllabus for 3rd and 4th semester was also presented. The syllabus for all the subjects included their Course Objectives and Course Outcomes. The syllabus was discussed at length and certain amendments were suggested which were duly incorporated. This was approved by the board.

APPROVED

3. The board members were of the view that syllabi for 5th, 6th & 7th/8th semester must be ready before December, 2015.

AGREED

There being no other matter, the meeting ended with a vote of thanks.


Chairman, BOS (EE)

Cc: Director for kind information
Dean (Academic)
All members of BOS (EE)

Minutes of Meeting, Board of Studies, 9.12.16

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA ELECTRICAL ENGINEERING DEPARTMENT

Minutes of Meeting (Board of Studies)

Held on 9th December, 2016

Venue: Committee Room

The following members were present:

1. Dr.J.S.Dhillon
2. Dr.Y.S.Brar
3. Dr. Lakhwinder Singh
4. Er.Pritam Singh
5. Pf.Jaswinder Singh
6. Pf.Preetinder Singh
7. Dr.Kanwardeep Singh
8. Pf.Gagandeep Singh Sodhi
9. Pf.Arvind Dhingra
10. Dr. Navneet Singh Bhangu
11. Pf.Harmeet Singh Gill

Pf.Jaswinder Singh, Chairman, BoS welcomed the participants to the meeting. The agenda which had already been circulated was placed before the board.

1. The codes for all subjects of B.Tech (Electrical Engineering) were placed before the board. The Chairman informed the members that code change was necessary as the Dean(Academics), Guru Nanak Dev Engineering College, Ludhiana has directed all departments to follow uniform structure for subject codes. This is also necessary as per directions received from affiliating university: IKG Punjab Technical University, Kapurthala.

The board members agreed for the change and the changed codes are appended alongwith.

2. The Program Educational Objectives and Program out comes for B.Tech (Electrical Engineering) and M.Tech (Power engineering) alongwith mission and vision statement of department were placed for review before the board.

The board members gave their valuable inputs which were recorded. The Chairman assured the board members that their suggestions shall be incorporated in the revised documentation.

3. The Chairman informed the board regarding upcoming accreditation visit for PG and compliance report for UG courses. In view of this board was of the view that Ph.D qualification faculty may be recruited to maintain cadre ratio.

[Signature]
9.12.16

Minutes of Meeting, Board of Studies, 14.7.17

Guru Nanak Dev Engineering College, Ludhiana

Electrical Engineering Department

Minutes of BoS Meeting

Date: 14.7.2017

Ref.No.

A meeting of Board of Studies of Electrical Engineering Department was held in the college committee room on 14.7.2017 at 10.00AM. The following were present:

1. Dr. J.S. Dhillon
2. Dr. Pioush Verma
3. Dr. Sanjay Marwaha
4. Dr. Lakhwinder Singh
5. Dr. Yadwinder Singh Brar
6. Pf. Jaswinder Singh
7. Pf. Khushdeep Singh
8. Pf. Preetinder Singh
9. Pf. Rupinderjit Singh
10. Dr. Kanwarddeep Singh
11. Pf. Gagandeep Singh Sodhi
12. Dr. Navneet Singh Bhangu
13. Pf. Harmeet Singh Gill
14. Pf. Arvind Dhingra

Chairman, BoS welcomed all to the 6th Board of Studies meeting.

The following points were discussed:

1. The revised vision and mission of Electrical Engineering Department were discussed and approved.
2. The syllabus for 7th/8th semester 2014 scheme B.Tech (Electrical) was put up for discussion. The members gave their valuable suggestions which were duly incorporated. The board members approved the syllabus.
3. The PEOs and POs of B.Tech (Electrical Engineering) & M.Tech (Power Engineering) were presented for validation of the board. These were duly validated by the board.
4. The syllabus for Basic Electrical Engineering 2017 batch was discussed and approved.

There being no other matter for discussion, the meeting ended with a vote of thanks.

HOD (EED) &

Chairman, BoS

Minutes of Meeting, Board of Studies (internal), 27.2.18

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

ELECTRICAL ENGINEERING DEPARTMENT

Minutes of Meeting Board of Studies (Internal)

Held on: 27th February, 2018

Venue: Committee Room

Ref. No. EE/ 200/A

Dr. 27/2/18

The following member were present:

1. Pf. Jaswinder Singh, Chairman *Jaswinder Singh*
2. Pf. Khushdeep Singh (On Leave)
3. Pf. Preetinder Singh *Preetinder Singh*
4. Pf. Rupinderjit Singh *Rupinder Singh*
5. Dr. Kanwardeep Singh *Kanwardeep Singh*
6. Pf. Gagandeep Singh Sodhi *Gagandeep Singh Sodhi*
7. Dr. Navneet Singh Bhangu *Navneet Singh Bhangu*
8. Pf. Harmeet Singh Gill *Harmeet Singh Gill*
9. Dr. Arvind Dhillon *Arvind Dhillon*

Special Invitee

Er. Satish Saini *Satish Saini*

Chairman, Smart Grid Technical Activities,
(SG TAC)- IEEE

Senior Projects & Program Manager, Hydro One Networks Inc.
Mississauga, Ontario, Canada.

Pf. Jaswinder Singh, Chairman, BoS welcomed the participants to the meeting and the following agenda points were discussed:-

1. The syllabus of the subject Smart Grids: Fundamentals & Technologies was placed before the board as it has to be added as an elective subject in 7th semester of B.Tech (Electrical Engg) in 2017 Syllabus Scheme. The same was approved. (subject code: DEEE-ITE11)
2. The Environment Engg. Subject for 2017 Syllabus Scheme has to be taught to the students of 2017 batch B.Tech. (Electrical Engg) immediately after the completion of 2nd Semester. The syllabus for Environment Engg. is common to all branches and will be supplied by Civil Engineering department. The item was approved.
3. New codes and hours allotted for the subjects of 2017 Syllabus Scheme was discussed and placed before the board. The board approved the same.
4. Course outcomes of B.Tech (Electrical Engg) and M.Tech (Power Engg.) were reformulated and deliberated upon in the meeting. The board approved the same.

Jaswinder Singh
HOD(Electrical) &
Chairman, BoS

27/02/2018

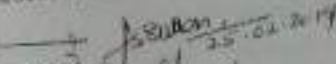
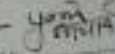
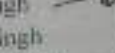
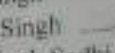
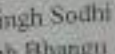
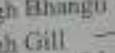
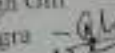
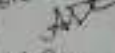
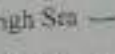
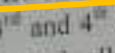
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
DEPARTMENT OF ELECTRICAL ENGINEERING

February 25, 2019

Ref.No. EE/ 198 /A

Minutes of Meeting

A board of studies meeting of department of Electrical Engineering was held in college committee room on 25.2.2019. The following members were present:

1. Dr. J.S.Dhillon — 
2. Dr. Y.P.Verma — 
3. Er. Dheeraj Kumar — 
4. Pf. Preetinder Singh — 
5. Pf. Rupinderjit Singh — 
6. Dr. Kanwardeep Singh — 
7. Pf. Gagandeep Singh Sodhi — 
8. Dr. Navneet Singh Bhangu — 
9. Pf. Harmeet Singh Gill — 
10. Dr. Arvind Dhillon — 
11. Dr. Amit Kamra — 
12. Pf. Jaswinder Singh Sra — 

Study scheme as per AICTE revised 2018 model curriculum was discussed for 2018 batch onwards. Syllabus for 3rd and 4th semester was discussed. The suggestions of the experts were incorporated. The scheme and syllabus after incorporating the comments are enclosed.


Chairman, BoS

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

DEPARTMENT OF ELECTRICAL ENGINEERING

SYLLABUS SCHEME FOR M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

SEMESTER-I									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-I	MEP-101	Advanced Power System Analysis	3	0	50	100	150	3
2.	Core-II	MEP-102	Power System Dynamics-I	3	0	50	100	150	3
3.	Mandatory	MRM-101	Research Methodology and IPR	3	0	50	100	150	3
4.	Program Elective -I	MEP-103	Renewable Energy System	3	0	50	100	150	3
		MEP-104	Smart Grids						
		MEP-105	Dynamics of Electrical Machines						
		MEP-106	SCADA System and Applications						
5.	Program Elective -II	MEP-107	Electrical Power Distribution System	3	0	50	100	150	3
		MEP-108	Mathematical Methods for Power Engineering						
		MEP-109	Pulse Width Modulation for Power Electronics Converters						
		MEP-110	Electric and Hybrid Vehicles						
6.	Lab-I	LMEP-101	Power System Steady State Analysis Laboratory	0	4	50	50	100	2
7.	Lab-II	LMEP-102	Renewable Energy Laboratory	0	4	50	50	100	2
8.	Audit Course-I	MAC-XXX	Audit Course	2	0	50	-	50	S/US
TOTAL				17	8	400	600	1000	19

SEMESTER-II									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-III	MEP-111	Digital Protection of Power System	3	0	50	100	150	3
2.	Core-IV	MEP-112	Power System Dynamics-II	3	0	50	100	150	3
3.	Program Elective -III	MEP-113	Restructured Power Systems	3	0	50	100	150	3
		MEP-114	Advanced Digital Signal Processing						
		MEP-115	High Power Converters						
		MEP-116	Power Apparatus Design						
4.	Program Elective -IV	MEP-117	Advanced Micro-Controller Based Systems	3	0	50	100	150	3
		MEP-118	Wind and Solar Systems						
		MEP-119	Power Quality						
		MEP-120	Artificial Intelligence Techniques						
5.	Project	LMPEP-101	Project	0	4	50	50	100	2
6.	Lab-III	LMEP-103	Power System Protection Laboratory	0	4	50	50	100	2
7.	Lab-IV	LMEP-104	Smart Grid Laboratory	0	4	50	50	100	2
8.	Audit course-II	MAC-XXX	Audit Course	2	0	50	-	50	S/US
TOTAL				14	12	400	550	950	18

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

SEMESTER-III									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Program Elective -V	MEP-121	Power System Transients	3	0	50	100	150	3
		MEP-122	Flexible AC Transmission and Custom Power Devices						
		MEP-123	Industrial Load Modeling and Control						
		MEP-124	Dynamics of Linear Systems						
2.	Open Elective	MOZZ-XXX	Open Elective	3	0	50	100	150	3
3.	Pre-Thesis	MPTEP-101	Pre-Thesis	0	2 [#] +18*	100	100	200	10
TOTAL				6	20	200	300	500	16

Max. Hours for Teacher

* Independent Study hours

SEMESTER-IV									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Thesis	MTEP-101	Thesis	0	4 [#] +28*	100	200	300	16
TOTAL				0	32				16

Max. Hours for Teacher

* Independent Study hours

LIST OF AUDIT COURSES		
S. No.	Course Code	Course Name
1.	MAC-101	English for Research Paper Writing
2.	MAC-102	Disaster Management
3.	MAC-103	Sanskrit for Technical Knowledge
4.	MAC-104	Value Education
5.	MAC-105	Constitution of India
6.	MAC-106	Pedagogy Studies
7.	MAC-107	Stress Management by Yoga
8.	MAC-108	Personality Development through Life Enlightenment Skills

LIST OF OPEN ELECTIVE SUBJECT OFFERED TO OTHER DEPARTMENTS		
S. No.	Course Code	Course Name
1.	MOEP-101	Renewable Energy System
2.	MOEP-102	Optimization Techniques
3.	MOEP-103	Organisation & Finance in Power Sector
4.	MOEP-104	Electric and Hybrid Vehicles

GUIDELINES FOR M.TECH THESIS

For evaluation of M.Tech. Thesis at Mid-Term and End Semester Evaluation, the board will consist of Supervisor, M.Tech Incharge/HOD and one observer minimum of rank of Associate Professor and above from other than the parent department.

The following Procedure is to be adopted for evaluation.

- a) Published/Accepted for publication in International/National/SCI Journal (non paid) with consent of Supervisor - 15 Marks
- b) Published/Accepted for publication in International/National Journal Non SCI Non paid (Science Citation Index) with consent of Supervisor – 10 Marks
- c) Published and Presented for publication in International Conference – 7 Marks
- d) Published and Presented for publication in National Conference with consent of Supervisor- 5 Marks.

For distinction, the candidate will have to earn at least A grade in Theory and O grade in Thesis. For obtaining O grade, the candidate has to publish a paper in any of the above mentioned categories (a to d).

In addition, the thesis report is to be submitted in spiral binding for external viva voce examination.

The hard bind report will be submitted (after incorporation of any modification recommended by the External Examiner) after the final viva-voce exam.

No dues will be submitted to office of Dean Academics after the end of final viva-voce exam.

After that the notification will be released from the office of Controller of Examination.

Subject Code: MEP-101

Subject Name: ADVANCED POWER SYSTEM ANALYSIS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hour
Total marks: 150	Elective Status: Compulsory

Prerequisites: Computer Aided Power System Analysis (at UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Perform load flow analysis using various methods
2	Apply generalized method of fault analysis on simultaneous and open conductors faults and rank various contingencies according to their severity
3	Apply Ward method and REI equivalents for reduction of large power system models
4	Apply Weighted Least Square method for power system state estimation
5	Estimate closeness to voltage collapse and calculate PV curves

UNIT 1

11 Hours

Overview of Newton-Raphson, Gauss-Siedel, Fast Decoupled methods, convergence properties, sparsity techniques, is handling Q_{min} and Q_{max} violations in Jacobian matrix, inclusion of frequency effects, Automatic Voltage Regulation in load flow.

UNIT 2

11 Hours

Simultaneous faults, open conductor faults, generalized method of fault analysis. Security state diagram, contingency analysis, generator shift distribution factors, line outage distribution factor, multiple line outages, overload index ranking.

UNIT 3

11 Hours

Power System Equivalents, Ward Method, and Radial, Equivalent and Independent (REI) equivalents for reduction of large power system models. Sources of errors in measurement, Virtual and Pseudo Measurements, Observability, Tracking state estimation, Weighted Least Square method, bad data correction.

UNIT 4

11 Hours

Voltage Stability, Voltage collapse, P-V curve, multiple power flow solution, continuation power flow, optimal load flow, voltage collapse proximity indices.

Text/Reference:

1. J.J. Grainger and W.D. Stevenson, "Power system analysis", McGraw Hill, 2003
2. A. R. Bergen and Vijay Vittal, "Power System Analysis", Pearson, 2000
3. L.P. Singh, "Advanced Power System Analysis and Dynamics", New Age International, 2006
4. G. L. Kusic, "Computer aided power system analysis", Prentice Hall India, 1986
5. A. J. Wood, B. F. Wollenberg and G. B. Sheblé, "Power generation, operation and control", Wiley, 2013
6. P.M. Anderson, "Faulted power system analysis", IEEE Press, 1995

E-Book and Online learning material:

1. Debapriya Das, Indian Institute of Technology, Kharagpur,
<https://swayam.gov.in/courses/4745-july-2018-power-system-analysis>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-102
Subject Name: POWER SYSTEM DYNAMICS-I

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Compulsory

Prerequisites: Electrical Machines (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the modeling of synchronous machine
2	Develop synchronous machine equivalent representation
3	Carry out synchronous machine stability analysis
4	Develop model of excitation system
5	Understand the modeling of prime movers

UNIT 1

11 Hours

Synchronous Machine Modelling: Per unit systems, Park's Transformation and Modified Park's Transformation, Flux-linkage equations.

UNIT 2

11 Hours

Synchronous Machine Equivalent Representation: Voltage and current equations, Formulation of State-space equations, Equivalent circuit.

UNIT 3

11 Hours

Synchronous Machine Stability, Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines, Small signal model, Introduction to frequency model.

UNIT 4

11 Hours

Synchronous Machine Excitation System, Philips-Heffron model and PSS Load modelling, Prime Movers, Modelling of Hydraulic and steam turbine, governing systems.

Text/Reference:

1. P. M. Anderson and A. A. Fouad, "Power System Control and Stability", John Wiley & Sons, 2008.
2. J Machowski, J Bialek and J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997.
3. P. Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.
4. E.W. Kimbark, "Power system stability", John Wiley & Sons, 2002.

E-Book and Online learning material:

1. <https://courses.engr.illinois.edu/ece576/sp2018/Sauer%20and%20Pai%20book%20-%20Jan%202007.pdf>

Subject Code: MRM-101

Subject Name: RESEARCH METHODOLOGY AND IPR

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours:
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Mandatory

Prerequisites: Minor/ Major Projects (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand research problem formulation and analyze research related information.
2	Attain the knowledge of research ethics
3	Attain the knowledge of writing reports and research papers
4	Understanding emphasis of Intellectual Property Right and patenting
5	Gain the knowledge about new developments in IPR

Unit 1 Introduction: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2 Literature Studies Approaches: Effective literature studies approaches, analysis, plagiarism, and research ethics

Unit 3 Effective Technical Writing: Writing reports and research papers, Developing a Research Proposal, Format of research proposal, presentation and assessment by a review committee.

Unit 4 Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under Patent Cooperation Treaty (PCT).

Unit 5 Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications, administration of Patent System. New developments in Intellectual Property Rights; IPR of Biological Systems, related computer software.

Text/Reference:

1. S. Melville and W. Goddard, "Research methodology: an introduction for science and engineering students", Juta Academic, 1996
2. R. Kumar, "Research Methodology: A Step by Step Guide for beginners", SAGE, 2014
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
4. Mayall, "Industrial Design", McGraw Hill, 1992.
5. Niebel, "Product Design", McGraw Hill, 1974.
6. Asimov, "Introduction to Design", Prentice Hall, 1962.
7. R. P. Merges, P. S. Menell, M. A. Lemley, "Intellectual Property in New Technological Age", 2016.
8. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

E-Book and Online learning material:

1. <https://www.coursera.org/learn/research-methods>
2. <https://www.lawctopus.com/certificate-course-on-research-methodology-online/>
3. "How to Build a Start-up", Available at Udacity, Self-Paced (One Month). <https://in.udacity.com/course/how-to-build-a-startup--ep245>
4. "Intellectual Property Rights: A Management Perspective, Available at edx (Offered by IIM Bangalore), Starts on 1 August 2018 (6 weeks). <https://www.edx.org/intellectual-property-rights-a-management-perspective>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-103
Subject Name: RENEWABLE ENERGY SYSTEM

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Non-Conventional Energy Sources (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand distributed and central generating station
2	Understand about renewable sources of energy
3	Apply the concepts of power electronic for grid interfacing of distributed generators
4	Understand power quality issues of distributed generation
5	Attain the knowledge of protection and economics of distributed generation

UNIT 1

11 Hours

Distributed vs. Central Station Generation, Turbo-generator, Nuclear generator and Micro-turbines, Introduction to Solar Energy, Wind Energy, Combined Heat and Power, Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells.

UNIT 2

11 Hours

Interfacing Distributed Generators with Grid: Applications of Power Electronic devices for Grid Interfacing of Distributed Generators.

UNIT 3

11 Hours

Power Quality Issues: Impact of Distributed Generation on the Power System, Power Quality Disturbances.

UNIT 4

11 Hours

Protection and Economics: Transmission System Operation, Protection of Distributed Generators, Economics of Distributed Generation.

Text/Reference:

1. R. Ranjan, D. P. Kothari, and K. C. Singal, "Renewable Energy Sources and Emerging Technologies", Prentice Hall of India, 2011.
2. M. H. Bollen and F. Hassan, "Integration of Distributed Generation in the Power System", Wiley –IEEE Press, 2011.
3. L.L. Lai and T.F. Chan, "Distributed Generation: Induction and Permanent Magnet Generators", Wiley-IEEE Press, 2007.
4. R. A. Messenger and J. Ventre, "Photovoltaic System Engineering", 2010.
5. J. F. Manwell, J.G. McGowan and A.L Rogers, "Wind energy explained: Theory, Design and Application", John Wiley and Sons, 2010.

E-Book and Online learning material:

1. Technical University of Denmark, <https://www.coursera.org/learn/wind-energy>
2. P.Haridos, IIT Madras, <https://swayam.gov.in/courses/4894-july-2018-non-conventionalenergy-resources>
3. A. Smets, Sustainable Energy: Design a Renewable Future, TU Delft & EDX
4. A. Smets, Solar Energy, TU Delft & EDX
5. A. Stegner, P.P. Drobinski, Wind resources for renewable energies, École Polytechnique & Courser

Subject Code: MEP-104
Subject Name: SMART GRIDS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Power System and Microcontroller (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate the difference between smart grid and conventional grid
2	Apply smart metering concepts to industrial and commercial installations
3	Formulate solutions in the areas of smart substations, distributed generation and wide area measurements
4	Understand integration of renewable energy sources with micro-grid
5	Come up with smart grid solutions using modern communication technologies

UNIT 1

12 Hours

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Concept of Robust and Self-Healing Grid, Present development and International policies in Smart Grid, Introduction to Smart Meters: Real Time Pricing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home and Building Automation, Smart Substations, Substation Automation, Feeder Automation.

UNIT 2

11 Hours

Smart Measurement System: Geographic Information System (GIS), Intelligent Electronic Devices (IED) and their application for monitoring and protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU)

UNIT 3

11 Hours

Micro-grid and Integration of Renewable Energy sources: Concept of micro-grid, need and applications of micro-grid, formation of micro-grid, Issues of interconnection, protection and control of micro-grid, Plastic and Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines, Captive power plants, Integration of renewable energy sources

UNIT 4

10 Hours

Smart Communication: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN). Bluetooth, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Cyber Security for Smart Grid Broadband over Power line (BPL), IP based protocols

Text/Reference:

1. A. Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011
2. C.W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009
3. J. Ekanayake, N. Jenkins, K. Liyanage, "Smart Grid: Technology and Applications", Wiley 2012
4. S. Borlase, "Smart Grid: Infrastructure, Technology and solutions", CRC Press, 2012
5. A.G. Phadke, "Synchronized Phasor Measurement and their Applications", Springer, 2012

E-Book and Online learning material:

1. N.P. Pandey, "Introduction to smart grid", IIT Roorkee
<https://swayam.gov.in/courses/4778-july-2018-introduction-to-smart-grid>
2. Narayana Prasad Padhy, Premalata Jena, "Introduction to Smart Grid," NPTEL
https://onlinecourses.nptel.ac.in/noc18_e42/preview

3. M. Vadari, M. Balasubramanyan, Distributed Energy – Smart Grid Resources for the Future, IEEE, Coursera
4. Dr. M. Vadari and M. Balasubramanyan, Smart Grids: Electricity for the Future, IEEE & EDX
5. Laura Ramirez, Pavol Bauer & Seyedmahdi Izadkhast, “Solar Energy: Integration of Photovoltaic Systems in Microgrids”, Delf University of Technology, <https://www.edx.org/course/solar-energy-integration-photovoltaic-delftx-pv4x-0>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-105

Subject Name: DYNAMICS OF ELECTRICAL MACHINES

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits:3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Electrical machines (At UG Level)

Additional Material allowed in ESE: Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Formulation of electrodynamic equations of all electric machines
2	Analyze the performance characteristics using Park's transformation
3	Knowledge of transformations for the dynamic analysis of machines
4	Knowledge of determination of stability of the machines under small signal and transient conditions
5	Study about synchronous machine

UNIT 1

11 Hours

Introduction: Stability, Primitive 4 Winding Commutator Machine, Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine

UNIT 2

11 Hours

Torque Equations: Torque Equation Analysis of Simple DC Machines using the Primitive Machine Equations, The Three Phase Induction Motor, Transformed Equations, Different Reference Frames for Induction Motor Analysis Transfer Function Formulation

UNIT 3

11 Hours

Three Phase Synchronous Machine: Three Phase Salient Pole Synchronous Machine, Parks Transformation, Steady State Analysis Dynamic analysis: Large Signal Transient, Small Oscillation Equations in State Variable form, Dynamical Analysis of Interconnected Machines

UNIT 4

11 Hours

Transient Analysis: Large Signal Transient Analysis using Transformed Equations, DC Generator /DC Motor System Alternator /Synchronous Motor System

Text/Reference:

1. D.P. Sengupta and J.B. Lynn, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1980
2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education., 2001
3. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company, 1987
4. I. Boldia and S.A. Nasar, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1992
5. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London. 1967

E-Book and Online learning material:

1. http://www.darshan.ac.in/Upload/DIET/Documents/EE/CED_Ch_2_Dynamics_of_Electrical_Drives_v1_03042018_095922AM.pdf

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-106

Subject Name: SCADA SYSTEM AND APPLICATIONS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Microcontroller (At UG Level)

Additional Material allowed in ESE: Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications
2	Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system
3	Knowledge about single unified standard architecture IEC 61850
4	Learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server
5	Learn and understand about SCADA applications in transmission and distribution sector, industries etc

UNIT 1

11 Hours

Introduction to SCADA, Data acquisition systems, Evolution of SCADA, Communication technologies. Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

UNIT 2

11 Hours

Industry SCADA System: Industries SCADA System Components, Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices(IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

UNIT 3

11 Hours

Architecture: SCADA Architecture, Various SCADA architectures, advantages and disadvantages of each system, single unified standard architecture -IEC 61850.

UNIT 4

11 Hours

Communication Technologies: SCADA Communication, various industrial communication technologies, wired and wireless methods and fiber optics, Open standard communication protocols, SCADA Applications: Utility applications, Transmission and Distribution sector operations, monitoring, analysis and improvement, Industries - oil, gas and water

Text/Reference:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA, 2004
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes Publications, Oxford, UK, 2004
3. William T. Shaw, "Cyber security for SCADA systems", Penn Well Books, 2006
4. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003
5. Michael Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power", PennWell 1999

E-Book and Online learning material:

1. Energy Management and SCADA, coordinated by IIT Madras, NPTEL,
<http://www.nptel.ac.in/courses/108106022/8>,

Subject Code: MEP-107

Subject Name: ELECTRIC POWER DISTRIBUTION SYSTEM

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Power System Transmission and Distribution (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Attain the knowledge of power distribution and its management
2	Attain the knowledge of Distribution automation and its application in practice
3	Understand Control and Communication through SCADA system
4	Apply optimization concept for Distribution Systems Switching
5	Understand the problems and challenges of Distribution automation

UNIT 1

11 Hours

Distribution of Power, Management, Power Loads, Load Forecasting Short-term and Long-term, Power System Loading, Technological Forecasting, Distribution Management System: Advantages, Distribution Automation: Definition, Restoration/ Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction

UNIT 2

11 Hours

Supervisory Control and Data Acquisition (SCADA) System: Introduction, Block Diagram, SCADA Applied To Distribution Automation, Common Functions of SCADA, Advantages of Distribution Automation through SCADA, and Communication Systems, Remote Metering, Automatic Meter Reading and its implementation

UNIT 3

11 Hours

Distribution Systems Switching: Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution and Monitoring.

UNIT 4

11 Hours

Maintenance of Automated Distribution Systems: Difficulties in Implementing Distribution, Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

Text/Reference:

1. A.S. Pabla, "Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd. 2008.
2. M.K. Khedkar and G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, 2011
3. A. J. Panseni, "Electrical Distribution Engineering", CRC Press, 2012
4. J. Momoh, "Electric Power Distribution, automation, protection and control", CRC Press, 2011
5. Turan Gonen, "Electric Power Distribution Engineering" CRC Press, 2007.
6. William H. Kersting, "Distribution System Modeling and Analysis (Electric Power Engineering Series)" 1st Edition, CRC Press, 2001.

E-Book and Online learning material:

1. Energy Management and SCADA, coordinated by IIT Madras, NPTEL,
<http://www.nptel.ac.in/courses/108106022/8>,

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-108

Subject Name: MATHEMATICAL METHODS FOR POWER ENGINEERING

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Numerical Statistical Techniques (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Attain the knowledge of vector spaces, linear transformation, eigenvalues and eigenvectors of linear operators
2	To learn about linear programming problems and understanding the simplex method for solving linear programming problems
3	Acquire knowledge about solving unconstrained nonlinear programming
4	Understanding the concept of random variables, functions of random variable and their probability distribution
5	Understand stochastic processes and their classification

UNIT 1

11 Hours

Vector spaces, linear transformations, Matrix representation of linear transformation, Eigen values and Eigen vectors of linear operator

UNIT 2

11 Hours

Linear Programming: Formulation, Simplex Method, Duality, Non Linear Programming: Formulation, Unconstrained Problems, Search methods.

UNIT 3

11 Hours

Constrained Problems: Lagrange method, Kuhn-Tucker conditions, Random Variables, Distributions.

UNIT 4

11 Hours

Stochastic Processes: Introduction, Independent Random Variables, Marginal and Conditional distributions, Monte Carlo Simulation.

Text/Reference:

1. K. Hoffman and R. Kunze, "Linear Algebra", 2nd Edition, PHI, 1992
2. E. Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, 2004
3. I. Miller, M. Miller and J. E. Freund's "Mathematical Statistics", PHI, 2002
4. J. Medhi, "Stochastic Processes", New Age International, New Delhi., 1994
5. A Papoulis, "Probability, Random Variables and Stochastic Processes", McGraw Hill, 2002
6. J. B Thomas, "An Introduction to Applied Probability and Random Processes", John Wiley, 2000
7. F. S. Hillier and G. J. Lieberman, "Introduction to Operations Research", McGraw Hill, 2001
8. D. M. Simmons, "Non Linear Programming for Operations Research", PHI, 1975

E-Book and Online learning material:

1. <https://pdfs.semanticscholar.org/905c/728be51197ea7af9e19e4848f037fb097341.pdf>

Subject Code: MEP-109

Subject Name: PULSE WIDTH MODULATION FOR PE CONVERTERS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Power Electronics (At UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate importance of power electronics converters and its modulation techniques
2	Apply advanced modulation strategies such as zero space vector placement, loss discontinuous and modulation applied to current source inverter.
3	Implement PWM using different strategies
4	Demonstrate the knowledge of continuing developments in modulation
5	Demonstrate the necessity of providing minimum pulse width and its effect

UNIT 1

11 Hours

Introduction to Power Electronic converters, Modulation of one inverter phase leg, Modulation of single phase VSI and 3 phase VSI.

UNIT 2

11 Hours

Modulation: Zero space vector placement modulation strategies, Losses-Discontinuous modulation, Modulation of CSI, over modulation of converters, programme modulation strategies

UNIT 3

11 Hours

Pulse width modulation: Pulse width modulation for multilevel inverters, Implementation of modulation controller

UNIT 4

11 Hours

Recent developments: Continuing developments in modulation as random PWM, PWM for voltage unbalance, Effect of minimum pulse width and necessity of providing dead time

Text/Reference:

1. D. Grahame Holmes, Thomas A. Lipo, "Pulse width modulation of Power Converter: Principles and Practice", John Wiley & Sons, 03-Oct-2003
2. B.Vew, "High Power Converter", Wiley Publication
3. M. K. Kazimirczuk, "Pulse width modulated dc-dc power converter", Wiley Publication

E-Book and Online learning material:

1. Dr. K. Afridi, Dr. R. Erickson, Dr. D. Maksimovic, Power Electronics Specialization, University of Colorado, Coursera

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-110

Subject Name: ELECTRIC AND HYBRID VEHICLES

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Electrical Machines and Electric Drives (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2	Understand hybrid drive-train topologies.
3	Attain the knowledge about DC motor drives configuration and control
4	Understand the selection and sizing of energy storage systems
5	Compare different energy management strategies

UNIT 1

11 Hours

History of Hybrid and Electric Vehicles: Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization Transmission characteristics.

UNIT 2

11 Hours

Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

UNIT 3

11 Hours

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance, Drive system efficiency.

UNIT 4

11 Hours

Matching the Electric Machine and Internal Combustion Engine: Sizing the propulsion motor, selecting the energy storage technology, sizing the power electronics devices for energy storage, Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies.

Text/Reference:

1. S. Ramirez, R. S. Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer, 2011
2. S.C. Tan, Y.M. Lai and C. K. Tse, "Sliding mode control of switching Power Converters" CRC press, 2012

E-Book and Online learning material:

1. <https://nptel.ac.in/courses/108103009/>
2. https://books.google.co.in/books?id=bQFuTCGNYWgC&printsec=frontcover&source=gbp_ge_summary_r&cad=0#v=onepage&q&f=false

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: LMEP-101

Subject Name: POWER SYSTEM STEADY STATE ANALYSIS LABORATORY

Programme: M.Tech (Power Engg.)	L: 0 T: 0 P: 4
Semester: 1	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: CAPSA Lab (At UG Level)

On Completion of the course, the student will have the ability to apply software tools for:

CO#	Course Outcomes (CO)
1	Load flow techniques, short circuit, transient stability
2	Load forecasting and unit commitment
3	Thyristor converters and IGBT inverters
4	PID controller using software and hardware tools

Sr. No. Name of Practical

Use of MATLAB/SIMULINK/PSIM/PSAT/MiPOWER/PSCAD/ETAP/Fuzzy

Logic/other software tools for following experiments

1. Load Flow Studies
2. Short Circuit Studies.
3. Transient Stability Studies/Load frequency control of single and multi-area systems
4. Load Forecasting
5. Unit Commitment
6. Simulation of Thyristor Converters.
7. Simulation of IGBT Inverters.
8. Simulation of PID controller
9. Hardware design of PID using ARDUINO UNO
10. Weighted Least Square Method for state estimation

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: LMEP-102

Subject Name: RENEWABLE ENERGY LABORATORY

Programme: M.Tech (Power Engg.)	L: 0 T: 0 P: 4
Semester: 1	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: Renewable Energy Resources (At UG Level)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Determine calorific value of a fuel
2	Analyze characteristics of solar module
3	Attain the knowledge of different MPPT techniques
4	Use of HOMER software

Sr. No.	Name of Practical

1.	Calorific value using Bomb calorimeter
2.	Gas Analyser for biomass plants
3.	I-V curves for solar cell
4.	Energy management of solar modules
5.	Implementation of MPPT techniques for solar module
6.	Effect of Load on Solar Panel Output
7.	Analysis of renewable energy resources in HOMER software
8.	Test the Capabilities of Solar Panels
9.	Wind power simulator
10.	Microgrid AC/DC Simulation using RCP.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-101

Subject Name: ENGLISH FOR RESEARCH PAPER WRITING

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Plan and prepare research papers/ reports
2	Prepare layout and sections of a report/ research paper
3	Develop skills for readability and writing review of the Literature
4	Develop skills for writing various sections of a research paper/ report
5	Develop skills for ensuring quality of research paper/ report

Unit 1 Planning and Preparation: Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2 Layout of a report/ research paper: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.

Unit 3 Review of the Literature: Introduction, Methods, Results, Discussion, Conclusions, the Final Check, key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit 4 Writing Skills: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

Unit 5 Miscellaneous Topics: Useful phrases, ensuring quality of research paper, first- time submission

Text/Reference:

1. R. Goldbort, "Writing for Science", Yale University Press, 2006.
2. R. Day, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006
3. N. Highman, "Handbook of Writing for the Mathematical Sciences", SIAM, 1998.
4. A. Wallwork, "English for Writing Research Papers", Springer New York, 2011

E-Book and Online learning material:

1. "Take Your English Communication Skills to the Next Level". Available at Coursera (Offered by Georgia Institute of Technology), 4 weeks, Starts on September 10, 2018.
<https://www.coursera.org/learn/english-communication-capstone>
2. "Effective Communication in Globalised Workplace- The Capstone". Available at Coursera (Offered by National University of Singapore), 3 weeks, Starts on August 06, 2018.
<https://www.coursera.org/specializations/effective-communication>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-102

Subject Name: Disaster Management

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Unit 1 Introduction: Disaster - Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types and Magnitude.

Unit 2 Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem; Natural Disasters - Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches; Man-made disasters - Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit 3 Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards With Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

Unit 4 Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Unit 5 Risk Assessment: Disaster Risk - Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

Unit 6 Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India

Text/References:

1. R. Nishith, Singh A.K., "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company.
2. Sahni, Pardeep et al. (Eds.), "Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.
3. Goel S.L., Disaster Administration and Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

Subject Code: MAC-103

Subject Name: Sanskrit for Technical Knowledge

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understanding basic Sanskrit language
2	Ancient Sanskrit literature about science & technology can be understood
3	Being a logical language will help to develop logic in students

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Text/References:

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-104
Subject Name: Value Education

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Knowledge of self-development
2	Learn the importance of Human values
3	Developing the overall personality

Unit 1: Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments.

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

Unit 3: Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking. Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence ,Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

Text/References:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-105
Subject Name: Constitution of India

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. 2. 3.
2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4	Discuss the passage of the Hindu Code Bill of 1956.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features

Unit 3: Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit 5: Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit 6: Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Text/References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-106
Subject Name: Pedagogy Studies

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit 1 Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions, Overview of methodology and Searching.

Unit 2 Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

Unit 3 Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? , Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4 Professional development: alignment with classroom practices and follow up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5 Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Text/References:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-107

Subject Name: Stress Management by Yoga

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Develop healthy mind in a healthy body thus improving social health also
2	Improve efficiency

Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2: Yam and Niyam. Do's and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 3: Asan and Pranayam i) Various yog poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayam

Text/References:

1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MAC-108

Subject Name: Personality Development through Life Enlightenment Skills

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3	Study of Neetishatakam will help in developing versatile personality of students.

Unit 1 Neetisatakam-Holistic development of personality:

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (don't's)
- Verses- 71,73,75,78 (do's)

Unit 2 Approach to day to day work and duties:

Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

Unit 3 Statements of basic knowledge:

- Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17,
- Personality of Role model.
- Shrimad Bhagwad Geeta: Chapter 2-Verses 17, Chapter 3-Verses 36,37, 42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Text/References:

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Subject Code: MEP-111

Subject Name: DIGITAL PROTECTION OF POWER SYSTEM

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Core

Prerequisites: Power System (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the concept and importance of digital Relays
2	Apply mathematical techniques for digital protection
3	Understand the control system techniques for digital protection
4	Understand to develop various protection algorithms
5	Apply digital protection techniques in power system

UNIT 1

11 Hours

Evolution of digital relays from electromechanical relays, Performance and operational characteristics of digital protection, Mathematical background of protection algorithms.

UNIT 2

11 Hours

Finite difference techniques, Interpolation formulae, forward, backward and central difference interpolation, Numerical differentiation, Basic elements of digital protection, Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers,

UNIT 3

11 Hours

Conversion subsystem: the sampling theorem, signal aliasing, Error, sample and hold circuits, multiplexers, analog to digital conversion, Digital filtering concepts, The digital relay as a unit consisting of hardware and software Sinusoidal wave based algorithms, Sample and first derivative (Mann and Morrison) algorithm,

UNIT 4

11 Hours

Fourier Algorithm: Full cycle window algorithm, fractional cycle window algorithm, Walsh function based algorithm. Differential equation based algorithms. Travelling Wave based Techniques, Digital Differential Protection of Transformers, Digital Line Differential Protection, and Recent Advances in Digital Protection of Power Systems.

Text/Reference:

1. A.G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009
2. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press, 1999
3. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006
4. S.R.Bhide "Digital Power System Protection" PHI Learning Pvt.Ltd.2014
5. Ravindra P Singh "Digital Power System Protection" PHI learning

E-Book and Online learning material:

1. https://books.google.co.in/books?id=0reaEkBzX8C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
2. <https://epdf.pub/download/computer-relaying-for-power-systems-2nd-edition/>
3. <https://nptel.ac.in/courses/108/101/108101039/>

Subject Code: MEP-112

Subject Name: POWER SYSTEM DYNAMICS-II

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Core

Prerequisites: Power System Dynamics-I

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Gain valuable insights into the dynamic phenomena of power system
2	Understand and Analyze the power system rotor angle stability problem
3	Understand and Analyze the power system voltage stability problem
4	Analyze and implement modern control strategies for automatic generation control
5	Simulate small signal and large signal stability problems

UNIT 1

11 Hours

Basic Concepts of Dynamic Systems and Stability Definition, Small Signal Stability (Low Frequency Oscillations) of Unregulated and Regulated System, Effect of Damper, Flux Linkage Variation and AVR

UNIT 2

11 Hours

Large Signal Rotor Angle Stability, Dynamic Equivalents And Coherency, Direct Method of Stability Assessment, Stability Enhancing Techniques, Mitigation Using Power System Stabilizer

UNIT 3

11 Hours

Asynchronous Operation and Resynchronization, Multi-Machine Stability, Dynamic Analysis of Voltage Stability, Voltage Collapse

UNIT 4

11 Hours

Frequency Stability, Automatic Generation Control, Primary and Secondary Control, Sub-Synchronous Resonance and Counter Measures, use of simulation tool for automatic generation control.

Text/Reference:

1. P. Kundur, "Power System Stability and Control", McGraw Hill Inc, 1994
2. J. Machowski, Bialek, Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997
3. L. Leonard Grigsby (Ed.); "Power System Stability and Control", Second edition, CRC Press, 2007
4. V. Ajjarapu, "Computational Techniques for voltage stability assessment & control"; Springer, 2006

E-Book and Online learning material:

1. <http://www.elcomhu.com/Electrical/Power%20System%20Stability/%5Bprabha%20kundur%5D%20power%20system%20stability%20and%20control.pdf>
2. <https://nptel.ac.in/courses/108/102/108102080/>

Subject Code: MEP-113

Subject Name: RESTRUCTURED POWER SYSTEMS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits:3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective III

Prerequisites: Power System analysis

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Identify the need of regulation and deregulation.
2	Understand market architectures in deregulated power system environment.
3	Define and describe the Technical and Non-technical issues in Deregulated Power Industry.
4	Identify and give examples of existing electricity markets.
5	Classify different market mechanisms and summarize the role of various entities in the market.

UNIT 1

11 Hours

Fundamentals of restructured system, Market architecture, Load elasticity, supply and demand bidding, Social welfare maximization

UNIT 2

11 Hours

Optimal power flow (OPF): Role of OPF in vertically integrated systems and in restructured markets, congestion management techniques

UNIT 3

11 Hours

Optimal bidding, Risk assessment, Hedging, Transmission pricing, Tracing of power, Ancillary services, Standard market design, distributed generation in restructured markets

UNIT 4

11 Hours

Developments in India, Information Technology applications in restructured market, working of restructured power systems, Pennsylvania-New Jersey-Maryland (PJM) Interconnection, recent trends in Restructuring

Text/Reference:

1. Lorrin Philipson, H. Lee Willis, "Understanding electric utilities and de-regulation", Marcel Dekker Pub., 1998.
2. Steven Stoft, "Power system economics: designing markets for electricity", John Wiley and Sons, 2002.
3. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boelen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.
4. Mohammad Shahidehpour, Muwaffaq Alomoush, "Restructured electrical power systems: operation, trading and volatility", Marcel Dekker.
5. P. Venkatesh, B.V. Manikandan. S. Charles Raja. A. Srinivasan. Electrical. Power Systems. Analysis, Security and Deregulation, PHI Learning, 2012
6. Loi Lei Lai. Power System Restructuring and Deregulation: Trading, Performance and Information Technology., Wiley, 2001
7. A. R. Abhyankar, S. A. Khaparde, Restructured Power Systems, Narosa, 2011

E-Book and Online learning material:

1. <https://nptel.ac.in/courses/108/101/108101005/>

Subject Code: MEP-114

Subject Name: ADVANCED DIGITAL SIGNAL PROCESSING

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester:2	Teaching Hours: 44
Theory/Practical: Theory	Credits:3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective III

Prerequisites: Linear algebra, Calculus and multivariable calculus, Signal and system (At UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Analyze the time domain and frequency domain representations as well analysis of discrete time signals and systems
2	Understand the design techniques for IIR and FIR filters and their realization structures.
3	Understand the implementation of digital filters
4	Understand about the various linear signal models and estimation of power spectrum of stationary random signals
5	Design of optimum FIR and IIR filters

UNIT 1

11 Hours

Discrete time signals, linear shift invariant systems, Stability and causality, Sampling of continuous time signals, discrete time Fourier transform- Discrete Fourier series- Discrete Fourier transform (DFT),

UNIT 2

11 Hours

Z transform-Properties of different transforms, linear convolution using DFT, Computation of DFT Design of IIR digital filters from analog filters, Impulse invariance method, bilinear transformation method

UNIT 3

11 Hours

Finite Impulse Response (FIR) filter design using window functions, Comparison of Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) digital filters, Basic IIR and FIR filter realization structures, Coefficient quantisation effects in IIR and FIR filters, A/D conversion noise- Arithmetic round-off errors, Dynamic range scaling.

UNIT 4

11 Hours

All pole, zero and Pole-zero models, Power spectrum estimation- Spectral analysis of deterministic signals, Estimation of power spectrum of stationary random signals, Optimum linear filters, Optimum signal estimation, Mean square error estimation.

Text/Reference:

- Sanjit K Mitra, "Digital Signal Processing: A computer-based approach", Tata Mc Grow-Hill Edition 1998
- Dimitris G. Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", Mc Grow Hill international editions. -2000
- Andreas Antoniou "Digital Filters: Analysis, Design, and Signal Processing Applications" Tata Mc Grow-Hill Edition 2018

E-Book and Online learning material:

- <https://nptel.ac.in/courses/108/106/108106151/>
- <https://nptel.ac.in/courses/108/105/108105055/>
- <http://dl.icdst.org/pdfs/files/025bf242e23c7ed259ea93f3cdfbb2f2.pdf>

Subject Code: MEP-115

Subject Name: HIGH POWER CONVERTERS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-III

Prerequisites: Power Electronics at UG level

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the characteristics of PSDs such as SCRs, GTOs, IGBTs and use them in practical systems
2	Knowledge of working of multi-level VSIs, DC-DC switched mode converters
3	Knowledge of working of CSI and DC-DC switched mode converters
4	Knowledge of working of cyclo-converters, power conditioners and their applications
5	Ability to design power circuit and protection circuit of PSDs and converters

UNITS 1

11 Hours

Power electronic systems, An overview of power semiconductor devices (PSD), multipulse diode rectifier, multipulse SCR rectifier.

UNIT 2

11 Hours

Phase shifting transformers, multilevel voltage source inverters: two level voltage source inverter, cascaded, H bridge multilevel inverter.

UNIT 3

11 Hours

Diode clamped multilevel inverters, flying capacitor multilevel inverter, PWM current source inverters, DC to DC switch mode converters

UNIT 4

11 Hours

AC voltage controllers: Cyclo-converters, matrix converter, Power conditioners and UPS, Design aspects of converters, protection of devices and circuits

Text/Reference:

1. N. Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: Converter, Applications and Design", John Wiley and Sons, 1989
2. M.H. Rashid, "Power Electronics", Prentice Hall of India, 1994
3. B. K .Bose, "Power Electronics and A.C. Drives", Prentice Hall, 1986
4. Bin Wu, "High power converters and drives", IEEE press, Wiley Enter science

E-Book and Online learning material:

1. <https://jntuforum.com/files/JNTUK/ElectricMachinesbyB.K.Bose.pdf>
2. https://www.academia.edu/36264608/HIGH-POWER_CONVERTERS_AND_AC_DRIVES
3. <https://download.e-bookshelf.de/download/0008/4373/77/L-G-0008437377-0017429215.pdf>

Subject Code: MEP-116
Subject Name: POWER APPARTUS DESIGN

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits:3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective III

Prerequisites: Machine design at UG level

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the general concepts of electrical machine design.
2	Acquire knowledge about various insulating materials used in electrical machine design.
3	Understand the different ways of cooling and ventilation of electric machine.
4	Analyze, design, model and synthesize of Transformers and Induction motors.
5	Learning of mathematical models of power system components

UNIT 1

11 Hours

Principles of Design of Machines Basic: General considerations & Limitations in design, specific magnetic and electric loadings, output, real and apparent flux densities, separation of main dimensions for D.C., induction and synchronous machines. Review of different types of insulating materials used in electrical machines.

UNIT 2

11 Hours

Heating, Cooling and Ventilation: Introduction, Modes of heat transfer, Heating and cooling of machines, Temperature rise calculation, continuous, short time and intermittent ratings, methods of ventilation and cooling.

UNIT 3

11 Hours

Design of Transformers: General considerations, output equation, choice of flux density and current density, main dimensions, leakage reactance & conductor size, design of tank and cooling tubes, calculation of magnetizing current, losses, efficiency and regulation, Recent advances in design of transformer.

UNIT 4

11 Hours

Design of Three-Phase Induction Motors & Alternators: General considerations, output equation, choice of specific electric and magnetic loadings, No. of slots in stator and rotor, elimination of harmonic torques, design of stator and rotor windings, leakage reactance, equivalent resistance of squirrel cage rotor, Types of alternators, comparison, specific loadings, output co-efficient, design of main dimensions.

Text/Reference:

1. Clayton A.E, "The Performance and Design of D.C. Machines", Sir I. Pitman & sons, Ltd.
2. M.G. Say, "The Performance and Design of A.C. Machines ", Pitman
3. Sawhney A.K, "A course in Electrical Machine Design", Dhanpat Rai & Sons, 5th Edition
4. Aggarwal R. K., Principles of Electrical Machine Design, S. K. Kataria & Sons.
5. Fitzgerald A.E., Charles Kingsley, Jr, and Stephan D, Umanx, Electric Machinery, Tata McGraw Hill.

E-Book and Online learning material:

1. <http://prof.usb.ve/jaller/Fitzgerald.pdf>

Subject Code: MEP-117

Subject Name: ADVANCED MICRO-CONTROLLER BASED SYSTEMS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective IV

Prerequisites: Microprocessor & Microcontroller (At UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	To learn how to program a processor in assembly language
2	To learn how to develop an advanced processor based system
3	To learn configuring and using different peripherals in a digital system
4	To compile and debug a Program
5	To generate an executable file and use it

UNIT 1

11 Hours

Basic Computer Organization, Accumulator based Processes-Architecture, Memory Organization-I/O Organization

UNIT 2

11 Hours

Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories, I/O Ports, Serial Communication Timers, Interrupts, Programming, Intel 8051 – Assembly language programming, Addressing-Operations, Stack & Subroutines, Interrupts-DMA 8

UNIT 3

11 Hours

PIC 16F877- Architecture Programming, Interfacing Memory/ I/O Devices, Serial I/O and data communication

UNIT 4

11 Hours

Digital Signal Processor (DSP), Architecture – Programming, Introduction to FPGA, Microcontroller development for motor control applications, Stepper motor control using micro controller

Text/Reference:

1. John.F.Wakerly: “Microcomputer Architecture and Programming”, John Wiley and Sons 1981
2. Ramesh S. Gaonker: “Microprocessor Architecture, Programming and Applications with the 8085”, Penram International Publishing (India), 1994
3. Raj Kamal: “The Concepts and Features of Microcontrollers”, Wheeler Publishing, 2005
4. Kenneth J. Ayala, “The 8051 microcontroller”, Cengage Learning, 2004
5. John Morton,” The PIC microcontroller: your personal introductory course”, Elsevier, 2005
6. Dogan Ibrahim,” Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F Series”, Elsevier, 2008
7. Microchip datasheets for PIC16F877

E-Book and Online learning material:

1. http://s1.nonlinear.ir/epublish/book/The_PIC_Microcontroller_Your_Personal_Introductory_Course_0750666641.pdf
2. <http://www.kelm.ftn.uns.ac.rs/literatura/mms/pdf/The%208051%20Microcontroller%20Architecture,%20Programming%20And%20Applications.pdf>

Subject Code: MEP-118
Subject Name: WIND AND SOLAR SYSTEMS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks:100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-IV

Prerequisites: Non Conventional energy resources (At UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate the importance of energy growth of the power generation from the renewable energy sources and participate in solving these problems
2	Demonstrate the knowledge of the physics of wind and all associated issues
3	Demonstrate the knowledge of the physics of solar power generation and all associated issues so as to solve practical problems
4	Demonstrate the knowledge of physics of solar power generation and the associated issues
5	Identify, formulate and solve the problems of energy crises using wind and solar energy

UNIT 1

11 Hours

Historical development and current status, characteristics of wind power generation, network integration issues

UNIT 2

11 Hours

Generators and power electronics for wind turbines, power quality standards for wind turbines, Technical regulations for interconnections of wind farm with power systems.

UNIT 3

11 Hours

Isolated wind systems, reactive power and voltage control, economic aspects, Impacts on power system dynamics, power system interconnection

UNIT 4

11 Hours

Introduction of solar systems, merits and demerits, concentrators, various applications, Solar thermal power generation, PV power generation, Energy Storage device, designing the solar system for small installations.

Text/Reference:

1. Thomas Ackermann, Editor, "Wind power in Power Systems", John Willy and sons ltd.2005
2. Siegfried Heier, "Grid integration of wind energy conversion systems", John Willy and sons ltd., 2006
3. K. Sukhatme and S.P. Sukhatme, "Solar Energy". Tata Mc Graw Hill, Second Edition, 1996

E-Book and Online learning material:

1. <https://www.rpc.com.au/information/faq/wind-power/wind-energy-systems.html>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: MEP-119
Subject Name: POWER QUALITY

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester:2	Teaching Hours: 44
Theory/Practical: Theory	Credits:3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective IV

Prerequisites: Power Systems & Power Electronics at UG level

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Acquire knowledge about the harmonics, harmonic introducing devices
2	Acquire knowledge about effect of harmonics on system equipment and loads
3	To develop analytical modeling skills needed for modeling and analysis of harmonics in networks and components
4	To have knowledge of active power factor correction based on static VAR compensators and its control techniques
5	To impart knowledge about series and shunt active power filtering techniques for harmonic

UNIT 1

11 Hours

Introduction-power quality-voltage quality-overview of power quality phenomena classification of power quality issues-power quality measures and standards-THD-TIF-DIN-C message weights-flicker factor transient phenomena-occurrence of power quality, voltage sags and swells, Current and voltage limits of harmonic distortions: IEEE, IEC, EN, NORSO.

UNIT 2

11 Hours

Harmonics-individual and total harmonic distortion, Causes of harmonics, RMS value of a harmonic waveform-Triplex harmonics-important harmonic introducing devices-SMPS, Elimination/suppression of harmonics, Three phase power converters- arcing devices saturable devices-harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads. Modeling of networks and components under non-sinusoidal conditions transmission and distribution systems, Shunt capacitors-transformers-electric machines-ground, systems loads that cause power quality problems, power quality problems created by drives and its impact on drive

UNIT 3

11 Hours

Power factor improvement- Passive Compensation , Passive Filtering , Harmonic ,Resonance, Control Methods for Single Phase APFC, Three Phase APFC and Control Techniques, PFC, Based on Bilateral Single Phase and Three Phase Converter, Static VAR compensators-SVC and STATCOM Active Harmonic Filtering-Shunt Injection, Filter for single phase, three-phase three-wire and three-phase four wire systems, d-q domain control of three phase shunt active filters uninterruptible power supplies constant voltage , transformers, series active power filtering techniques for harmonic cancellation and isolation.

UNIT 4

11 Hours

Dynamic Voltage Restorers for sag, swell and flicker problems. Grounding and wiring introduction, NEC grounding requirements-reasons for grounding, typical grounding and wiring problems solutions to grounding and wiring problems

Text/Reference:

1. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
2. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000
3. J. Arrillaga, "Power System Quality Assessment", John Wiley, 2000
4. J. Arrillaga, B.C. Smith, N.R. Watson & A. R. Wood, "Power system Harmonic Analysis", Wiley, 2008
5. Dugan R. C., McGranaghan M. F. and Beaty H. W., "Electrical Power System Quality", McGraw-Hill International Book Company
6. Surajit Chattopadhyay, "Electric Power Quality (Power Systems)" Springer, 2011 Edition

E-Book and Online learning material:

1. <http://uni-site.ir/khuelec/wp-content/uploads/Electrical-Power-Systems-Quality-2nd-Ed-Malestrom.pdf>
2. http://www.gcebargur.ac.in/sites/gcebargur.ac.in/files/lectures_desk/electrical_power_systems_quality.pdf
3. <https://nptel.ac.in/courses/108/106/108106025/>

Subject Code: MEP-120

Subject Name: ARTIFICIAL INTELLIGENCE TECHNIQUES

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks:100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective IV

Prerequisites: Probability and statistics

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the concepts of biological foundations of artificial neural networks
2	Understand Feedback networks and radial basis function networks and fuzzy logics
3	Explain the concept of fuzzy logic and fuzzy logic system
4	Identifications of neural network
5	Apply concept of genetic algorithms and genetic operator.

UNIT 1

11 Hours

Biological foundations to intelligent Systems, Artificial Neural Networks, Single layer and Multilayer Feed Forward NN, LMS and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks

UNIT 2

11 Hours

Fuzzy Logic, Knowledge Representation and Inference Mechanism, Defuzzification Methods

UNIT 3

11 Hours

Fuzzy Neural Networks, some algorithms to learn the parameters of the network like GA, System Identification using Fuzzy and Neural Network

UNIT 4

11 Hours

Genetic algorithms, Reproduction cross over, mutation, Introduction to evolutionary program, Applications of techniques to practical problems

Text/Reference:

1. J M Zurada , “An Introduction to ANN”, Jaico Publishing House
2. Simon Haykins, “Neural Networks”, Prentice Hall
3. Timothy Ross, “Fuzzy Logic with Engg. Applications”, McGraw. Hill
4. Driankov, Dimitra, “An Introduction to Fuzzy Control”, Narosa Publication
5. Golding, “Genetic Algorithms”, Addison-Wesley Publishing Com

E-Book and Online learning material:

1. <https://books.google.co.in/books?id=03DfRqUrTwsC&pg>

Subject Code: LMEP-103

Subject Name: POWER SYSTEM PROTECTION LABORATORY

Programme: M.Tech (Power Engg.)	L: 0 T: 0 P: 4
Semester: 2	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: Digital Protection of Power System

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the operation and characteristics of electro-mechanical/ static/numerical relays.
2	Understand the operation of reverse power protection.
3	Understand the use of microcontroller/ arduino for power system protection.
4	Understand the use of software tool for short circuit analysis.
5	Understand the use of energy analyzer for power system monitoring.

Experiments:-

Sr. No. Name of Practical

1. To perform and plot inverse time characteristics of Electro-mechanical Non-directional Over-current relay for power system protection.
2. To perform and plot inverse time characteristics of Electro-mechanical directional Over-current relay for power system protection.
3. To perform and plot the characteristics of Static overcurrent relay.
4. To perform and plot the characteristics of Static earth-fault relay.
5. To perform and plot the characteristics of Numerical Over- and Under- Voltage relays.
6. To perform reverse power protection.
7. Monitoring and analysis of power system using three-phase energy analyser.
8. Determination of ground resistance and soil resistivity.
9. Testing the dielectric strength of insulating oil.
10. Use of Microcontroller/Arduino for power system protection.
11. Short Circuit Analysis using software tool.
12. Modelling of Differential Relay using software tool.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (POWER ENGINEERING) FULL-TIME 2019 ONWARDS

Subject Code: LMEP-104
Subject Name: SMART GRID LABORATORY

Programme: M.Tech (Power Engg.)	L: 0 T: 0 P: 4
Semester: 2	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: Advanced Power System Analysis

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the fundamental elements of the smart grid system.
2	Understand the use of WAVECT controller for smart grid system.
3	Use simulation tools such as MATLAB/Labview/ WAVECT for power flow analysis, optimization and state estimation
4	Understand communication, networking, and sensing technologies involved with the smart grid.
5	Understand key technologies in generation, transmission and distribution systems that enables smart grid.

Experiments:-

Sr. No. Name of Practical

1. Familiarization with the components of Smart Grid using laboratory scale Real Time Control Prototyping (RCP) system.
2. Introduction to FPGA based WAVECT controller for control and communication.
3. To generate a simple PWM signal and implement it using WAVECT controller.
4. To develop three phase representation of grid connected solar PV based smart grid system.
5. Use of WAVECT software for Power System Analyzer plots.
6. To develop strategy for synchronized connection of various power sources.
7. To study a basic Demand Side Management (DSM) technique for load management in a micro grid using a laboratory scale Real Time Control Prototyping (RCP) system.
8. Write a program using software tool for optimal power flow of smart grid system.
9. Write a program using software tool for state estimation.
10. Use of simulation tool LAB-VIEW for Smart Grid Architecture Model.
11. Intelligent automatic generation control with high penetration of renewable.
12. Testing inverter design for solar emulator to a step change in load.
13. To develop reactive power strategy and its testing using software tool.

Guru Nanak Dev Engineering College, Ludhiana

Department of Production Engineering

No. PE/159(i)

Dated: 22/3/14

MINUTES OF MEETING

Minutes of meeting of First Board of Studies held on 22-03-2014 at 10:30 AM in committee room:

The following persons were present:

1. Dr. O.P Singh	9. Dr. Jatinder Kapoor
2. Dr. Sanjeev kumar	10. Dr. Harwinder Singh
3. Dr. R.S Bhatti	11. Prof. B.S Gill
4. Prof. J.S Ratol	12. Prof. Jagdeep Singh
5. Er. Lalit Sharma	13. Prof. Jaswinder Singh
6. Prof J.S Grewal	14. Prof. Parminder Singh
7. Dr. Rupinder Singh	15. Prof. Iqwinderpreet Singh
8. Dr.J.N Jha	

The meeting started with welcome note & already circulated agenda was set in notion.

Following decisions were taken unanimously:-

Proceedings

1.1 Percentage of credit hours of existing course is given below for discussion:-

S.No.	Broad Area	Existing Percentage of credits	Range recommended as per AICTE model curriculum
1.	Humanities and Social Sciences (HS) including Management	9.1	5-10
2.	Basic sciences (including electives) and Env. Sc. Including human values	10.2	15-20
3.	Engineering sciences including materials, workshops, drawing, basics of electrical/electronics/mechanical/computer etc.	26.5	15-20
4.	Professional courses relevant to the chosen specialization/branch	39.3	30-40
5.	Professional subjects-electives relevant to chosen specialization	4	10-15
6.	Open elective from other technical and emerging subject areas	2	5-10
7.	Project work/seminar and/or internship in Industry	11.7	10-15

Discussion was made on this issue. The matter was approved in principle.

- 1.2 Industrial Training : Discussion on the Present system and suggestions for further improvement

Discussion was made on this issue. Members were interested for bifurcation of training into 2-3 parts for its effectiveness. The matter was approved in principle.

- 1.3 Credit based System to be implemented from 2015 Admission Batch

Approved

- 1.4 Core/ Elective Subjects has to be reviewed must be covering the Gate Syllabus.

Discussion was made on this issue. The matter was approved in principle

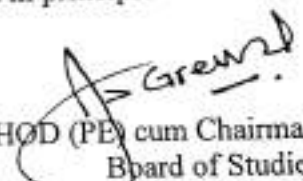
- 1.5 The question papers of End Semester examinations should be 100% internal but should be checked by a committee consisting of two external members, two internal members and HOD for proper format and standard.

Discussion was made on this issue. The matter was approved in principle.

- 1.6 The revised Scheme and syllabus should be completed before 15th june,2014 and final approval of the same should be taken by BOS before 30th june,2014 .

Discussion was made on this issue. The matter was approved in principle

The meeting ended with vote of thanks.


HOD (PE) cum Chairman
Board of Studies

Distribution:

1. Director, GNDEC, Ludhiana for kind information
2. All members of BOS (PE)
3. Dean Academics, GNDEC, Ludhiana
4. BOS file

Department of Production Engineering
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
MASTER OF TECHNOLOGY
(PRODUCTION ENGINEERING) 2019

Syllabus Scheme for Master of Technology Production Engineering Starting 2019 onwards

Total Credits: 19+18+16+16=69

1st Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks		
				L	T	P			InL	Ext.	Total
1	MPE-101	Core Course	Advanced Metal Forming	3	0	0	3	Theory	50	100	150
2	MPE-102	Core Course	Advanced Metal Casting	3	0	0	3	Theory	50	100	150
3	MPE-XXX	Program Elective	Program Elective I (Any one)								
	MPE-105		Entrepreneurship	3	0	0	3	Theory	50	100	150
	MPE-106		Jig Fixture and Press Design								
	MPE-107		Advanced Plant Layout Design								
4	MPE-XXX	Program Elective	Program Elective II (Any one)								
	MPE-108		Product Design and Development	3	0	0	3	Theory	50	100	150
	MPE-109		Additive Manufacturing Process and Applications								
	MPE-110		Flexible Manufacturing Systems								
5	LMPE-101	Core Course	Advanced Manufacturing processes Laboratory	0	0	4	2	Practical	50	50	100
6	LMPE-102	Core Course	Advanced Machining and Casting processes Laboratory	0	0	4	2	Practical	50	50	100
7	MRM-101	Core Course	Research Methodology and IPR	3	0	0	3	Theory	50	100	150
8	MAC-105	Audit Course 1	Constitution of India	2	0	0	0	Theory	50	-	50
Total				17	0	12	19		40	600	1000

2nd Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks		
				L	T	P			IntL	Ext.	Total
1	MPE-103	Core Course	Advanced Welding Processes	3	0		3	Theory	50	100	150
2	MPE-104	Core Course	Advanced Metal Cutting	3	0		3	Theory	50	100	150
3	MPE-XXX	Program Elective	Program Elective III (Any one)								
	MPE-111		Production and Inventory Control	3	0		3	Theory	50	100	150
	MPE-112		Quality Assurance								
	MPE-113		Advanced Industrial Tribology								
4	MPE-XXX	Program Elective	Program Elective IV (Any one)								
	MPE-114		Industrial Robotic Design	3	0		3	Theory	50	100	150
	MPE-115		Non-Conventional Machining Process								
	MPE-116		Computer Aided Design								
5	LMPE-103	Core Course	Advanced Welding Process Laboratory	0	0	4	2	Practical	50	50	100
6	LMPE-104	Core Course	Mechanical and Morphological characterization Laboratory	0	0	4	2	Practical	50	50	100
7	LMPE-101	Core Course	Project	0	0	4	2	Practical	50	50	100
8	MAC-106	Audit Course 2	Pedagogy Studies	2	0	0	0	Theory	50	-	50
Total				14	0	12	18		40	550	950

3rd Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks	
				L	T	P			Int.	Ext. Total
1	MPE-XXX	Program Elective	Program Elective V (Any one)							
	MPE-117		Operations Management	3	0	0	3	Theory	50	100
	MEP-118		Materials Management							150
	MPE-119		Advance Operations Research							
2	MOZZ-XXX	Open Elective	Open Elective 1	3	0	0	3	Theory	50	100
3	MPTPE-101	Pre-thesis	Formulation of research problem	0	0	20	10	Practical	10	200
Total				6	0	20	16		20	500

4th Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks	
				L	T	P			Int.	Ext. Total
1	MTPE-101	Thesis	Thesis work	0	0	32	16	Practical	10	300
Total				0	0	32	16		10	300

List of Electives

Audit course 1 & 2	List of Open Elective	Open Elective offered by Production Engineering
MAC-101 English for Research Paper Writing MAC-102 Disaster Management MAC-103 Sanskrit for Technical Knowledge MAC-104 Value Education MAC-105 Constitution of India MAC-106 Pedagogy Studies MAC-107 Stress Management by Yoga MAC-108 Personality Development through Life Enlightenment Skills.	1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy	MPE-120 Industrial Safety MPE-121 Operations Research MPE-122 Composite Materials

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

7th BOS meeting
of
Production Engineering
on
13-12-2019 (Friday)



Venue: Production Engg. Dept.

Guru Nanak Dev Engineering College
An Autonomous College u/s Act 2(f) and 12(B) of UGC act 1956
Gill Road, Gill Park, Ludhiana

Minutes of meeting of 7th Board of Studies Meeting of Production Engineering on 13-12-2019

A meeting of BOS (Production Engg.) was held on 13-12-2019 at 12.30PM in Production Engineering Dept.. The following members were present-

Dr. J.S.Grewal, Prof. & Head P.E GNDEC Ludhiana
Dr. Rupinder Singh, Prof. P.E GNDEC Ludhiana
Dr. Jagdeep Singh, Asst. Prof. P.E GNDEC Ludhiana.
Dr. Jatinder Kapoor, Prof. M.E GNDEC Ludhiana
Dr. Harwinder Singh, Prof. M.E GNDEC Ludhiana
Dr. O.P.Singh, Prof. M.E BCET Gurdaspur
Dr. Sanjeev Kumar, Prof. M.E PEC Chandigarh
Dr. Dixit Garg, Prof. M.E NIT Kurukshetra
Dr. Sandeep Grover, Prof. M.E YMCA Faridabad
Er. Lalit Sharma (Industrialist and Alumni GNDEC Ludhiana)
Dr. N.S.Bhangu (Nominee of Dean Academics GNDEC Ludhiana)
Er. G.S.Sodhi (TPO, GNDEC Ludhiana)
Dr. H.S.Rai (COE, GNDEC Ludhiana)

The following member was not able to attend the meeting: Dr. Harpuneet Singh, Asst. Prof. P.E GNDEC Ludhiana, Dr. J.P Singh Senior Scientific Officer, DGQA (MoD)

1. Apprising the Board of Studies about name change of UG Production Engineering course from Production Engineering to Production and Industrial Engineering

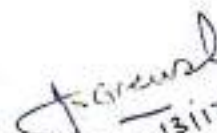
The matter was discussed at large. Approved with new nomenclature as B.Tech Mechanical (Production) in accordance with AICTE notification F.No 27/RIFD/Pay/01/2017-18, Dt. 28 April, 2017

2. To discuss and finalize the M.Tech Production Engineering syllabus

Approved

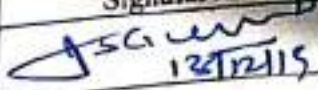
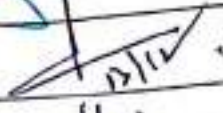
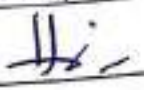
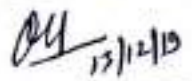
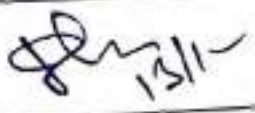
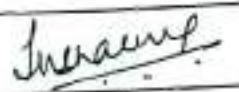
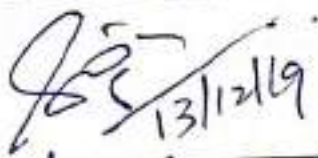
3. To start certificate course/diploma/post diploma/ post graduate diploma

Approved. Initially the course will be offered on 3D printing


13/12/2019
Chairman (BOS), P.E

3

List of BOS members

S.No.	Name	Designation	Signature
1.	Dr. J.S.Grewal, Prof. & Head	Chairman	 13/12/19
2.	Dr. Rupinder Singh, Prof.	Member	
3.	Dr. Harpuneet Singh, Asst. Prof.	Member	— As
4.	Dr. Jagdeep Singh, Asst. Prof.	Member	
5.	Dr. Jatinder Kapoor, Prof. Mechanical Engg.	Member	
6.	Dr. Harwinder Singh, Prof. Mechanical Engg.	Member	
7.	Dr. O.P.Singh, Prof. Mechanical Engg. BCET Gurdaspur	Member	 13/12/19
8.	Dr. Dixit Garg, Prof. Mechanical Engg. NIT Kurukshetra	Member	 13/11
9.	Dr. J.P.Singh, Senior Scientific Officer, DGQA (MoD)	Member	— As
10.	Er. Lalit Sharma, Industrialist	Member	
11.	Dr. Sanjeev Kumar, Prof. Mechanical Engg. PEC Chandigarh	Member	
12.	Dr. Sandeep Grover, Prof. Mechanical Engg. YMCA Univ. of Sc. & Tech., Faridabad	Member Nominated by IKGPTU Jalandhar	 13/12/19
13.	Dean Academic/ Nominee	Member	
14.	COE/Nominee	Member	
15.	Dean T & P/ Nominee	Member	

Agenda Items

1. Apprising the Board of Studies about name change of UG Production Engineering course from Production Engineering to Production and Industrial Engineering

Keeping in view of GATE 2020 requirement it is proposed to change the B.Tech Production Engineering course to B.Tech Production and Industrial Engineering. For additional subjects required in Industrial Engineering part, it is proposed to offer the same through MOOCs platform.

The syllabus for GATE 2020 under Production and Industrial Engineering is enclosed (Annex. I). Also the study scheme and syllabus for B.Tech Production Engineering is also attached (Annex. II). The courses deficit to comply by GATE 2020 may be offered through MOOCs platform.

Submitted for Consideration & Approval

2. To discuss and finalize the M.Tech Production Engineering syllabus

The detailed syllabus and scheme is enclosed (Annex. III) for discussion and ratification.

Submitted for Consideration & Approval

3. To start certificate course/diploma/post diploma/ post graduate diploma

In accordance with UGC approval to Autonomous Colleges to run certificate/diploma/post diploma/post graduate diploma it is proposed to run the same in following two specializations:

- (a) Project management
- (b) 3D printing

The syllabus for both (a) Project management and (b) 3D printing is enclosed (Annex. IV and Annex. V)

Submitted for Consideration & Approval

ACTION TAKEN REPORT

1. The syllabus of 3rd and 4th semester UG Production Engineering along with detailed scheme for UG and PG has been prepared.

Noted, Implemented.

2. Summer training was successfully completed with modified syllabus contents.

Noted, Implemented.

3. The BOS has recommended revision in syllabus of Machine drawing, Material science, Manufacturing processes, Physical metallurgy and heat treatment along with some structural changes in examination pattern.

Noted and implemented.

Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Minutes of Meeting

The 2nd meeting of Board of Studies (Civil Engineering) was held on 6th September, 2014 in the office of Head of Department, Civil department and chaired by Dr. J N Jha (Professor & Head).

Following members were present in the meeting:

- Dr. J.N.Jha – Chairman - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harpal Singh – Member - Guru Nanak Dev Engineering College, Ludhiana,
- Dr. H S Rai –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. B S Walla –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. K S Gill – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harvinder Singh – Member - Guru Nanak Dev Engineering College, Ludhiana
- Er. Inderpreet Kaur – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Sanjeev Aggarwal – Member- GZSPTU Campus, Bathinda- Subject Expert- VC Nominee
- Dr. S P Singh – Member- NIT Jalandhar- Subject Expert
- Dr. Siby John – Member- PEC University of Technology, Chandigarh-Subject Expert- Director's Nominee
- Er. Satish Kumar Tanwar –Member- Ultratech- Industry Representative,
- Er. T S Chahal –Member- Supt. Engg.-PWD, B&R, Govt. of Punjab – alumina
- Er. Gurdeepak Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Harjinder Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana

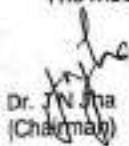
The Following decisions were taken:

1. The proposed credit system for B.Tech (Civil Engg.) -UG course (2014 admission batch onwards and to be implemented from 3rd semester i.e. Aug.2015 session) were discussed and are accepted with minor changes. The credits of two subjects (BTCE-501, BTCE502) of 5th semester were reduced from 5 to 4 and are added to subject 'Survey Camp Training' credits of same semester.
2. It was also suggested that concept of open elective should be started at UG level. This suggestion will be forwarded to Academic Council for further discussion.
3. In light of UGC recommendations the subject 'Research methodology' was made core subject in all PG courses offered in Civil Engineering Department.
4. Subject 'Air Pollution & Control' was included in the list of core subjects for the scheme of M.Tech Environmental Science & Engineering.

2014/9/6

5. The subjects 'Water & Waste Water Treatment Technologies-I' and 'Water & Waste Water Treatment Technologies-II' has been renamed as 'Physico-Chemical Treatment Methods' and 'Biological Treatment Methods' respectively in the scheme of M.Tech Environmental Science & Engineering.
6. The subject 'Advanced Solid Mechanics' has been included as a core subject for the scheme of M.Tech. Structural Engineering Scheme. 'Advanced Structural Analysis' and 'Advanced Solid mechanics' subjects were merged together to accommodate 'Research methodology' as a core subject for the scheme of M.Tech. Structural Engineering Scheme.
7. BOS was of unanimous view that the list of 'Program Electives' and 'Open Electives' should be separate and accordingly the list of 'Program Electives' and 'Open Electives' were prepared separately for all PG courses currently running in the Civil Engineering Department.
8. The proposed syllabus of 1st semester for all PG courses was approved.

The meeting ended with vote of thanks.


Dr. J.N. Jha
(Chairman)



Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Batch 2014 & onward

Scheme: M. Tech (Structural Engineering)—Full Time

Schedule of Teaching and study Scheme

Semester	Subjects	Credits	Contact Hours/week			No. of subjects	Distribution of marks		Total Credits
			L	T	P		Ext	Int	
1	Core subjects	4	4	-	-	3	100	50	20
	Program elective	3	3	-	-	1	100	50	
	Open elective	3	3	-	-	1	100	50	
	Laboratory-1	2	--	-	4	1	50	50	
2	Core subjects	4	4	-	-	3	100	50	20
	Program elective	3	3	-	-	1	100	50	
	Open elective	3	3	-	-	1	100	50	
	Laboratory-2	2	--	-	4	1	50	50	
3	Program elective	3	3	-	-	1	100	50	14
	Program elective	3	3	-	-	1	100	50	
	Pre-thesis seminar	4	-	-	4	1	50	50	
	Pre-thesis project	4	-	-	4	1	50	50	
4	Thesis/Dissertation	14	14	-	-	--	100	200	14
Total Marks and credits							1500	1000	68

List of Core Subjects

S. No.	Subject	Subject Code
1	Structural Dynamics	MTST-501
2	Bridge Engineering	MTST-502
3	Theory and Design of Plates, Shells and Grids	MTST-503
4	Research Methodology	MTST-504
5	Advanced Solid Mechanics & Structural Analysis	MTST-505
6	Plastic Analysis and Design of Steel Structures	MTST-506

List of Laboratory/Practical work

S. No.	Subject	Subject Code
1	Laboratory-1	MTST-507
2	Laboratory-2	MTST-508
3	Pre-thesis seminar	MTST-509
4	Pre-thesis project	MTST-510
5	Thesis	MTST-511

List of Program Electives

S. No.	Subject	Subject Code
1	Nonlinear Analysis and computer aided methods	MTST-601
2	Finite Element Methods	MTST-602
3	Non-destructive Testing and Composite Materials	MTST-603
4	High Rise Buildings	MTST-604
5	Structural Reliability	MTST-605
6	Structural Optimisation	MTST-606
7	Pre-stressed Concrete Structures	MTST-607
8	Analysis & Design of substructures	MTST-608
9	Soil-Structure Interaction	MTST-609
10	Earthquake Resistant Design of Masonry and RC Buildings	MTST-610
11	Buried Structures	MTST-611
12	Design of Highway and Airport Pavements	MTST-612
13	Environmental Impact assessment & Management	MTST-613
14	Disaster Reduction and Management	MTST-614
15	Site Investigations	MTST-615
16	Advanced Structure Design and detailing	MTST-616
17	Industrial Structures	MTST-617
18	Theory of elasticity and plasticity	MTST-618
19	Structural Stability	MTST-619
20	Ground Improvement	MTST-620

List of subjects to be offered as ‘Open Electives’

1	Experimental Methods in Engineering	MTCE-621
2	Numerical Methods in Engineering	MTCE-622
3	Instrumentation and model simulation	MTCE-623
4	Advanced Engineering Mathematics	MTCE-624
5	Probabilistic Methods in Engineering	MTCE-625
6	Limit Analysis	MTCE-626

Minutes of Meeting

The 11th BOS meeting was held in the HoD office (Civil) on 17 July, 2019 under the chair of Dr. H. S. Rai (Professor and BOS Chairman), whereby following members were present:

Dr. H. S. Rai – Chairman - GNDEC, Ludhiana

Dr. K. S. Gill – Member - GNDEC, Ludhiana

Dr. Harpal Singh – Member- GNDEC, Ludhiana

Dr. Harvinder Singh – Member - GNDEC, Ludhiana

Dr. Jagbir Singh – Member- GNDEC, Ludhiana

Dr. Gurdeepak Singh – Member- GNDEC, Ludhiana

Dr. Prashant Garg – Member- GNDEC, Ludhiana

Dr. Puneet Pal Singh Cheema – Member- GNDEC, Ludhiana

Dr. Inderpreet Kaur – Special Invitee – GNDEC, Ludhiana

Dr. Jaspal Singh – Special Invitee – Professor, PAU, Ludhiana

Er. Rakesh Garg – Special Invitee – Xen, PWD (B&R) – Industry Expert

Dr. Akshay Girdhar – Nominated Member (COE) - GNDEC, Ludhiana

Dr. N. S. Bhangu – Nominated Member (Academic Branch) - GNDEC, Ludhiana

Er. Charnjeet Singh – Special Invitee – GNDEC, Ludhiana

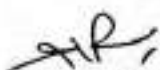
Dr. K. S. Gill relinquished the charge of BOS chairman after providing his services for three years. The department extended gratitude to him for his valuable contribution as BOS chairman.

Following decisions were taken against the agenda items:

1. Department proposed new study schemes for different M.Tech. Programs (Structural Engineering-Full Time, Geotechnical Engineering-Full Time, Environmental Science and Engineering-Full Time, Soil Mechanics & Foundation Engineering-Part Time) starting year 2019 (for Batch 2019 & onward) which were discussed & approved.
2. The syllabus for first semester pertaining to the above mentioned schemes was also discussed and approved.

3. The contents of course named "Building Information Modelling (BIM) 1425106" was proposed and approved for batch B.Tech 2017 and onward.
4. A list of 05 theory subjects (03 credits each) and 01 laboratory (01 credit) was finalized for B.Tech. (Batch 2018 & onward) students to select from, for class room study to qualify for "Civil Engineering" as Minor Engineering Branch.
5. A list of MOOC courses for the session July - November 2019 was finalized for B.Tech. (Batch 2018 & onward) students to qualify for "Civil Engineering" as Minor Engineering Branch.
6. A list of MOOC courses for the session July - November 2019 was finalized for B.Tech. (Batch 2018 & onward) students to qualify for B.Tech. Civil Engineering (Honor) degree.
7. Considering the importance and need of short term certificate course for professionals and graduate students, department proposed a certificate course on 'Analysis & Design of RC Buildings' of 60 hours (04 credits) course spread over a period of 3 months and the same was approved by the BOS.
8. Department proposed mutual swapping of "Geotechnical Engineering Lab" (Sem 5th) subject with "Transportation Engineering Lab" (Sem 6th) subject without changing the credits & total marks for B.Tech. Civil Engineering 2017 scheme. It was approved by the BOS.
9. Department proposed change in the credits of course "Environmental Systems Engineering" (MTEV - 16601) from 03 to 04 for M.Tech. (Environmental Science and Engineering) Scheme 2016 and the same was approved by BOS.

The meeting ended with vote of thanks to all present.


Dr. H. S. Rai

Encl: Copy of Study Schemes, syllabus & other items



Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department
M.Tech. (Structural Engineering)

Program Outcomes (POs):

After completion of the program graduates will be able to

1. Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude.
2. Identify, formulate and solve engineering problems in the domain of structural engineering field.
3. Use different software tools for Analysis and Design structural engineering domain.
4. Design and conduct experiments, analyze and interpret data, for development of simulation experiments.
5. Function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility.

First Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MST-101	Advanced Structural Analysis	3	0	0	50	100	150	3
Core Theory	MST-102	Finite Element Method in Structural Engineering	3	0	0	50	100	150	3
Elective	MST- AAA	Program Elective I	3	0	0	50	100	150	3
Elective	MST-BBB	Program Elective II	3	0	0	50	100	150	3
Core Lab I	LMST-101	Structural Design Laboratory	0	0	4	50	50	100	2
Core Lab II	LMST-102	Advanced Concrete Technology Laboratory	0	0	2	50	50	100	1
MLC	MRM-101	Research Methodology and IPR	3	0	0	50	100	150	3
Audit 1	MAC-102	Disaster Management	2	0	0	50	-	50	0
Total			17	0	6	400	600	1000	18
Second Semester									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MST-103	Advanced Solid Mechanics	3	0	0	50	100	150	3
Core Theory	MST-104	Structural Dynamics	3	0	0	50	100	150	3
Elective	MST- CCC	Program Elective III	3	0	0	50	100	150	3

Elective	MST- DDD	Program Elective IV	3	0	0	50	100	150	3
Core Lab III	LMST-103	Model Testing Laboratory	0	0	2	50	50	100	1
Core Lab IV	LMST-104	Numerical Analysis Laboratory	0	0	4	50	50	100	2
Core	LMPST-101	Project	0	0	4	50	50	100	2
Audit 2	MAC-101	English for research report / paper writing	2	0	0	50	-	50	0
Total			14	0	10	400	550	950	17

Third Semester

Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Elective	MST-EEE	Program Elective V	3	0	0	50	100	150	3
Open Elective	MOST-XXX	Open Elective	3	0	0	50	100	150	3
Pre-thesis	MPTST-101	Formulation of Research Problem	0	0	2*+ 18**	100	100	200	10
Total			6	0	20	200	300	500	16

Fourth Semester

Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Thesis	MTST-101	Thesis	0	0	4*+ 28**	100	200	300	16
Total			0	0	32	100	200	300	16

* Max hours for teacher

** Independent study hours

List of Electives		
S. No.	Course Name	Course Code
1	Theory of Thin Plates and Shells	MST – 111
2	Theory of Structural Stability	MST – 112
3	Theory and applications of cement composites	MST – 113
4	Structural Optimization	MST – 114
5	Structural Health monitoring & Retrofitting	MST – 115
6	Bridge Engineering	MST – 116
7	Design of High Rise Structures	MST – 117
8	Design of Masonry Structures	MST – 118
9	Advanced Steel Structural Design	MST – 119
10	Advanced Design of Foundations	MST – 120
11	Industrial Structures	MST – 121
12	Soil-structure Interactions	MST – 122
13	Advanced Concrete Structural Design	MST – 123
14	Pre-stressed Concrete Structures	MST – 124
15	Fracture Mechanics of Concrete	MST – 125
16	Design of Plates and Shells	MST – 126

BOS Minutes of Meetings

Minutes of Meeting, Board of Studies, 30.6.15

Minutes of the Board of Studies Meeting Of Electrical Engineering Department Held on 30th June, 2015 Venue: Committee Room

The following were present:

1. Dr. J.S.Dhillon
2. Dr. Pious Verma
3. Dr. Sanjay Marwaha
4. Dr. Lakhwinder Singh
5. Er. Pritam Singh
6. Pf. Jaswinder Singh
7. Dr. Y.S.Brar
8. Pf. Preetinder Singh
9. Dr. Kanwardeep Singh
10. Pf. Gagandeep Singh Sodhi
11. Pf. Arvind Dhillra
12. Pf. Navneet Singh Bhangu
13. Pf. Harneet Singh Gill

Pf. Jaswinder Singh, Chairman, BOS welcomed the participants to the meeting. The agenda which had already been circulated was placed before the board.

1. The new study scheme was put up for discussion and approval. The chairman apprised the board that as per the college norms credit based scheme was being introduced and the same was put for approval of the board. The board after certain amendments unanimously approved the same.

APPROVED

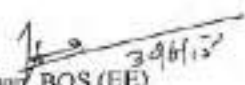
2. The syllabus for 3rd and 4th semester was also presented. The syllabus for all the subjects included their Course Objectives and Course Outcomes. The syllabus was discussed at length and certain amendments were suggested which were duly incorporated. This was approved by the board.

APPROVED

3. The board members were of the view that syllabi for 5th, 6th & 7th/8th semester must be ready before December, 2015.

AGREED

There being no other matter, the meeting ended with a vote of thanks.


Chairman, BOS (EE)

Cc: Director for kind information
Dean (Academic)
All members of BOS (EE)

Minutes of Meeting, Board of Studies, 9.12.16

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA ELECTRICAL ENGINEERING DEPARTMENT

Minutes of Meeting (Board of Studies)

Held on 9th December, 2016

Venue: Committee Room

The following members were present:

1. Dr.J.S.Dhillon
2. Dr.Y.S.Brar
3. Dr. Lakhwinder Singh
4. Er.Pritam Singh
5. Pf.Jaswinder Singh
6. Pf.Preetinder Singh
7. Dr.Kanwardeep Singh
8. Pf.Gagandeep Singh Sodhi
9. Pf.Arvind Dhingra
10. Dr. Navneet Singh Bhangu
11. Pf.Harmeet Singh Gill

Pf.Jaswinder Singh, Chairman, BoS welcomed the participants to the meeting. The agenda which had already been circulated was placed before the board.

1. The codes for all subjects of B.Tech (Electrical Engineering) were placed before the board. The Chairman informed the members that code change was necessary as the Dean(Academics), Guru Nanak Dev Engineering College, Ludhiana has directed all departments to follow uniform structure for subject codes. This is also necessary as per directions received from affiliating university: IKG Panjab Technical University, Kapurthala.

The board members agreed for the change and the changed codes are appended alongwith.

2. The Program Educational Objectives and Program outcomes for B.Tech (Electrical Engineering) and M.Tech (Power engineering) alongwith mission and vision statement of department were placed for review before the board.

The board members gave their valuable inputs which were recorded. The Chairman assured the board members that their suggestions shall be incorporated in the revised documentation.

3. The Chairman informed the board regarding upcoming accreditation visit for PG and compliance report for UG courses. In view of this board was of the view that Ph.D qualification faculty may be recruited to maintain cadre ratio.


- 1 - 12.12.16

Minutes of Meeting, Board of Studies, 14.7.17

Guru Nanak Dev Engineering College, Ludhiana

Electrical Engineering Department

Minutes of BoS Meeting

Date: 14.7.2017

Ref.No.

A meeting of Board of Studies of Electrical Engineering Department was held in the college committee room on 14.7.2017 at 10.00AM. The following were present:

1. Dr. J.S. Dhillon
2. Dr. Pioush Verma
3. Dr. Sanjay Marwaha
4. Dr. Lakhwinder Singh
5. Dr. Yadwinder Singh Brar
6. Pf. Jaswinder Singh
7. Pf. Khushdeep Singh
8. Pf. Preetinder Singh
9. Pf. Rupinderjit Singh
10. Dr. Kanwardeep Singh
11. Pf. Gagandeep Singh Sodhi
12. Dr. Navneet Singh Bhangu
13. Pf. Harmeet Singh Gill
14. Pf. Arvind Dhingra

Chairman, BoS welcomed all to the 6th Board of Studies meeting.

The following points were discussed:

1. The revised vision and mission of Electrical Engineering Department were discussed and approved.
2. The syllabus for 7th/8th semester 2014 scheme B.Tech (Electrical) was put up for discussion. The members gave their valuable suggestions which were duly incorporated. The board members approved the syllabus.
3. The PEOs and POs of B.Tech (Electrical Engineering) & M.Tech (Power Engineering) were presented for validation of the board. These were duly validated by the board.
4. The syllabus for Basic Electrical Engineering 2017 batch was discussed and approved.

There being no other matter for discussion, the meeting ended with a vote of thanks.

HO (EED) &

Chairman, BoS

Minutes of Meeting, Board of Studies (internal), 27.2.18

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

ELECTRICAL ENGINEERING DEPARTMENT

Minutes of Meeting Board of Studies (Internal)

Held on: 27th February, 2018

Venue: Committee Room

Ref. No. EE/ 200 /A

Dr. 27/2/18

The following member were present:

1. P.E. Jaswinder Singh, Chairman
2. P.E. Khushdeep Singh (On Leave)
3. P.E. Preetinder Singh
4. P.E. Rupinderjit Singh
5. Dr. Kanwardeep Singh
6. P.E. Gagandeep Singh Sodhi
7. Dr. Navneet Singh Bhangra
8. P.E. Harmeet Singh Gill
9. Dr. Arvind Dhillon

Special Invitee

Er. Satish Saini - *HS*
Chairman, Smart Grid Technical Activities,
(SG TAC)- IEEE
Senior Projects & Program Manager, Hydro One Networks Inc.
Mississauga, Ontario, Canada.

P.E. Jaswinder Singh, Chairman, BoS welcomed the participants to the meeting and the following agenda points were discussed:-

1. The syllabus of the subject Smart Grids: Fundamentals & Technologies was placed before the board as it has to be added as an elective subject in 7th / 8th Semester of B.Tech (Electrical Engg) in 2017 Syllabus Scheme. The same was approved. (SUBJECT CODE: DEEE-ITE11)
2. The Environment Engg. Subject for 2017 Syllabus Scheme has to be taught to the students of 2017 batch B.Tech. (Electrical Engg) immediately after the completion of 2nd Semester. The syllabus for Environment Engg. is common to all branches and will be supplied by Civil Engineering department. The item was approved.
3. New codes and hours allotted for the subjects of 2017 Syllabus Scheme was discussed and placed before the board. The board approved the same.
4. Course outcomes of B.Tech (Electrical Engg) and M.Tech (Power Engg.) were reformulated and deliberated upon in the meeting. The board approved the same.

Ja
HOD(Electrical) &
Chairman, BoS

27/02/2018

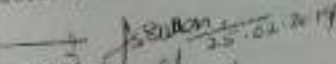
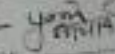
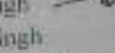
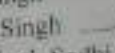
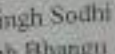
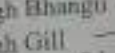
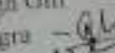
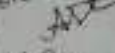
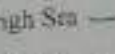
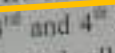
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
DEPARTMENT OF ELECTRICAL ENGINEERING

February 25, 2019

Ref.No. EE/ 198 /A

Minutes of Meeting

A board of studies meeting of department of Electrical Engineering was held in college committee room on 25.2.2019. The following members were present:

1. Dr. J.S.Dhillon — 
2. Dr. Y.P.Verma — 
3. Er. Dheeraj Kumar — 
4. P.E. Preetinder Singh — 
5. P.E. Rupinderjit Singh — 
6. Dr. Kanwardeep Singh — 
7. P.E. Gagandeep Singh Sodhi — 
8. Dr. Navneet Singh Bhangu — 
9. P.E. Harmeet Singh Gill — 
10. Dr. Arvind Dhillon — 
11. Dr. Amit Kamra — 
12. P.E. Jaswinder Singh Sra — 

Study scheme as per AICTE revised 2018 model curriculum was discussed for 2018 batch onwards. Syllabus for 3rd and 4th semester was discussed. The suggestions of the experts were incorporated. The scheme and syllabus after incorporating the comments are enclosed.


Chairman, BoS

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

DEPARTMENT OF ELECTRICAL ENGINEERING

SYLLABUS SCHEME FOR M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

SEMESTER-I									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-I	MEP-101	Advanced Power System Analysis	3	0	50	100	150	3
2.	Mandatory	MRM-101	Research Methodology and IPR	3	0	50	100	150	3
3.	Program Elective -I	MEP-103	Renewable Energy System	3	0	50	100	150	3
		MEP-104	Smart grids						
		MEP-105	Dynamics of Electrical Machines						
		MEP-106	SCADA System and Applications						
4.	Lab-I	LMEP-101	Power System Steady State Analysis Laboratory	0	4	50	50	100	2
TOTAL				9	4	200	350	550	11

SEMESTER-II									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-II	MEP-102	Power System Dynamics-I	3	0	50	100	150	3
2.	Audit course I	MAC-XXX	Audit Course	2	0	50	-	50	S/US
3.	Program Elective -II	MEP-107	Electrical Power Distribution System	3	0	50	100	150	3
		MEP-108	Mathematical Methods for Power Engineering						
		MEP-109	Pulse Width Modulation for Power Electronics Converters						
		MEP-110	Electric and Hybrid Vehicles						
4.	Lab-II	LMEP-102	Renewable Energy Laboratory	0	4	50	50	100	2
TOTAL				8	4	200	250	450	8

SEMESTER-III									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-III	MEP-111	Digital Protection of Power System	3	0	50	100	150	3
2.	Program Elective -III	MEP-113	Restructured Power Systems	3	0	50	100	150	3
		MEP-114	Advanced Digital Signal Processing						
		MEP-115	High Power Converters						
		MEP-116	Power Apparatus Design						
3.	Audit course-II	MAC-XXX	Audit Course	2	0	50	-	50	S/US
4.	Lab-III	LMEP-103	Power System Protection Laboratory	0	4	50	50	100	2
TOTAL				6	4	200	250	450	8

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

SEMESTER-IV									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-IV	MEP-112	Power System Dynamics-II	3	0	50	100	150	3
2.	Program Elective -IV	MEP-117	Advanced Micro-Controller Based Systems	3	0	50	100	150	3
		MEP-118	Wind and Solar Systems						
		MEP-119	Power Quality						
		MEP-120	Artificial Intelligence Techniques						
3.	Lab-IV	LMEP-104	Smart Grids Laboratory	0	4	50	50	100	2
4.	Project	MPEP-101	Project	0	4	50	50	100	2
TOTAL				6	8	200	300	500	10

SEMESTER-V									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Program Elective -V	MEP-121	Power System Transients	3	0	50	100	150	3
		MEP-122	Flexible AC Transmission and Custom Power Devices						
		MEP-123	Industrial Load Modeling and Control						
		MEP-124	Dynamics of Linear Systems						
2.	Open Elective	MOZZ-XXX	Open Elective	3	0	50	100	150	3
3.	Pre-Thesis	MPTEP-101	Pre-Thesis	0	2 [#] +18 [*]	100	100	200	10
TOTAL				8	20	250	300	500	16

Max. Hours for Teacher

* Independent Study hours

SEMESTER-VI									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Thesis	MTEP-101	Thesis	0	4 [#] +28 [*]	100	200	300	16
TOTAL				0	32	100	200	300	16

Max. Hours for Teacher

* Independent Study hours

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

LIST OF AUDIT COURSES		
S. No.	Course Code	Course Name
1.	MAC-101	English for Research Paper Writing
2.	MAC-102	Disaster Management
3.	MAC-103	Sanskrit for Technical Knowledge
4.	MAC-104	Value Education
5.	MAC-105	Constitution of India
6.	MAC-106	Pedagogy Studies
7.	MAC-107	Stress Management by Yoga
8.	MAC-108	Personality Development through Life Enlightenment Skills

LIST OF OPEN ELECTIVE SUBJECT OFFERED TO OTHER DEPARTMENTS		
S. No.	Course Code	Course Name
1.	MOEP-101	Renewable Energy System
2.	MOEP-102	Optimization Techniques
3.	MOEP-103	Organisation & Finance in Power Sector
4.	MOEP-104	Electric and Hybrid Vehicles

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-101

Subject Name: ADVANCED POWER SYSTEM ANALYSIS

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hour
Total marks: 150	Elective Status: Compulsory

Prerequisites: Computer Aided Power System Analysis (at UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Perform load flow analysis using various methods
2	Apply generalized method of fault analysis on simultaneous and open conductors faults and rank various contingencies according to their severity
3	Apply Ward method and REI equivalents for reduction of large power system models
4	Apply Weighted Least Square method for power system state estimation
5	Estimate closeness to voltage collapse and calculate PV curves

UNIT 1

11 Hours

Overview of Newton-Raphson, Gauss-Siedel, Fast Decoupled methods, convergence properties, sparsity techniques, is handling $Q_{\min}$ and $Q_{\max}$ violations in Jacobian matrix, inclusion of frequency effects, Automatic Voltage Regulation in load flow.

UNIT 2

11 Hours

Simultaneous faults, open conductor faults, generalized method of fault analysis. Security state diagram, contingency analysis, generator shift distribution factors, line outage distribution factor, multiple line outages, overload index ranking.

UNIT 3

11 Hours

Power System Equivalents, Ward Method, and Radial, Equivalent and Independent (REI) equivalents for reduction of large power system models. Sources of errors in measurement, Virtual and Pseudo Measurements, Observability, Tracking state estimation, Weighted Least Square method, bad data correction.

UNIT 4

11 Hours

Voltage Stability, Voltage collapse, P-V curve, multiple power flow solution, continuation power flow, optimal load flow, voltage collapse proximity indices.

Text/Reference:

1. J.J. Grainger and W.D. Stevenson, "Power system analysis", McGraw Hill, 2003
2. A. R. Bergen and Vijay Vittal, "Power System Analysis", Pearson, 2000
3. L.P. Singh, "Advanced Power System Analysis and Dynamics", New Age International, 2006
4. G. L. Kusic, "Computer aided power system analysis", Prentice Hall India, 1986
5. A. J. Wood, B. F. Wollenberg and G. B. Sheblé, "Power generation, operation and control", Wiley, 2013
6. P.M. Anderson, "Faulted power system analysis", IEEE Press, 1995

E-Book and Online learning material:

1. Debapriya Das, Indian Institute of Technology, Kharagpur,
<https://swayam.gov.in/courses/4745-july-2018-power-system-analysis>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MRM-101

Subject Name: RESEARCH METHODOLOGY AND IPR

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours:
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Mandatory

Prerequisites: Minor/ Major Projects (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand research problem formulation and analyze research related information.
2	Attain the knowledge of research ethics
3	Attain the knowledge of writing reports and research papers
4	Understanding emphasis of Intellectual Property Right and patenting
5	Gain the knowledge about new developments in IPR

Unit 1 Introduction: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2 Literature Studies Approaches: Effective literature studies approaches, analysis, plagiarism, and research ethics

Unit 3 Effective Technical Writing: Writing reports and research papers, Developing a Research Proposal, Format of research proposal, presentation and assessment by a review committee.

Unit 4 Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under Patent Cooperation Treaty (PCT).

Unit 5 Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications, administration of Patent System. New developments in Intellectual Property Rights; IPR of Biological Systems, related computer software

Text/Reference:

1. S. Melville and W. Goddard, "Research methodology: an introduction for science and engineering students", Juta Academic, 1996
2. R. Kumar, "Research Methodology: A Step by Step Guide for beginners", SAGE, 2014
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
4. Mayall, "Industrial Design", McGraw Hill, 1992.
5. Niebel, "Product Design", McGraw Hill, 1974.
6. Asimov, "Introduction to Design", Prentice Hall, 1962.
7. R. P. Merges, P. S. Menell, M. A. Lemley, "Intellectual Property in New Technological Age", 2016.
8. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

E-Book and Online learning material:

1. <https://www.coursera.org/learn/research-methods>
2. <https://www.lawctopus.com/certificate-course-on-research-methodology-online/>

3. "How to Build a Start-up", Available at Udacity, Self-Paced (One Month).
<https://in.udacity.com/course/how-to-build-a-startup--ep245>
4. "Intellectual Property Rights: A Management Perspective, Available at edx (Offered by IIM Bangalore), Starts on 1 August 2018 (6 weeks).
<https://www.edx.org/intellectual-property-rights-a-management-perspective>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-103

Subject Name: RENEWABLE ENERGY SYSTEM

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Non-Conventional Energy Sources (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand distributed and central generating station
2	Understand about renewable sources of energy
3	Apply the concepts of power electronic for grid interfacing of distributed generators
4	Understand power quality issues of distributed generation
5	Attain the knowledge of protection and economics of distributed generation

UNIT 1

11 Hours

Distributed vs. Central Station Generation, Turbo-generator, Nuclear generator and Micro-turbines, Introduction to Solar Energy, Wind Energy, Combined Heat and Power, Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells.

UNIT 2

11 Hours

Interfacing Distributed Generators with Grid: Applications of Power Electronic devices for Grid Interfacing of Distributed Generators.

UNIT 3

11 Hours

Power Quality Issues: Impact of Distributed Generation on the Power System, Power Quality Disturbances.

UNIT 4

11 Hours

Protection and Economics: Transmission System Operation, Protection of Distributed Generators, Economics of Distributed Generation.

Text/Reference:

1. R. Ranjan, D. P. Kothari, and K. C. Singal, "Renewable Energy Sources and Emerging Technologies", Prentice Hall of India, 2011.
2. M. H. Bollen and F. Hassan, "Integration of Distributed Generation in the Power System", Wiley –IEEE Press, 2011.
3. L.L. Lai and T.F. Chan, "Distributed Generation: Induction and Permanent Magnet Generators", Wiley-IEEE Press, 2007.
4. R. A. Messenger and J. Ventre, "Photovoltaic System Engineering", 2010.
5. J. F. Manwell, J.G. McGowan and A.L Rogers, "Wind energy explained: Theory, Design and Application", John Wiley and Sons, 2010.

E-Book and Online learning material:

1. Technical University of Denmark, <https://www.coursera.org/learn/wind-energy>
2. P.Haridos, IIT Madras, <https://swayam.gov.in/courses/4894-july-2018-non-conventionalenergy-resources>
3. A. Smets, Sustainable Energy: Design a Renewable Future, TU Delft & EDX
4. A. Smets, Solar Energy, TU Delft & EDX
5. A. Stegner, P.P. Drobinski, Wind resources for renewable energies, École Polytechnique & Courser

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-104
Subject Name: SMART GRIDS

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Power System and Microcontroller (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate the difference between smart grid and conventional grid
2	Apply smart metering concepts to industrial and commercial installations
3	Formulate solutions in the areas of smart substations, distributed generation and wide area measurements
4	Understand integration of renewable energy sources with micro-grid
5	Come up with smart grid solutions using modern communication technologies

UNIT 1

12 Hours

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Concept of Robust and Self-Healing Grid, Present development and International policies in Smart Grid, Introduction to Smart Meters: Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home and Building Automation, Smart Substations, Substation Automation, Feeder Automation.

UNIT 2

11 Hours

Smart Measurement System: Geographic Information System(GIS), Intelligent Electronic Devices(IED) and their application for monitoring and protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU)

UNIT 3

11 Hours

Micro-grid and Integration of Renewable Energy sources: Concept of micro-grid, need and applications of micro-grid, formation of micro-grid, Issues of interconnection, protection and control of micro-grid, Plastic and Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines, Captive power plants, Integration of renewable energy sources

UNIT 4

10 Hours

Smart Communication: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN).Bluetooth, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Cyber Security for Smart Grid Broadband over Power line (BPL), IP based protocols

Text/Reference:

1. A. Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011
2. C.W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009
3. J. Ekanayake, N. Jenkins, K. Liyanage, "Smart Grid: Technology and Applications", Wiley 2012
4. S. Borlase, "Smart Grid: Infrastructure, Technology and solutions", CRC Press, 2012
5. A.G. Phadke, "Synchronized Phasor Measurement and their Applications", Springer, 2012

E-Book and Online learning material:

1. N.P. Pandey, "Introduction to smart grid", IIT Roorkee

<https://swayam.gov.in/courses/4778-july-2018-introduction-to-smart-grid>

2. Narayana Prasad Padhy, Premalata Jena, "Introduction to Smart Grid," NPTEL

https://onlinecourses.nptel.ac.in/noc18_ee42/preview

3. M. Vadari, M. Balasubramanyan, Distributed Energy – Smart Grid Resources for the Future, IEEE, Coursera

4. Dr. M. Vadari and M. Balasubramanyan, Smart Grids: Electricity for the Future, IEEE & EDX

5. Laura Ramirez, Pavol Bauer & Seyedmahdi Izadkhast, "Solar Energy: Integration of Photovoltaic Systems in Microgrids", Delf University of Technology, <https://www.edx.org/course/solar-energy-integration-photovoltaic-delftx-pv4x-0>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-105

Subject Name: DYNAMICS OF ELECTRICAL MACHINES

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Electrical machines (At UG Level)

Additional Material allowed in ESE: Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Formulation of electrodynamic equations of all electric machines
2	Analyze the performance characteristics using Park's transformation
3	Knowledge of transformations for the dynamic analysis of machines
4	Knowledge of determination of stability of the machines under small signal and transient conditions
5	Study about synchronous machine

UNIT 1

11 Hours

Introduction: Stability, Primitive 4 Winding Commutator Machine, Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine

UNIT 2

11 Hours

Torque Equations: Torque Equation Analysis of Simple DC Machines using the Primitive Machine Equations, The Three Phase Induction Motor, Transformed Equations, Different Reference Frames for Induction Motor Analysis Transfer Function Formulation

UNIT 3

11 Hours

Three Phase Synchronous Machine: Three Phase Salient Pole Synchronous Machine, Parks Transformation, Steady State Analysis Dynamic analysis: Large Signal Transient, Small Oscillation Equations in State Variable form, Dynamical Analysis of Interconnected Machines

UNIT 4

11 Hours

Transient Analysis: Large Signal Transient Analysis using Transformed Equations, DC Generator /DC Motor System Alternator /Synchronous Motor System

Text/Reference:

1. D.P. Sengupta and J.B. Lynn, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1980
2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education., 2001
3. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company, 1987
4. I. Boldia and S.A. Nasar, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1992
5. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London. 1967

E-Book and Online learning material:

1. http://www.darshan.ac.in/Upload/DIET/Documents/EE/CED_Ch_2_Dynamics_of_Electrical_Drives_v1_03042018_095922AM.pdf

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-106

Subject Name: SCADA SYSTEM AND APPLICATIONS

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Microcontroller (At UG Level)

Additional Material allowed in ESE: Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications
2	Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system
3	Knowledge about single unified standard architecture IEC 61850
4	Learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server
5	Learn and understand about SCADA applications in transmission and distribution sector, industries etc

UNIT 1

11 Hours

Introduction to SCADA, Data acquisition systems, Evolution of SCADA, Communication technologies. Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

UNIT 2

11 Hours

Industry SCADA System: Industries SCADA System Components, Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices(IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

UNIT 3

11 Hours

Architecture: SCADA Architecture, Various SCADA architectures, advantages and disadvantages of each system, single unified standard architecture -IEC 61850.

UNIT 4

11 Hours

Communication Technologies: SCADA Communication, various industrial communication technologies, wired and wireless methods and fiber optics, Open standard communication protocols, SCADA Applications: Utility applications, Transmission and Distribution sector operations, monitoring, analysis and improvement, Industries - oil, gas and water

Text/Reference:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA, 2004
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes Publications, Oxford, UK, 2004
3. William T. Shaw, "Cyber security for SCADA systems", Penn Well Books, 2006
4. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003
5. Michael Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power", PennWell 1999

E-Book and Online learning material:

1. Energy Management and SCADA, coordinated by IIT Madras, NPTEL,
<http://www.nptel.ac.in/courses/108106022/8>,

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: LMEP-101

Subject Name: POWER SYSTEM STEADY STATE ANALYSIS LABORATORY

Programme: M.Tech (Electrical Engg.)	L: 0 T: 0 P: 4
Semester: 1	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: CAPSA Lab (At UG Level)

On Completion of the course, the student will have the ability to apply software tools for:

CO#	Course Outcomes (CO)
1	Load flow techniques, short circuit, transient stability
2	Load forecasting and unit commitment
3	Thyristor converters and IGBT inverters
4	PID controller using software and hardware tools

Sr. No. Name of Practical
Use of MATLAB /SIMULNK/PSIM/PSAT/MiPOWER/PSCAD/ETAP/other software tools for following experiments

- 1.** Load Flow Studies
- 2.** Short Circuit Studies.
- 3.** Transient Stability Studies/Load frequency control of single and multi-area systems
- 4.** Load Forecasting
- 5.** Unit Commitment
- 6.** Simulation of Thyristor Converters.
- 7.** Simulation of IGBT Inverters.
- 8.** Simulation of PID controller
- 9.** Hardware design of PID using ARDUINO UNO
- 10.** Weighted Least Square Method for state estimation

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-102

Subject Name: POWER SYSTEM DYNAMICS-I

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits:3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Compulsory

Prerequisites: Electrical Machines (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the modeling of synchronous machine
2	Develop synchronous machine equivalent representation
3	Carry out synchronous machine stability analysis
4	Develop model of excitation system
5	Understand the modeling of prime movers

UNIT 1

11 Hours

Synchronous Machine Modelling: Per unit systems, Park's Transformation and Modified Park's Transformation, Flux-linkage equations.

UNIT 2

11 Hours

Synchronous Machine Equivalent Representation: Voltage and current equations, Formulation of State-space equations, Equivalent circuit.

UNIT 3

11 Hours

Synchronous Machine Stability, Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines, Small signal model, Introduction to frequency model.

UNIT 4

11 Hours

Synchronous Machine Excitation System, Philips-Heffron model and PSS Load modelling, Prime Movers, Modelling of Hydraulic and steam turbine, governing systems

Text/Reference:

1. P. M. Anderson and A. A. Fouad, "Power System Control and Stability", John Wiley & Sons, 2008.
2. J Machowski, J Bialek and J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997.
3. P. Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.
4. E.W. Kimbark, "Power system stability", John Wiley & Sons, 2002.

E-Book and Online learning material:

1. <https://courses.engr.illinois.edu/ece576/sp2018/Sauer%20and%20Pai%20book%20-%20Jan%202007.pdf>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-107

Subject Name: ELECTRIC POWER DISTRIBUTION SYSTEM

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Power System Transmission and Distribution (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Attain the knowledge of power distribution and its management
2	Attain the knowledge of Distribution automation and its application in practice
3	Understand Control and Communication through SCADA system
4	Apply optimization concept for Distribution Systems Switching
5	Understand the problems and challenges of Distribution automation

UNIT 1

11 Hours

Distribution of Power, Management, Power Loads, Load Forecasting Short-term and Long-term, Power System Loading, Technological Forecasting, Distribution Management System: Advantages, Distribution Automation: Definition, Restoration/ Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction

UNIT 2

11 Hours

Supervisory Control and Data Acquisition (SCADA) System: Introduction, Block Diagram, SCADA Applied To Distribution Automation, Common Functions of SCADA, Advantages of Distribution Automation through SCADA, and Communication Systems, Remote Metering, Automatic Meter Reading and its implementation

UNIT 3

11 Hours

Distribution Systems Switching: Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution and Monitoring.

UNIT 4

11 Hours

Maintenance of Automated Distribution Systems: Difficulties in Implementing Distribution, Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

Text/Reference:

1. A.S. Pabla, "Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd. 2008.
2. M.K. Khedkar and G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, 2011
3. A. J. Panseni, "Electrical Distribution Engineering", CRC Press, 2012
4. J. Momoh, "Electric Power Distribution, automation, protection and control", CRC Press, 2012

E-Book and Online learning material:

1. Energy Management and SCADA, coordinated by IIT Madras, NPTEL,
<http://www.nptel.ac.in/courses/108106022/8>,

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-108

Subject Name: MATHEMATICAL METHODS FOR POWER ENGINEERING

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Numerical Statistical Techniques (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Attain the knowledge of vector spaces, linear transformation, eigenvalues and eigenvectors of linear operators
2	To learn about linear programming problems and understanding the simplex method for solving linear programming problems
3	Acquire knowledge about solving unconstrained nonlinear programming
4	Understanding the concept of random variables, functions of random variable and their probability distribution
5	Understand stochastic processes and their classification

UNIT 1

11 Hours

Vector spaces, linear transformations, Matrix representation of linear transformation, Eigen values and Eigen vectors of linear operator

UNIT 2

11 Hours

Linear Programming: Formulation, Simplex Method, Duality, Non Linear Programming: Formulation, Unconstrained Problems, Search methods.

UNIT 3

11 Hours

Constrained Problems: Lagrange method, Kuhn-Tucker conditions, Random Variables, Distributions.

UNIT 4

11 Hours

Stochastic Processes: Introduction, Independent Random Variables, Marginal and Conditional distributions, Monte Carlo Simulation.

Text/Reference:

1. K. Hoffman and R. Kunze, "Linear Algebra", 2nd Edition, PHI, 1992
2. E. Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, 2004
3. I. Miller, M. Miller and J. E. Freund's "Mathematical Statistics", PHI, 2002
4. J. Medhi, "Stochastic Processes", New Age International, New Delhi., 1994
5. A Papoulis, "Probability, Random Variables and Stochastic Processes", McGraw Hill, 2002
6. J. B Thomas, "An Introduction to Applied Probability and Random Processes", John Wiley, 2000
7. F. S. Hillier and G. J. Lieberman, "Introduction to Operations Research", McGraw Hill, 2001
8. D. M. Simmons, "Non Linear Programming for Operations Research", PHI, 1975

E-Book and Online learning material:

1. <https://pdfs.semanticscholar.org/905c/728be51197ea7af9e19e4848f037fb097341.pdf>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-109

Subject Name: PULSE WIDTH MODULATION FOR PE CONVERTERS

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Power Electronics (At UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate importance of power electronics converters and its modulation techniques
2	Apply advanced modulation strategies such as zero space vector placement, loss discontinuous and modulation applied to current source inverter.
3	Implement PWM using different strategies
4	Demonstrate the knowledge of continuing developments in modulation
5	Demonstrate the necessity of providing minimum pulse width and its effect

UNIT 1

11 Hours

Introduction to Power Electronic converters, Modulation of one inverter phase leg, Modulation of single phase VSI and 3 phase VSI.

UNIT 2

11 Hours

Modulation: Zero space vector placement modulation strategies, Losses-Discontinuous modulation, Modulation of CSI, over modulation of converters, programme modulation strategies

UNIT 3

11 Hours

Pulse width modulation: Pulse width modulation for multilevel inverters, Implementation of modulation controller

UNIT 4

11 Hours

Recent developments: Continuing developments in modulation as random PWM, PWM for voltage unbalance, Effect of minimum pulse width and necessity of providing dead time

Text/Reference:

1. D. Grahame Holmes, Thomas A. Lipo, "Pulse width modulation of Power Converter: Principles and Practice", John Wiley & Sons, 03-Oct-2003
2. B.Vew, "High Power Converter", Wiley Publication
3. M. K. Kazimirczuk, "Pulse width modulated dc-dc power converter", Wiley Publication

E-Book and Online learning material:

1. Dr. K. Afridi, Dr. R. Erickson, Dr. D. Maksimovic, Power Electronics Specialization, University of Colorado, Coursera

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MEP-110

Subject Name: ELECTRIC AND HYBRID VEHICLES

Programme: M.Tech (Electrical Engg.)	L: 3 T: 0 P: 0
Semester: 2	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Electrical Machines and Electric Drives (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2	Understand hybrid drive-train topologies.
3	Attain the knowledge about DC motor drives configuration and control
4	Understand the selection and sizing of energy storage systems
5	Compare different energy management strategies

UNIT 1

11 Hours

History of Hybrid and Electric Vehicles: Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization Transmission characteristics.

UNIT 2

11 Hours

Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

UNIT 3

11 Hours

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance, Drive system efficiency.

UNIT 4

11 Hours

Matching the Electric Machine and Internal Combustion Engine: Sizing the propulsion motor, selecting the energy storage technology, sizing the power electronics devices for energy storage, Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies.

Text/Reference:

1. S. Ramirez, R. S. Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer, 2011
2. S.C. Tan, Y.M. Lai and C. K. Tse, "Sliding mode control of switching Power Converters" CRC press, 2012

E-Book and Online learning material:

1. <https://nptel.ac.in/courses/108103009/>
2. https://books.google.co.in/books?id=bQFuTCGNYWgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: LMEP-102

Subject Name: RENEWABLE ENERGY LABORATORY

Programme: M.Tech (Electrical Engg.)	L: 0 T: 0 P: 4
Semester: 2	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: Renewable Energy Resources (At UG Level)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Determine calorific value of a fuel
2	Analyze characteristics of solar module
3	Attain the knowledge of different MPPT techniques
4	Use of HOMER software

Sr. No. Name of Practical

- 1.** Calorific value using Bomb calorimeter
- 2.** Gas Analyser for biomass plants
- 3.** I-V curves for solar cell
- 4.** Energy management of solar modules
- 5.** Implementation of MPPT techniques for solar module
- 6.** Effect of Load on Solar Panel Output
- 7.** Analysis of renewable energy resources in HOMER software
- 8.** Test the Capabilities of Solar Panels
- 9.** Wind power simulator
- 10.** Microgrid AC/DC Simulation using RCP.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-101

Subject Name: ENGLISH FOR RESEARCH PAPER WRITING

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Plan and prepare research papers/ reports
2	Prepare layout and sections of a report/ research paper
3	Develop skills for readability and writing review of the Literature
4	Develop skills for writing various sections of a research paper/ report
5	Develop skills for ensuring quality of research paper/ report

Unit 1 Planning and Preparation: Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2 Layout of a report/ research paper: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.

Unit 3 Review of the Literature: Introduction, Methods, Results, Discussion, Conclusions, the Final Check, key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit 4 Writing Skills: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

Unit 5 Miscellaneous Topics: Useful phrases, ensuring quality of research paper, first- time submission

Text/Reference:

1. R. Goldbort, "Writing for Science", Yale University Press, 2006.
2. R. Day, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006
3. N. Highman, "Handbook of Writing for the Mathematical Sciences", SIAM, 1998.
4. A. Wallwork, "English for Writing Research Papers", Springer New York, 2011

E-Book and Online learning material:

1. "Take Your English Communication Skills to the Next Level". Available at Coursera (Offered by Georgia Institute of Technology), 4 weeks, Starts on September 10, 2018.
<https://www.coursera.org/learn/english-communication-capstone>
2. "Effective Communication in Globalised Workplace- The Capstone". Available at Coursera (Offered by National University of Singapore), 3 weeks, Starts on August 06, 2018.
<https://www.coursera.org/specializations/effective-communication>

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-102

Subject Name: Disaster Management

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Unit 1 Introduction: Disaster - Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types and Magnitude.

Unit 2 Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem; Natural Disasters - Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches; Man-made disasters - Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit 3 Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards With Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

Unit 4 Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Unit 5 Risk Assessment: Disaster Risk - Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

Unit 6 Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India

Text/References:

1. R. Nishith, Singh A.K., "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company.
2. Sahni, Pardeep et al. (Eds.), "Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.
3. Goel S.L., Disaster Administration and Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-103

Subject Name: Sanskrit for Technical Knowledge

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understanding basic Sanskrit language
2	Ancient Sanskrit literature about science & technology can be understood
3	Being a logical language will help to develop logic in students

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Text/References:

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-104

Subject Name: Value Education

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Knowledge of self-development
2	Learn the importance of Human values
3	Developing the overall personality

Unit 1: Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments.

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

Unit 3: Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking. Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

Text/References:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-105

Subject Name: Constitution of India

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. 2. 3.
2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4	Discuss the passage of the Hindu Code Bill of 1956.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features

Unit 3: Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit 5: Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit 6: Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Text/References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-106

Subject Name: Pedagogy Studies

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Unit 1 Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions, Overview of methodology and Searching.

Unit 2 Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

Unit 3 Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? , Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4 Professional development: alignment with classroom practices and follow up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5 Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Text/References:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-107

Subject Name: Stress Management by Yoga

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Develop healthy mind in a healthy body thus improving social health also
2	Improve efficiency

Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2: Yam and Niyam. Do's and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 3: Asan and Pranayam i) Various yog poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayam

Text/References:

1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
M.TECH (ELECTRICAL ENGINEERING) PART-TIME 2019 ONWARDS

Subject Code: MAC-108

Subject Name: Personality Development through Life Enlightenment Skills

Programme: M.Tech (Electrical Engg.)	L: 2 T: 0 P: 0
Semester: 2/3	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): NA
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3	Study of Neetishatakam will help in developing versatile personality of students.

Unit 1 Neetisatakam-Holistic development of personality:

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (don't's)
- Verses- 71,73,75,78 (do's)

Unit 2 Approach to day to day work and duties:

Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47, 48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

Unit 3 Statements of basic knowledge:

- Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17,
- Personality of Role model.
- Shrimad Bhagwad Geeta: Chapter 2-Verses 17, Chapter 3-Verses 36,37, 42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Text/References:

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Annexure I

MINUTES OF 2nd BOS MEETING

Minutes of 2nd meeting of Board of Studies held on 01.09.2014 at 11.00 am in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill
2. Pf. Kanwaljit Singh
3. Pf. Amecta Seehra
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Ajay Kumar Sharma
7. Dr. Kanav Kahol
8. Pf. Nirmal Singh Grewal
9. Dr. S. Bansal

The meeting started with welcome by Chairman BOS for the 2nd Board of Studies Meeting to the present members.

Following decisions were taken:-

Item No. 1 **Confirmation of Minutes of 1st meeting of Board of Studies held on 07.04.2014.**

Action Taken: Minutes of 1st meeting confirmed.

Item No. 2 **Apprising the members of Board of Studies about the Program Educational Objectives (PEO), Program Outcomes (PO) and in turn their achievement through courses for M.Tech (ECE).**

Action Taken: All members agreed that the self employment / entrepreneurship factor should be included in PEO 1. So the PEO 1 is modified as follows:

PEO 1: Work in educational, R & D institutes, Industry and as an entrepreneur in Electronics & Communication Engineering field.

PEO 2 - 4 approved as proposed.

The POs from PO 1 to 5 and PO 7 to 11 are approved as proposed but the PO 6 is modified as follows:

Annexure I

MINUTES OF 2nd BOS MEETING

Minutes of 2nd meeting of Board of Studies held on 01.09.2014 at 11.00 am in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill
2. Pf. Kanwaljit Singh
3. Pf. Ameeta Seehra
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Ajay Kumar Sharma
7. Dr. Kanav Kahol
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The meeting started with welcome by Chairman BOS for the 2nd Board of Studies Meeting to the present members.

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Action Taken: All members agreed that the self employment / entrepreneurship factor should be included in PEO 1. So the PEO 1 is modified as follows:

PEO 1: Work in educational, R & D institutes, Industry and as an entrepreneur in Electronics & Communication Engineering field.

PEO 2 - 4 approved as proposed.

The POs from PO 1 to 5 and PO 7 to 11 are approved as proposed but the PO 6 is modified as follows:

PO 6: An ability to perform effectively in diverse and Multidisciplinary teams as a member / leader and take objective & rational decisions to achieve common goals.

The finalized PEO's & PO's are attached as Annexure I(a).

Item No. 3 **Introduction of credit based system for MTech (ECE)**

Action Taken: Approved.

Item No. 4 **Revision of syllabus of M.Tech (ECE) 2014 admission batch.**

Action Taken: The board was of the view that

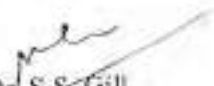
- i. The engineering design subject should be added as core so the title of subject MTEC-505 is modified to "Engineering Design & Project Management"
- ii. Data Mining subject should be added so the title of subject MTEC-607 is modified to "Data Mining & Cloud Computing"
- iii. Instead of specifying the core subjects, a list of cores should be proposed and any three core subjects as per availability of teachers should be taught in 1st / 2nd semester.
- iv. A chapter on parallel processing may be added to the subject MTEC-616 Computer Communication & Networks.
- v. A Chapter on Discrete Algebra should be added to MTEC-501 Advanced Mathematics for Engineers.
- vi. The syllabus of MTEC-503 is changed and the new syllabus proposed by Dr. Ajay Kumar Sharma is approved.
- vii. Few topics related to A.I. techniques proposed to be added to the syllabus of the subject MTEC-605 Soft Computing.
- viii. The syllabus of the subjects MTEC-502 and MTEC-601 approved as proposed.

The finalized syllabus of five subjects is attached as Annexure-I(b).

Item No. 5 **To ratify the broad classification of curriculum upto 2013 batch and finalize the broad classification of curriculum 2014 onwards.**

Action Taken: Approved.

The meeting ended with the vote of thanks by chairman BOS.


Dr. S.S. Gill,
Chairman
Board of Studies
Deptt. of ECE

Distribution: -

1. Director, GNDEC, Ludhiana for kind information
2. All Members of Board of Studies (ECE) through email
3. Dean, Academic, GNDEC, Ludhiana
4. Dean PG, GNDEC, Ludhiana
5. BOS File.

No. ECE/ 45

Date: 18.01.16

MINUTES OF MEETING

Minutes of the 4th meeting of Board of Studies of Department of Electronics & Communication Engineering held on 18.01.2016 at 11.00 AM in committee room.

The following persons were present:

1. Dr. Sandeep Singh Gill (Chairman)
2. Pf. Ameeta Seehra
3. Pf. Narwant Singh Grewal
4. Pf. Balwinder Singh Dhaliwal
5. Dr. Munish Rattan
6. Dr. Baljeet Kaur
7. Dr. Ajay Kumar Sharma
8. Pf. Nirmal Singh Grewal
9. Dr. Rajeevan Chandel

Received
Hans.
22/3/2016

The meeting started with the Chairman BOS welcoming the members to the 4th Board of Studies Meeting.

Following decisions were taken: -

Item No. 1 **Confirmation of minutes of 3rd meeting of Board of Studies held on 27.01.2015.**

Action Taken: Minutes of 3rd meeting confirmed.

Item No. 2 **Approval of syllabus of subjects of B.Tech. (ECE) 2014 admission batch onwards upto 5th semester.**

Action Taken: **Approved with following modifications:**

- i. For each subject, text books, and reference books should be separately specified.

Page 1 of 3

Minutes of 4th Meeting of BOS on 18.01.2016 (Department of Electronics & Communication Engineering)

- ii. In place of "minimum numerical contents," the term should be "Numerical/Design Problem contents" and a range should be specified for the same.
- iii. There should be 12-13 experiments in all lab subjects and hardware experimental results should be validated using simulation softwares/MATLAB wherever possible.
- iv. Reference Books / In-house manuals should be specified in the syllabus of lab subjects.

Numerous other suggestions were given by the BOS members regarding course contents, addition / deletion of certain topics, addition / deletion of reference books, standardisation of syntax for syllabus of all subjects, etc. All the suggestions have been incorporated in the syllabus and the final syllabus is attached at Annexure-I.

Item No. 3

Syllabus of remaining subjects of M.Tech. (ECE) 2014 admission batch.

Action Taken:

Approved with the following modifications: -

(i) The title of "Digital VLSI Design" subject should be changed to "VLSI Design Verification & Testing" and that of "Advanced Error Control Codes" should be changed to "Error Control Coding Techniques".

(ii) The subject of "Data Mining & Cloud Computing" should be separated into two subjects namely

- Databases and Data Mining
- Cloud Computing

As for B.Tech syllabus, many suggestions were given by the BOS members regarding the addition / deletion of topics, books, etc. All the suggestions have been incorporated in the syllabus. The final study scheme and syllabus is attached at Annexure-II.

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Item No. 4 **Approval of panel of external paper setters for B.Tech (ECE) & M.Tech.**

Action Taken: Approved as proposed. The approved list attached at annexure III.

The meeting ended with the vote of thanks by chairman BOS.



Dr. Sandeep Singh Gill
Chairman
Board of Studies
Department of ECE

Encl:-

- i. Annexure I
- ii. Annexure II
- iii. Annexure III

GURU NANAK DEV ENGINEERING COLLEGE LUDHIANA
(Department of Electronics & Communication Engineering)

No. ECE/1178

MINUTES OF MEETING

Date: 08.08.19

Minutes of 12th meeting Board of Studies of Department of Electronics and Communication Engineering held on 02.08.2019 at 11.00 AM in college committee room.

The following members were present in the meeting.

1. Er. Ameeta Seehra, Chairperson
2. Dr. Balwinder Singh Dhaliwal, Member
3. Dr. Munish Rattan, Member
4. Dr. Baljeet Kaur, Member
5. Dr. Amit Kumar Kohli, Associate Professor, ECE Department, Thapar University, Patiala, Member
6. Er. H.S. Jatana, Group and Process Ground, SCL, Mohali, Member
7. Dr. J.S. Sahambi, Professor, Department of EE, IIT Ropar, Member
8. Sh. Ajeet Thakur, Assistant Professor, ECE, ABVGIET, Shimla, HP, Member
9. Dr. Amit Kamra, COE Nominee
10. Er. Gagandeep Singh Sodhi, TPO (GNDEC)

The following decisions were taken: -

1. The new scheme for M.Tech (ECE) for 2019 batch for all the four semesters (according to latest AICTE guidelines) was discussed and finalized by BOS.
2. The syllabus of M.Tech (ECE) for 1st and 2nd semester for 2019 batch was discussed and finalized by BOS.
3. The panel of external paper setters for B.Tech (ECE) and M.Tech (ECE) was finalized by BOS members.
4. The list of courses offered for Minor Degree and Honours Degree in Electronics and Communication Engineering was finalized by BOS members.

Ameeta Seehra

(Er. Ameeta Seehra)
Chairperson
Board of Studies,
Department of ECE,
GNDEC, Ludhiana.

Annexure 3.1

M. Tech. (ECE) PEO's

After quite-a-few years of completing M Tech (ECE), the students will:

PEO1 Work in educational, R&D institutes, Industry and as an Entrepreneur in Electronics & Communication Engineering field.

PEO2 Pursue their doctoral studies and research in the institutes of high repute in India & abroad and develop independent and lifelong learning skills for continuous professional development.

PEO3 Analyze the technical problems and develop feasible, optimal, environmentally and socially acceptable solutions by applying research skills, technical knowledge and modern tools while working individually and in teams.

PEO4 Demonstrate an ability to communicate effectively and practice professional ethics and social responsibility in their career.

M. Tech. (ECE) PO's

After completing M Tech (ECE), the students will have

S. No.	Graduate Attributes	Program Outcomes (PO's)
1.	GA1: Scholarship of knowledge	PO1:An ability to discriminate, evaluate, analyze & synthesize the existing and new knowledge of electronics and communication engineering and to integrate the same for enhancement of knowledge
2.	GA2: Critical Thinking	PO2:An ability to analyze a problem and formulate intellectual & creative framework for conducting research for its solution in a theoretical, practical and policy context.
3.	GA3: Problem Solving	PO3:An ability to evaluate alternative solution of an electronics & communication engineering related problems to find the feasible and optimal solution with appropriate consideration for public health and safety, cultural, societal and environmental issues.
4.	GA4: Research Skill	PO4:An ability to use research based techniques and skills including literature survey, experiments, research methodologies, analysis and interpretation of data and development of scientific/technical knowledge to provide valid conclusions by contributing individually or in groups.
5.	GA5: Usage of Modern tools	PO5:An ability to develop appropriate models, techniques, skills using modern engineering & software tools for solving electronics & communication engineering problems.
6.	GA6: Collaborate and Multidisciplinary Work	PO6:An ability to perform effectively in diverse and Multidisciplinary teams as a member / leader and take objective & rational decisions to achieve common goals.

7.	GA7: Project Management and Finance	PO7:An ability to comprehend and apply engineering and management principles to manage individual and team projects with appropriate consideration to economical & financial aspects.
8.	GA8: Communication	PO8:An ability to Communicate effectively, clearly and confidently with a range of audience through oral and written presentations.
9.	GA9: Life-long learning	PO9:An ability to recognize the need for and engage in continuous professional development and life-long learning
10.	GA10: Ethical Practices and Social Responsibility	PO10:An understanding of professional, ethical, intellectual issues, practices, and social responsibilities as a researcher and member of society.
11.	GA11: Independent and Reflective Learning	PO11:An ability for critical self analysis and self correction.

M Tech (ECE) Pending Elective Subjects' Syllabus

M. Tech (ECE) Syllabus Scheme 2014 Admission Batch Onwards

Semester-I

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-501	Advanced Mathematics for Engineers	Core	4	0	4	4
2	MTEC-502	Advanced Communication System	Core	4	0	4	4
3	MTEC-503	Advanced Optical Communication System	Core	4	0	4	4
4	MTEC-xxx	Department Elective - I	Program Elective	3	0	3	3
5	MTEC-xxx	Department Elective – II	Program Elective	3	0	3	3
6	MTEC-507	Lab – I	Core	0	4	4	2
Total				18	4	22	20

Semester II

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-504	Advanced Digital Signal Processing	Core	4	0	4	4
2	MTEC-505	Engineering Design and Project Management	Core	4	0	4	4
3	MTEC-506	Advanced Microwave Engineering	Core	4	0	4	4
4	MTEC-xxx	Department Elective - III	Program Elective	3	0	3	3
5	MTxx-xxx	Open Elective – I	Program Open	3	0	3	3
6	MTEC-508	Lab – II	Core	0	4	4	2
Total				18	4	22	20

Semester-III

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-xxx	Department Elective - IV	Program Elective	3	0	3	3
2	MTxx-xxx	Open Elective – II	Program Open	3	0	3	3
3	MTEC-509	Pre-Thesis Seminar	Core	0	1	1	1
4	MTEC-510	Pre-Thesis Project	Core	0	3	3	3
Total				6	4	10	10

Semester-IV

S. No.	Subject Code	Subject Title	Type	Schedule of Teaching			Credits
				L	P	Total	
1	MTEC-511	Thesis	Core	-	-	-	15
Total				-	-	-	15

List of Department Core Subjects

MTEC-501	Advanced Mathematics for Engineers
MTEC-502	Advanced Communication System
MTEC-503	Advanced Optical Communication System
MTEC-504	Advanced Digital Signal Processing
MTEC-505	Engineering Design and Project Management
MTEC-506	Advanced Microwave Engineering

List of Department Electives Subjects

MTEC-601	Semiconductor Devices Theory & Modeling
MTEC-602	Multimedia Communication
MTEC-603	Advanced Wireless Networks
MTEC-604	Advanced Wireless & Mobile Communication
MTEC-605	Soft Computing
MTEC-606	Error Control Coding Techniques
MTEC-607	Databases and Data Mining
MTEC-608	Bio-medical Electronics
MTEC-609	Organic Electronics
MTEC-610	VLSI Design, Verification & Testing
MTEC-611	VLSI Design Automation
MTEC-612	Low Power VLSI Design
MTEC-613	Nano-Electronics

MTEC-614	Speech & Image Processing
MTEC-615	Advanced Digital System Design
MTEC-616	Computer Communication & Networks
MTEC-617	Advanced Embedded System Design
MTEC-618	Modeling and Simulation of Communication Systems
MTEC-619	Cloud Computing

COURSE NAME: ADVANCED MATHEMATICS FOR ENGINEERS

COURSE CODE: MTEC-501

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 70-80%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Apply Fourier transforms in the design of analogue filters, modulation, demodulation and frequency domain filtering.
- CO2 Use statistics in the analysis of engine performance data, difference in mean running times, temperatures and also in cusum control charts.
- CO3 Use conformal mapping for solving the electric & magnetic fields in various applications and also, in various coplanar waveguide structures present in silicon substrate.
- CO4 Derive equations of catenary shape, isoperimetric problems and other multivariable functions using calculus of variations.
- CO5 Apply wavelet transform for signal processing and different applications to divide given function into different scale components.
- CO6 Apply concepts of discrete algebra for problem solving.

Syllabus

Unit 1. Fourier Integral and Transform

The Fourier integral, The Fourier transform, Fourier sine and cosine transform, properties of fourier transform, Convolution theorem, Parseval's Identities, application of Fourier transform, The windowed fourier transform, The sharinon sampling theory, low pass and band pass filters.

Unit 2. Conformal Mapping

Conformal mapping and application to boundary value problems, linear Fractional transformation, Schwarz-Christoffel transformation, harmonic functions and Dirichlet's problem, solution of Dirichlet's problem by conformal mapping.

Unit 3. Statistics

Measure of central tendency, measure of variability, skewness, kurtosis, correlation, regression, sampling, level of significance, Chi square distribution, t, F, Z distribution, Theory of estimation, types of hypothesis, hill Climbing

Unit 4. Wavelets

The idea behind the wavelet, the Haar wavelet, a wavelet expansion, multiresolution analysis and Haar wavelets, general construction of wavelets and multi resolution analysis, Shannon wavelets.

Unit 5. Calculus of Variation

Euler's Lagrange's differential equation, The Brachistochrone problem, Hamilton's principle and other applications, isoperimetric problem, Rayleigh-Ritz method, Galerkin's method.

Unit 6. Discrete Algebra

Mathematical logic, Boolean algebra, logic gates, finite state machines, coding theory.

Text Books:

1. I. M. Gelfand and S.V. Fomin, "Calculus of Variation", Prentice Hall.
2. A. Jaffery, "Advance Engineering Mathematics", Elsevier.
3. S. C. Gupta and V. K. Kapoor, "Fundamental of Mathematical Statistics", S. Chand & Sons.
4. Robert X Gao and Ruqiang Yan, "Wavelets", Springer Verlag.

Reference books and other resources:

1. E. Hernandez and Guido L. Weiss, "A First Course on Wavelets", CRC Press.
2. K. H. Rosen, "Discrete Mathematics", MGH Publication.
3. John A. Dossey, "Discrete Mathematics", Addison Wesley Publishing Company.
4. T. Sengadir, "Discrete Mathematics", Pearson Education.
5. G. Shanker Rao, "Discrete Mathematics", New Age International Pvt. Ltd Publishers.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO5
Unit 1	H	-	-	-	-	-
Unit 2	L	H	-	-	-	-
Unit 3	L	-	H	-	-	-
Unit 4	-	-	-	H	-	-
Unit 5	L	-	-	-	H	-
Unit 6	-	-	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ADVANCED COMMUNICATION SYSTEM

COURSE CODE: MTEC-502

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 10%-20 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend various modulation, demodulation and orthogonal techniques of communication system.
- CO2 Analyze errors in system using optimum receivers and detectors.
- CO3 Discuss digital technology, software define radio and cognitive radio.
- CO4 Explain MIMO and channel modeling.

Syllabus

Unit 1. Digital Communication Systems

Introduction to communications systems, digital communication systems, review of digital modulation techniques, BPSK, QPSK, PCM, DPCM, Delta modulation, multicarrier modulation, OFDM working and mathematical representation of OFDM signal, pulse shaping and windowing in OFDM signal and spectral efficiency.

Unit 2. Optimum Receivers

Optimum receivers for signals corrupted by additive White Gaussian noise, correlation demodulator, optimum detector. ML sequence detector, probability of error for binary modulation techniques.

Unit 3. Broadcast Networks

Introduction to broadcast networks, digital audio broadcasting, HD digital technology, direct to home (DTH).

Unit 4. Software Defined Radio

Need for software radio, general structure for transceiver for SDR, third generation SDR system architecture, trends in SDR, cognitive radio, spectrum sensing in cognitive radio.

Unit 5. MIMO Systems

Introduction, space diversity and systems based on space diversity, smart antenna system and MIMO, MIMO based system architecture, multipath and space time processing in MIMO, Antenna considerations for MIMO, channel modelling, measurement and capacity in MIMO, cyclic delay diversity.

Text Books:

1. John G. Proakis, "Digital Communication", Prentice Hall India.

Reference books and other resources:

1. Upena Dalal, “Wireless Communication”, Oxford University Press.
2. Wayne Tomasi, “Advanced Communication Systems”, Pearson Education.
3. Related IEEE/IEE/ Science Direct publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	-
Unit 4	-	-	H	-
Unit 5	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ADVANCED OPTICAL COMMUNICATION SYSTEM

COURSE CODE: MTEC-503

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 20%-30 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain the various signal propagation concepts (including losses, dispersion, scattering, nonlinear effects etc.) related to optical fibers.
- CO2 Explain the basic structure design of different optical amplifier and analyze their characteristics to determine performance.
- CO3 Explain the concepts related to different dispersion management techniques used in optical fiber communication.
- CO4 Define the soliton system and analyze the design of soliton system in different conditions (loss, dispersion, high speed and multichannel).
- CO5 Explain the modulation formats and demodulation schemes used in coherent light wave systems and analyze their performance.
- CO6 Describe basic concepts related to radio over fiber system and analyze its performance in different conditions

Syllabus

Unit 1. Introduction to Optical Fibers

Wave propagation, Dispersion and its limitations, losses and non-linear effects.

Unit 2. Optical Amplifiers

Semiconductor optical amplifier, Raman amplifier, EDFA.

Unit 3. Dispersion Management

Need pre-compensation schemes, best compensation techniques, dispersion compensating fibers, optical filters, fiber Bragg grating

Unit 4. Soliton Systems

Fiber soliton, soliton based communications, loss managed solitons, dispersion-managed solitons, high speed soliton systems, WDM soliton systems.

Unit 5. Coherent Light Wave Systems

Basic concepts, modulation formats, demodulation schemes, bit error rate, sensitivity degradation.

Unit 6. Radio over Fiber

Concept, advantages of RoF in mobile communication networks, macro diversity and micro diversity in RoF, RoF for hyper LAN 2 microcellular communication networks, RoF multiplexing techniques.

Text Books:

1. G. P. Aggarwal, “Fiber-Optic Communication Systems”, John Wiley & Sons.

Reference books and other resources:

1. Djafar K. Mynbaev, “Fiber-Optic Communication Systems”, John Wiley & Sons.
2. Leonid Kazovsky, Sergio Benedetto and Alan Willner, “Optical Fiber Communication Systems”, Artech House.
3. Hamed Al-Raweshidy and Shozo Komaki, “Radio Over Fiber Technologies for Mobile Communication Networks”, Artech House.
4. Related IEEE/IEE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	L	H	-	-	-	-
Unit 3	L	-	H	-	-	-
Unit 4	-	-	-	H	-	-
Unit 5	L	-	-	-	H	-
Unit 6	-	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	-	-	-	-	-	-	-	-	-	-
CO2	M	-	H	-	M	-	-	-	L	-	-
CO3	M	-	H	-	M	-	-	-	L	-	-
CO4	M	-	H	M	M	-	-	-	L	-	-
CO5	M	-	H	-	M	-	-	-	L	-	-
CO6	M	-	H	M	M	-	-	-	L	-	-

COURSE NAME: ADVANCED DIGITAL SIGNAL PROCESSING

COURSE CODE: MTEC-504

Internal Marks: 50

L T P

External Marks: 100

4 - -

Numerical & Design Problems Content: 20%-30%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Design FIR & IIR filters using appropriate method depending upon the given specification.
- CO2 Explain sampling rate conversion methods and design the sampling rate converters.
- CO3 Adaptive filters design using LMS & RLS algorithms.
- CO4 Discuss different methods of spectrum estimation and analysis.
- CO5 Analyze the effects of finite-word length in DSP systems.
- CO6 Explain applications of multi-rate DSP & adaptive filters.

Syllabus

Unit 1. Design of IIR Filters

Introduction to digital filters; Types of digital filters: FIR and IIR filters; Choosing between FIR and IIR filters; Filter design steps; Features of IIR filters; coefficient calculation methods for IIR filters; Pole-zero placement method of coefficient calculation, Impulse invariant method of coefficient calculation, Matched z-transform (MZT) method of coefficient calculation, Bilinear z-transform (BZT) method of coefficient calculation.

Unit 2. Design of FIR Filters

Features of FIR Filters; FIR coefficient calculation methods; Window methods; The Optimal method; Frequency sampling method; Special FIR Filter design topics.

Unit 3. Multirate Digital Signal Processing

Introduction; Concepts of multirate signal processing: Sampling rate reduction: decimation by integer factors, Sampling rate increase: interpolation by integer factors, Sampling rate conversion by non-integer factors, Multistage approach to sampling rate conversion;

Design of practical sampling rate converters; Sample rate conversion using polyphase filter structure; Applications of multirate signal processing.

Unit 4. Adaptive Digital Filters

Concepts of adaptive filtering, Basic Wiener filter theory, Basic LMS adaptive algorithm, Recursive least squares algorithm, Applications of adaptive filters.

Unit 5. Spectrum Estimation and Analysis

Principles of spectrum estimation, Traditional methods: pitfalls, windowing, The periodogram method and periodogram properties, Modified periodogram methods, The Blackman-Turkey method, and The fast correlation method, Comparison of the power spectral density estimation methods, Modern parametric estimation methods.

Unit 6. Analysis of Finite Word-length Effects in Fixed-Point DSP Systems

DSP arithmetic: Fixed-point arithmetic, Floating-point arithmetic, ADC quantization noise and signal quality, Finite word length effects in IIR and FIR digital filters.

Text Books:

1. E. C. Ifeachor and B. W. Jervis, “Digital Signal Processing”, Second Edition, Pearson Education, 2002.
2. J. G. Proakis and D. K. Manolakis, “Digital Signal Processing”, Third Edition, Pearson Education, 2003.

Reference books and other resources:

1. J. G. Proakis, C. M. Rader, F. Ling, C. L. Nikias, M. Moonen, and I. K. Proudler, “Algorithms for Statistical Signal Processing”, Pearson Education, 2002.
2. A. V. Oppenheim and R. W. Schaffer, “Digital Signal Processing”, Prentice Hall, 1975.
3. Monson H. Hayes, “Statistical Digital Signal Processing and Modeling”, Wiley Publications, 1999.
4. Simon Haykin, “Adaptive Filter Theory”, Fourth Edition, Pearson Education, 2008.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	H	-	-	-	-	-
Unit 3	-	H	-	-	-	H
Unit 4	-	-	H	-	-	H
Unit 5	-	-	-	H	-	-
Unit 6	-	-	-	-	H	-

Mapping of CO with PO

[illegible]

COURSE NAME: ENGINEERING DESIGN AND PROJECT MANAGEMENT

COURSE CODE: MTEC-505

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 5%-10 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Develop ability to analyze and solve problems methodically as well as manage individual and team projects with appropriate consideration of engineering and financial aspects.
- CO2 Have an understanding of professional, ethical and social responsibilities as professional Engineer and manager.
- CO3 Develop an ability to communicate effectively through oral and written presentation.
- CO4 Perform effectively in groups and teams as a member / leader.

Syllabus

Unit 1. Introduction to Engineering Design

Definition, Identifying requirements & analyzing needs, Exploring and evaluating concepts, Prototyping and modeling systems, Testing, Deploying and validating a design, Documentation.

Unit 2. Introduction to Project Management

Definition of a project, Why project management, Project life cycle, Organization structures (functional vs. matrix and borrowed resources), Translating needs into requirements, Survey of local & global industrial economic scenario.

Unit 3. Project Selection and Planning

Project selection approaches, Decision methodologies (decision trees, analytical hierarchy process), Project evaluation techniques, Estimation (costs, schedule and requirements), Project financing.

Unit 4. Project Management and Leadership

Special demands on project managers, selecting the project manager and the project team, Project communications, Teams and team development, Characteristics of successful project management.

Unit 5. Project Planning and Estimating

Work breakdown structure, Scheduling techniques (precedence diagrams, PERT/CPM, Gantt and milestone charts), Budgeting techniques (S-curve, earned value) Resource allocation techniques (resource loading and leveling)

Unit 6. Risk and Quality Management

Fundamentals of risk (e.g., what is risk?), Methods for dealing with risk and uncertainty, Historic roots of quality management, Current approaches to quality

Unit 7. Project Execution and Control

Project execution (configuration management), Project control (measuring work performance), Financial control (activity based accounting), Integrated cost and schedule control (Earned value).

Unit 8. Ethical Project Management

Professional ethics & values, Corporate social Responsibility, Dealing within an ethical selection, Group case study & task.

Text Books:

1. K. Nagarajan, "Project Management, New Age International Publishers", New Delhi.

Reference books and other resources:

1. Kathy Schwalbe, "An Introduction to Project Management", Kathy Schwalbe LLC.
2. Paromeshwar P. Iyer, "Engineering Project Management with case studies", Vikas Publishing House Pvt. Limited, New Delhi.
3. B. Blanchard and W. Fabrycky, "Systems Engineering and Analysis", Prentice Hall.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	M	-	-	-
Unit 2	H	-	M	-
Unit 3	H	-	-	-
Unit 4	-	-	-	H
Unit 5	H	-	-	-
Unit 6	M	-	-	-
Unit 7	H	-	-	-
Unit 8	-	H	H	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	H	H	H	H	H	H	-	M	-	-
CO2	-	-	-	-	-	-	-	-	M	H	M
CO3	-	-	-	-	-	-	-	H	M	-	-
CO4	-	-	-	-	-	H	H	M	-	-	L

COURSE NAME: ADVANCED MICROWAVE ENGINEERING

COURSE CODE: MTEC-506

Internal Marks: 50

L T P

External Marks: 100

4 0 -

Numerical & Design Problems Content: 5%-10 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Analyze microwave networks using S and mixed mode S parameters.
- CO2 Design microwave filters using various methods.
- CO3 Design advanced microwave amplifiers based on MIC
- CO4 Explain the operation of microstrip antenna, parameters and performance improvement techniques.

Syllabus

Unit 1. Microwave Network Analysis

Concept of differential signal, coupling and crosstalk, Introduction to S parameters, properties of S parameters, Single ended, mixed mode, Single ended to mixed mode conversion.

Unit 2. Design of Microwave filters

Introduction, Microwave filter structures, Planar, Active, Superconductive, SAW and micro-machined filters etc., Pseudo-elliptic Filters, Prototype Synthesis Example, Design of Hilbert Filters, Realizations and Measured Performance.

Unit 3. Advanced Microwave Integrated Circuits

Multi-Standard Multi-Band Reconfigurable LNA, LNA Inventions, Multiband Multi-Standard LNA with CPW Transmission Line Inductor.

Unit 4. Microstrip Antenna

Microstrip Patch antennas, variations of shorted patch antenna, dual frequency shorted patch antennas, low cross polarized antennas, dual arm printed monopole antenna: Coplanar Waveguide Feeding.

Unit 5. Antennas on Impedance Substrates

High Impedance Surface (HIS), surface wave bends, reflection phase, bandwidth, Antennas on HIS, diffraction control, tunable impedance substrate, holographic artificial impedance substrate.

Text Books:

1. Allan Huynh, Magnus Karlsson and Shaofang Gong, “Advanced Microwave Circuits and Systems”, In Tech.
2. Pierre Jarry and Jacques Beneat, “Design and Realizations of Miniaturized Fractal Microwave and RF Filters”, Wiley-Blackwell.
3. Arjuna Marzuki, Ahmad Ismat Abdul Rahim and Mourad Loulou, “Advances in Monolithic Microwave Integrated Circuits for Wireless Systems: Modeling and Design Technologies”, Information Science Reference.
4. Rod Waterhouse, “Printed Antennas for Wireless Communications”, John Wiley & Sons.

Reference books and other resources:

1. Related IEEE publications

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	
Unit 4	-	-	-	H
Unit 5	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	M	M	-	-	-	-	-	H	-	-
CO2	M	-	H	-	H	-	-	-	H	-	-
CO3	M	-	H	-	H	-	-	-	H	-	-
CO4	M	-	H	-	H	-	-	-	H	-	-

COURSE NAME: SEMICONDUCTOR DEVICES THEORY & MODELING

COURSE CODE: MTEC 601

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 20%-30 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Apply basic equations like Poisson's equations, continuity equation etc. for the operation of semiconductor devices.
- CO2 Explain the current-voltage characteristics and switching characteristics of p-n junctions with the use of mathematical equations.
- CO3 Model low frequency and high frequency capacitance-voltage characteristics and other depletion effects on device performance.
- CO4 Derive bipolar device models for circuit and time-dependent analysis.
- CO5 Differentiate between long-channel and short-channel MOSFETs on the basis of characteristics and non-linear parameters.

Syllabus

Unit 1. Physics of Semiconductors

Energy bands in solids- carrier concentration in intrinsic and extrinsic semiconductors, Carrier transport in silicon-drift and diffusion current, velocity saturation, Basic equations for device operation-Poisson's equation, current-density equations, continuity equation.

Unit 2. P-N Junctions

Built-in potential, Diode equation, current-voltage characteristics-temperature dependence and diode leakage currents, Time-dependent and switching characteristics- excess charge carriers, Diffusion Capacitance.

Unit 3. MOS capacitors

Surface Potential, electrostatic Potential and charge distribution in Silicon, Capacitances in MOS structure-low frequency and high frequency C-V characteristics, polysilicon work

function and depletion effects, charge in Si-SiO₂ interface, effects of interface traps on device characteristics-surface generation and recombination.

Unit 4. Bipolar Transistors

NPN & PNP Transistors, Ideal Current-Voltage Characteristics, Bipolar Device Models for Circuit and Time-Dependent Analysis.

Unit 5. MOSFET Devices

Long-channel MOSFETs: drain current model, I-V characteristics, subthreshold characteristics, Temperature dependence of Threshold voltage, channel mobility. Short-Channel MOSFETs: short channel effects, velocity saturation, channel length modulation, source-drain series resistance.

Text Books:

1. Y. Taur and T. H. Ning, “Fundamentals of Modern VLSI Devices”, Second Edition, Cambridge University Press, 2013.
2. N. Arora, “MOSFET Modeling for VLSI simulation: Theory and Practice”, World Scientific, 2007.

Reference books and other resources:

1. S. M. Sze, “Physics of Semiconductor Devices”, John Wiley & Sons, 3rd Edition, 2007.
2. B. G. Streetman and S. Banerjee, “Solid State Electronic Devices”, Pearson Prentice Hall, 2006.
3. T. A. Fjeldly, T. Ytterdal and M. S. Shur, “Introduction to Device Modeling and Circuit Simulation”, Wiley.
4. Y. Tsividis, “Operation and Modeling of the MOS Transistor”, Second Edition, Oxford.
5. R. F. Pierret, “Semiconductor Device Fundamentals”, Addison Wesley Publishers, 1996.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	H	L	-	-	-	-	-	-	-	-
CO3	H	H	L	-	H	-	-	-	-	-	-
CO4	H	H	L	-	H	-	-	-	-	-	-
CO5	H	H	L	-	H	-	-	-	H	-	-

COURSE NAME: MULTIMEDIA COMMUNICATION

COURSE CODE: MTEC-602

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Comprehend the concepts of multimedia representation

CO2 Explain various audio, video, text and image file standards.

CO3 Apply various audio, video, text and image compression techniques

CO4 Study and analyze various security issues related to multimedia.

Syllabus

Unit 1. Multimedia Information Representation

Different types of multimedia information, Information representation: Text, Image, Audio, Video.

Unit 2. Multimedia systems and file formats/standards

Distributed MM Systems, Multimedia processors, Multimedia OS, Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/Video Standards, MPEG-1, MPEG-2, MPEG-4, MPEG-7.

Unit 3. Text and Image Compression

Introduction, compression principles, Text compression techniques: GIF, TIFF, JPEG, PNG, Image compression techniques: static Huffman coding, dynamic Huffman coding, arithmetic coding, Lempel-Ziv coding.

Unit 4. Audio and Video Compression

Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression techniques, Huffman, Run length, Variable length, Lossy /lossless compression.

Unit 5. Security Issues

Transform audio coders, Image coding, video coding, Water marking techniques, Steganography techniques, Organization, Storage and retrieval, ANNs for MMSP.

Text Books:

1. Fred Halsall, "Multimedia communications", Prentice Hall.
2. Proakis, "Digital communications", Prentice Hall.

Reference books and other resources:

1. P. K. Andleigh and K. Thakkar, "Multimedia Systems Design", PHI, 2002.
2. Tay Vaughan, "Multimedia", 5/e, TMH, 2001.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	-
Unit 4	-	-	H	-
Unit 5	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ADVANCED WIRELESS NETWORKS

COURSE CODE: MTEC-603

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the basics of wireless area networks.
- CO2 Describe and analyse the advancements in wireless internet.
- CO3 Identify and resolve issues in AD-hoc networks.
- CO4 Analyze various design challenges in wireless sensor networks.
- CO5 Contrast and analyze emerging ultra wideband technologies

Syllabus

Unit 1. Wireless Area Networks

WiMAX: Network architecture , protocol stack of IEEE 802.16 , physical layer, MAC layer schemes ,differences between IEEE 802.11 and IEEE 802.16; WLAN: Fundamentals, network architecture, protocol stack of IEEE 802.11 , physical layer, MAC layer mechanism; WPAN: System model, protocol stack of IEEE802.15; Bluetooth: Network architecture, operation, protocol stack, physical and MAC layer ; Radio Frequency Identification (RFID): Types and specifications.

Unit 2. Wireless Internet

Mobile IP - IPv6 advancements ,mobility management ,functions ,location management, registration and handoffs ,wireless security and standards; TCP in Wireless Domain: TCP over wireless , types , traditional , snoop , indirect , mobile , transaction oriented , impact of mobility.

Unit 3. AD-hoc Network

Ad-hoc Network: Introduction - characteristics , medium access scheme , routing schemes, multicasting , transport layer protocol , pricing scheme , QoS provisioning , self organization, security , energy management and deployment consideration.

Unit 4. Wireless Sensor Network

Wireless Sensor Network: Characteristics and architecture of wireless sensor network, layered and clustered , data dissemination , data gathering , MAC protocols , routing schemes, security , enabling technologies for sensor network and applications ,comparison with MANET - ZIGBEE standard and architecture ,WBAN standard and architecture.

Unit 5. Emerging Technologies

UWB Radio Communication: Fundamentals of UWB , operation of UWB systems, comparison with other technologies, advantages and disadvantages; Multimode 802.11 - IEEE 802.11a/b/g - software radio based multimode system, meghadoot architecture - 802.11VoIP phone - IEEE 802.11n.

Text Books:

1. William Stallings, “Wireless Communication and Networks”, Second Edition, Prentice Hall, 2005.
2. K. Pahlavan and P. Krishnamurthy, “Principle of Wireless Networks - A Unified Approach”, Prentice Hall of India, 2006.

Reference books and other resources:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad-hoc Wireless Networks-Architecture and Protocols”, 2nd Edition, Pearson education, 2007.
2. Vijay K. Garg, “Wireless Communications and Networks”, Second Edition, Morgan Kaufmann Publishers (Elsevier), 2007.
3. C. K. Toh, “Ad Hoc Mobile Wireless networks”, First Edition, Pearson education, 2002.
4. Upena Dalal , “Wireless Communication”, Oxford University Press, 2009.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	
Unit 2	-	H	-	-	
Unit 3	-	-	H	-	
Unit 4	-	-	-	H	
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	L	L	-	-	-	-	-	-	-	-	-
CO3	L	L	H	-	-	-	-	-	-	-	-
CO4	L	L	-	-	-	-	-	-	-	-	-
CO5	H	L	H	H	-	-	-	-	H	-	H

COURSE NAME: ADVANCED WIRELESS & MOBILE COMMUNICATION

COURSE CODE: MTEC-604

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the basic terminology and various generations of wireless communication systems.
- CO2 Explain various types of fading techniques and associated parameters.
- CO3 Explain various techniques to combat fading.
- CO4 Describe multiple accesses using CDMA.
- CO5 Explain latest wireless communication standards.

Syllabus

Unit 1. Review of Wireless Communication Systems

The cellular concept, handoff and system capacity, trunking and grade of service, capacity improvement techniques, Evolution and enabling technologies of cellular networks: 2G, 2.5 G, 3G-WCDMA, 3G CDMA 2000, 3G TD-SCDMA, 4G, and 5G cellular networks.

Unit 2. Small Scale Fading and Multipath

Wireless channel and fading, types of fading, Parameters of mobile multipath channels, ISI and its reduction using Pulse shaping techniques, Rayleigh fading, Rician fading and Nakagami fading distributions.

Unit 3. Diversity and Channel equalization

Introduction to diversity, types of diversity, multi antenna maximal ratio combiner, BER with diversity, fundamentals of equalization, algorithms for adaptive equalization.

Unit 4. Multiple Access

Introduction to CDMA, spread spectrum and linear feedback shift register, generation and properties of PN sequences, correlation of PN sequences and jammer margin, CDMA advantage and RAKE Receiver, Multi user CDMA.

Unit 5. Latest Wireless Standards

IEEE 802.15.6 Body area network, IEEE 802.20 Mobile Broadband Wireless Access, IEEE 802.22 Wireless Regional Area Networks, evolving IEEE 802.25 Omni-Range Area Network.

Text Books:

1. T. S. Rappaport, “Wireless Communications”, Pearson Education.
2. William Stallings, “Wireless Communication and Networks”, Pearson Prentice Hall.

Reference books and other resources:

1. NPTEL, “Advanced 3G and 4G Wireless Mobile Communications”, <http://nptel.ac.in/courses/117104099/>.
2. Jochen Schiller, “Mobile Communications (2nd Edition)”, Addison-Wesley.
3. Research Papers from IEEE Journals.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	-	-	-	-	-	-	-	-	-	-
CO3	M	-	H	-	H	-	-	-	-	-	-
CO4	M	-	H	-	M	-	-	-	-	-	-
CO5	M	-	-	-	-	-	-	-	H	-	-

COURSE NAME: SOFT COMPUTING

COURSE CODE: MTEC-605

Internal Marks: 50

L T P

External Marks: 100

3 - -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain the concepts of soft computing, artificial intelligence and optimization problems.
- CO2 Explain the principles of Artificial Neural Networks and design Artificial Neural Networks models for given problems.
- CO3 Apply the fuzzy techniques for the analysis and design of specified systems.
- CO4 Utilize the Genetic Algorithms and PSO Algorithm for the optimization of given problems.
- CO5 Design hybrid soft computing algorithms for solving the different problems.

Syllabus

Unit 1. Soft Computing and Artificial Intelligence

Hard vs. Soft computing, constituents of soft computing, scope of soft computing, meaning of optimization, local optima, global optima, heuristic methods, stochastic methods, constrained optimization, design variables, objective function, and variable bounds. Artificial intelligence: definitions, programming models and techniques, fundamental issues, progress of artificial intelligence.

Unit 2. Artificial Neural Networks

Biological neural networks, history of development in neural networks principles, artificial neural net terminology, models of neuron, activation functions, topology, learning, types of learning: supervised, unsupervised, Reinforcement learning, learning Rules/Methods. Back-propagation learning algorithm, architecture of back propagation networks, selection of various parameters in back propagation networks, multilayer perceptron networks, radial basis function network, Kohonen's self-organizing networks, Hopfield network, applications/case-studies.

Unit 3. Fuzzy Logic Systems

Crisp & fuzzy sets; properties, operations, and relations, membership functions, fuzzification, fuzzy rule based systems, fuzzy-inference systems, defuzzification techniques, applications/ case-studies.

Unit 4. Genetic Algorithm (GA)

GA history, biological background of GA, working principle, basic terminologies, operators: encoding, selection, cross over, mutation, stopping criteria, problem solving using GA.

Unit 5. PSO Algorithm

Biological background of PSO, working principle, basic terminologies, operators, PSO equations, problem solving using PSO.

Unit 6. Hybrid Soft Computing Techniques

Neuro-fuzzy hybrid algorithm, genetic neuro-hybrid algorithm, fuzzy genetic-hybrid algorithm, genetic fuzzy hybrid algorithm, GA-PSO hybrid algorithm.

Text Books:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", PHI, 2010.
2. F. O. Karray and C. D. Silva, "Soft Computing and Intelligent Systems Design", Pearson Education, 2009.

Reference books and other resources:

1. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing", Second Edition, Wiley Publications, 2007.
2. J.-S R. Jang, C.-T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", Prentice Hall India, 2010.
3. S. K. Valluru and T. N. Rao, "Introduction to Neural Networks, Fuzzy Logic & Genetic Algorithms", First Edition, Jaico, 2010.
4. N. P. Padhy, "Artificial Intelligence and Intelligent Systems", Second Edition, Oxford University Press, 2005.
5. Related IEEE/IEE/ Science Direct publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	H	-
Unit 6	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	-	M	-	M	-	-	-	-	-	-
CO3	H	-	M	-	M	-	-	-	-	-	-
CO4	H	-	M	-	M	-	-	-	-	-	-
CO5	H	M	M	M	M	-	-	-	-	-	-

COURSE NAME: ERROR CONTROL CODING TECHNIQUES

COURSE CODE: MTEC 606

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 20%-30 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain basic parameters and terminology related to coding theory.
- CO2 Coding and decoding of data using Linear Codes.
- CO3 Coding and decoding of data using Convolutional Codes.
- CO4 Coding and decoding of data using Viterbi Codes.
- CO5 Coding and decoding of data using LDPC Codes.
- CO6 Coding and decoding of data using Turbo Codes.

Syllabus

Unit 1. Mathematical Preliminaries and Introduction

Groups, subgroups and equivalence relations, cosets, rings and fields, vector spaces, linear independence and basis, linear codes and independence, spanning, Basics of binary block codes for the binary symmetric channel.

Unit 2. Linear Block Codes

Linear block codes; The dual code, Systematic generation matrix, minimum distance of a linear code, Hamming distance, Bounds on the size of a block code; Bounded and maximum-likelihood decoding of binary block codes.

Unit 3. Convolutional and Viterbi Codes

Basics of convolutional codes; states and trellis, the Viterbi decoding algorithm. Catastrophic error propagation, path enumeration, viterbi decoder over AWGN channel.

Unit 4. Low Density Parity Check (LDPC) Codes

LDPC Codes terminology, Gallager decoding algorithm, BP decoding of LDPC codes, density evolution under BP decoding, convergence and concatenation theorem, turbo codes.

Unit 5. Turbo Codes

Turbo Codes, Implementation of Turbo Decoder, From Turbo Code to Advanced Iterative Receivers, Turbo-Based Interleaving Techniques, Turbo-MIMO Techniques.

Text Books:

1. R. Bose, "Information Theory, Coding and Cryptography", Tata McGraw-Hill Education, 2008.
2. Thierry Lestable (Editor) and Moshe Ran (Editor), "Error Control Coding for B3G/4G Wireless Systems: Paving the Way to IMT-Advanced Standards", John Wiley, April 2011.

Reference books and other resources:

1. P. V. Kumar, M. Win, H-F. Lu and C. Georghiades, "Error-Control Coding Techniques and Applications", Chapter 17 in Optical Fiber Telecommunications IV-B: Systems and Impairments, Editors: Ivan P. Kaminow and Tingye Li, Elsevier Science Press, 2002.
2. F. J. MacWilliams and N. J. A. Sloane, "The Theory of Error-Correcting Codes", North-Holland, 1977.
3. NPTEL website: Error Control Code : <http://nptel.ac.in/syllabus/117108044/>.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	L	H	-	-	-	-
Unit 3	L	-	H	H	-	-
Unit 4	L	-	-	-	H	-
Unit 5	L	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	M	-	H	-	M	-	-	-	L	-	-
CO3	M	-	H	-	M	-	-	-	L	-	-
CO4	M	-	H	-	M	-	-	-	L	-	-
CO5	M	-	H	-	M	-	-	-	L	-	-
CO6	M	-	H	H	M	-	-	-	H	-	-

COURSE NAME: DATABASES AND DATA MINING

COURSE CODE: MTEC-607

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe the concepts of database systems.
- CO2 Analyze different types and characteristics involved in distributed systems.
- CO3 Explain architecture and tools of data warehousing and Online Analytical Processing (OLAP).
- CO4 Apply tasks and techniques of data mining.
- CO5 Explain different clustering and classification techniques.

Syllabus

Unit 1. Basics of Database System

Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Decision Support Systems, Components of a Database management, Distributed Processing and Client Basic Concepts, Keys, Design Issues, ER Diagrams, Types of databases.

Unit 2. Distributed Database Management System (DDBMS)

Introduction to distributed database, Advantages and disadvantages of distributed database, Homogenous and Heterogeneous distributed databases, Functions and architecture of DDBMS, Data fragmentation, Data allocation, Distributed transactions, Distributed concurrency control, Distributed deadlock management and Distributed database recovery.

Unit 3. Data Warehousing and Online Analytical Processing (OLAP)

Introduction to data warehousing, Data ware architecture, Data flows, warehousing tools, Data marts, Data warehouse design, Online Analytical Processing (OLAP benchmarks,

benefits, representation of multi-dimensional data applications of OLAP, OLAP tools, categories of OLAP tools).

Unit 4. Data Mining

Introduction, Process of data mining, Data mining goals, Tasks and techniques (Prediction modeling, Database segmentation, Link analysis, Deviation detection), Applications of data mining.

Unit 5. Clustering and Classification

Introduction, Issues in clustering, Types of clustering: Hierarchical and partitioning clustering, K-means clustering, Applications of clustering, Applications of classification, Classification techniques: Decision trees, Nearest neighbour.

Textbooks:

1. B. Connolly, "Database Systems: A Practical Approach to Design, Implementation and Management." Pearson Education, 2007.
2. A. K. Pujari, "Data Mining Techniques", Universities Press, 2013.

Reference books and other resources:

1. V. Pudi and P. R. Krishna "Data Mining", Oxford University Press India, 2009.
2. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Pearson Education, 2007.
3. H. F. Korth and A. Silberchatz, "Database Concepts", Tata McGraw Hill, 2010.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	L	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	L	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: BIOMEDICAL ELECTRONICS

COURSE CODE: MTEC-608

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Describe the methods of recording and measuring various bio potentials.

CO2 Analyze medical imaging systems.

CO3 Classify and describe therapeutic equipments.

Syllabus

Unit 1. Measuring, Recording and Monitoring Instruments

Biomedical signals and electrodes, Biomedical recorders, Oximeters, Biomedical telemetry, Telemedicine technology, Blood cell counters.

Unit 2. Modern Imaging Systems

X-ray machine, Visualization of X-rays, Physical parameters for X-ray Detectors, Principle of NMR Imaging system, Image reconstruction techniques, Basic NMR components, Biological effect of NMR imaging, Advantages of NMR imaging system.

Unit 3. Ultrasonic Systems

Basics of diagnostic radiology, Diagnostic Ultrasound, Physics of Ultrasonic waves, Medical ultrasound, Three-dimensional ultrasound imaging systems, Portable ultrasound systems.

Unit 4. Therapeutic Equipment

Cardiac pacemakers, Cardiac defibrillators, Electrotherapy equipment, Capnography, Radiotherapy equipment, Laser applications in Biomedical field.

Text Book:

1. R. S. Khandpur, "Magnetic Resonance Imaging System", in Handbook of Biomedical Instrumentation, Third Edition, New Delhi, India: McGraw Hill Education, 2014.

Reference books and other resources:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.
2. Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.

Mapping of course contents with CO

Contents	CO1	CO2	CO3
Unit 1	H	-	-
Unit 2	-	H	-
Unit 3	-	H	-
Unit 4	-	-	H

Mapping of CO with PO

[illegible]

COURSE NAME: ORGANIC ELECTRONICS

COURSE CODE: MTEC-609

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe the architecture, fabrication and properties of organic electronic transistor.
- CO2 Summarize advanced materials for organic electronics.
- CO3 Comprehend different manufacturing methods in organic electronics.
- CO4 Describe the fabrication and characterization of Integrated Circuits.

Syllabus

Unit 1. Introduction to Organic Electronic Materials

Organic Electronic Materials – Classification, Organic Thin-Film Transistor – Architecture, Operating Mode, Fabrication Techniques, Structure - Property Relationships, Methods of Improving Performance – Structural Perfection, Device Architecture, Electrical and Environmental Stability – Chemical Effects on Stability, Gate Dielectrics on Electrical Functionality.

Unit 2. Advanced Materials for Organic Electronics

Pentacene Transistors– Performance, Engineered Pentacenes – Reversible Functionalization–End-Substituted Derivatives, Peri-functionalized Pentacenes, Heteropentacenes, Semiconductors Based on Polythiophene and Indolo [3,2-*B*] Carbazole– Polydialkylterthiophenes, Polydialkylquaterthiophenes, Polythiophene Nanoparticles, Indocarbazole Designs.

Unit 3. Manufacturing Methods

Production of Substrates for Organic Electronics- Reel-to-Reel Vacuum Metallization, Organic Vapor Phase Deposition – Production of TFTs, OLED, Organic Photovoltaics,

Micro- and Nanofabrication Techniques – Thermal Imaging, Printing, Digital Lithography for TFT Fabrication, Solution Based Printing.

Unit 4. Devices, Applications and Products

Transistors to Integrated Circuits – Fabrication and Characterization of ICs, Non-Rigid Display – Roll-Up Active-Matrix Displays Design, Active–Matrix Light-Emitting Displays – Advantages Over LCDs, Fabrication Process, Large-Area Detectors and Sensors – Future Prospects, Organic Semiconductor-Based Chemical Sensors.

Text Book:

1. H. Klauk, “Organic Electronics: Materials, Manufacturing, and Applications” Wiley-VCH Verlag GmbH & Co. KGaA, 2006.

Reference Books and Other Resources:

1. M. Pope and C. E. Swenberg, "Electronics Processes in Organic Crystals and Polymers", Second Edition, Oxford Science Publications, 1999.
2. W. Brutling, "Physics of Organic Semiconductors", Wiley- YCH, 2005.
3. Z. H. Kafafi, "Organic Electroluminescence", CRC Press, 2005.
4. S. Sun and N. S. Sarciftci, "Organic Photovoltaics -Mechanisms, Materials and Devices", CRC Press, 2005.
5. Related IEEE/IE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	-	-	H	-
Unit 4	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	L	-	-	-	-	L	-	-
CO2	M	-	-	M	-	-	-	-	L	-	-
CO3	M	-	-	M	-	-	-	-	L	-	-
CO4	M	-	-	H	-	-	-	-	L	-	-

COURSE NAME: VLSI DESIGN, VERIFICATION & TESTING

COURSE CODE: MTEC-610

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe digital VLSI design flow and high level design representations.
- CO2 Explain high level synthesis algorithms like scheduling, allocation and binding along with the logic optimization.
- CO3 Implement Binary Decision Diagram for verification of circuits.
- CO4 Apply temporal logic for verification and use model checking algorithms.
- CO5 Apprehend testing of combinational and sequential circuits, fault simulations and BIST mechanism.

Syllabus

PART-A (Design)

Unit 1. Introduction

Introduction to Digital VLSI Design Flow, High Level Design Representation, Transformations for High Level Synthesis.

Unit 2. Scheduling, Allocation and Binding

Introduction to HLS: Scheduling, Allocation and Binding Problem, Scheduling Algorithms, Binding and Allocation Algorithms.

Unit 3. Logic Optimization and Synthesis

Two level Boolean Logic Synthesis, Heuristic Minimization of Two-Level Circuits, Finite State Machine Synthesis, Multilevel Implementation.

PART-B (Verification)

Unit 4. Binary Decision Diagram

Binary Decision Diagram: Introduction and construction, Ordered Binary Decision Diagram, Operations on Ordered Binary Decision Diagram, Ordered Binary Decision Diagram for Sequential Circuits.

Unit 5. Temporal Logic

Introduction and Basic Operations on Temporal Logic, Syntax and Semantics of Computational Tree Logic (CTL), Equivalence between CTL Formulas.

Unit 6. Model Checking

Verification Techniques, Model Checking Algorithm, Symbolic Model Checking.

PART-C (Testing)

Unit 7. Introduction to Digital Testing and Fault Simulation

Introduction to Digital VLSI Testing, Functional and Structural Testing, Fault Equivalence, Fault Simulation, Testability Measures (SCOAP).

Unit 8. Combinational Circuit and Sequential Circuit Testing

Introduction to Automatic Test Pattern Generation (ATPG) and ATPG Algorithms, D-Algorithm, ATPG for Synchronous Sequential Circuits, Scan Chain based Sequential Circuit Testing.

Unit 9. Built in Self test (BIST)

Components of BIST, Memory Testing.

Text Books:

1. L. T. Wang, Y. W. Chang and K. T. Cheng, "Electronic Design Automation: Synthesis, Verification and Test", Elsevier, 2009.
2. M. L. Bushnell and V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory & Mixed-Signal Circuits", Kluwer Academic Publishers, 2002.

Reference Books and Other Resources:

1. L.T. Wang, C. W. Wu and X. Wen, "VLSI Test Principles and Architectures: Design for Testability", Elsevier, 2006.
2. L. Scheffer, L. Lavagno and G. Martin, "EDA for IC System Design, Verification, and Testing", Taylor & Francis Group, 2006.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	H	-	-	-
Unit 4	-	-	H	-	-
Unit 5	-	-	-	H	-
Unit 6	-	-	-	H	-
Unit 7	-	-	-	-	H
Unit 8	-	-	-	-	H
Unit 9	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	L	-	-	-	-	-	-	-
CO2	H	H	-	H	L	M	-	-	H	-	-
CO3	H	H	-	H	L	M	-	-	H	-	-
CO4	H	H	-	H	L	M	-	-	H	-	-
CO5	H	H	-	H	L	M	-	-	H	-	-

COURSE NAME: VLSI DESIGN AUTOMATION

COURSE CODE: MTEC-611

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe the various steps involved in VLSI Design Cycle and discuss the basic algorithms of data structures.
- CO2 Design the VLSI devices and explain their Fabrication process.
- CO3 Understand the issues related to fabrication process, cost and power dissipation.
- CO4 Analyze and Apply different algorithms for Partitioning, Floorplanning and Placement.
- CO5 Classify the various Routing Algorithms and explain the Clock and power routing in Physical Design.

Syllabus

Unit 1. Introduction

VLSI Design Cycle, Physical Design Cycle, New Trends in Physical Design Cycle, Design Styles and System Packaging Styles, Basic Data Structure and basic algorithm techniques.

Unit 2. Design and Fabrication of VLSI Devices

Fabrication of VLSI Circuits: NMOS Fabrication Process, CMOS Fabrication Process, Details of Fabrication Process, Design Rules and Layout of basic devices.

Unit 3. Fabrication Process and its impact on Physical Design

Scaling Methods, Comparison of fabrication process, Issues related to Fabrication Process and other issues in interconnect power dissipation, yield and fabrication costs.

Unit 4. Partitioning, Floorplanning, Placement and Pin Assignment

NP-hard problems, design style specific partitioning problems, Partitioning algorithms:

Group migration algorithms, Floorplanning, floorplanning algorithms , floorplanning algorithms for mixed block and cell designs, Placement, Placement algorithms, Partitioning based Placement algorithms, Pin assignment, advanced heuristic soft computing techniques for Partitioning, Floorplanning and Placement.

Unit 5. Various Routing Techniques

Global Routing, Global Routing Algorithms, Detailed Routing, routing considerations, routing models, channel routing problems, switchbox routing problems, Detailed Routing Algorithms, Over –the- cell routing: cell models, Overview of Two, Three and multilayer layer over –the- cell routers and performance driven OTC routing, Clock and power routing: clocking schemes, design considerations for the clocking system, power and ground routing.

Text Books:

1. N. A., “Algorithms for VLSI Physical Design Automation”, Third Edition, Springer, 2013.
2. M. Sarrafzadeh and C. K. Wong, “Introduction to VLSI Physical Design”, Fourth Edition, McGraw-Hill., 1996

Reference Books and Other Resources:

1. Charles J. Alpert, Dinesh P. Mehta and Sachin S. Sapatnekar, “Handbook of Algorithms for Physical Design Automation”, Auerbach Publications (CRC Press), 2008.
2. R. Dreschler, “Evolutionary Algorithms for VLSI CAD”, Third Edition, Springer, 2002.
3. S. K. Lim, “Practical Problems in VLSI Physical Design Automation”, Springer, 2008.
4. S. M. Sait and H. Youssef, “VLSI Physical Design Automation: Theory and Practice”, World Scientific, 1999.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	L	H	-	-	-
Unit 3	L	H	H	-	-
Unit 4	L	-	-	H	-
Unit 5	L	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	M	-	-	-	-	-	-	H	-	-
CO2	H	H	-	H	M	-	-	-	H	-	-
CO3	H	M	-	H	-	-	-	-	H	-	-
CO4	H	H	-	H	H	-	-	-	H	-	-
CO5	H	M	-	H	M	-	-	-	H	-	-

COURSE NAME: LOW POWER VLSI DESIGN

COURSE CODE: MTEC-612

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the sources of power dissipation and important parameters and apply design approaches for low power VLSI.
- CO2 Analyze the impact of device parameters and technology on performance of low power electronics.
- CO3 Optimize dynamic power and static power at circuit level during standby and runtime using various techniques.
- CO4 Estimate and solve power related issues during clock distribution.
- CO5 Apply power analysis methodology and power estimation and power minimization techniques for the design of memory and arithmetic circuits.

Syllabus

Unit 1. Introduction

Power and Energy basics, Sources of power dissipation in Digital Integrated circuits, important parameters for low power design, Low power design approaches.

Unit 2. Device and Technology Impact on Low Power Electronics

Dynamic dissipation in CMOS, transistor Sizing & gate oxide thickness, impact of technology Scaling, Technology & Device innovation.

Unit 3. Circuit Level Power Optimization Techniques

Dynamic Power Optimization: multiple supply voltages, transistor sizing, technology mapping. Static power Optimization: Multiple thresholds, transistor stacking, Introduction to energy recovery CMOS.

Unit 4. Power Optimization at Standby and Runtime

Clock gating, power gating, body biasing, supply voltage ramping, Power reduction of memory in standby mode using voltage scaling and body biasing. Dynamic voltage and frequency scaling, adaptive body biasing, Power domains and power management.

Unit 5. Low Power Clock Distribution

Power Dissipation in Clock Distribution, Single driver vs. Distributed buffers, Buffer and device sizing, Zero skew vs. tolerant skew, chip and package co-design of clock network.

Unit 6. Logic Synthesis for Low Power

Low power design flow, power analysis methodology, Power estimation Techniques, Power Minimization Techniques.

Unit 7. Design of Low Power Memory and Arithmetic Elements

Memory architecture, SRAM cell metrics, power in cell array, power for read and write access. Design of circuits for addition, Multiplication and Division.

Text Books:

1. J. M. Rabaey and M. Pedram, “Low Power Design Methodologies”, Kluwer-Academic Publishers.
2. A. Pal, “Low Power VLSI Circuits and Systems”, Springer.

Reference Books and Other Resources:

1. N. H. Weste and D. M. Harris, “CMOS VLSI Design: A Circuits and System Perspective”, Fourth Edition, Pearson.
2. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, “Digital Integrated Circuits: A Design Perspective”, Second Edition, PH/Pearson.
3. K. Roy and S. C. Prasad, “Low-Power CMOS VLSI Circuit Design”, Wiley.
4. P. Chandrakasan and R. W. Broderson, “Low-Power CMOS Design”, IEEE Press.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	H	-	-
Unit 5	-	-	-	H	-
Unit 6	-	-	-	-	H
Unit 7	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	M	-	H	L	-	-	-	M	-	-
CO2	H	H	-	H	-	-	-	-	M	-	-
CO3	H	H	-	H	L	-	-	-	H	-	-
CO4	H	H	-	H	-	-	-	-	H	-	-
CO5	H	H	-	H	L	-	-	-	H	-	-

COURSE NAME: NANO ELECTRONICS

COURSE CODE: MTEC-613

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Express the fundamentals of nanoelectronics.
- CO2 Illustrate Silicon MOSFETs and Quantum Transport Devices in nanoelectronics.
- CO3 Identify the structure and applications of Carbon nanotubes.
- CO4 Discuss molecular electronics and mass storage devices

Syllabus

Unit 1. Fundamentals of Nanoelectronics

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation: power dissipation limit – dissipation in reversible computation – the ultimate computer.

Unit 2. Silicon Mosfets & Quantum Transport Devices

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

Unit 3. Carbon Nanotubes

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of all carbon nanotube nanoelectronics.

Unit 4. Molecular Electronics

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

Text Books:

1. K. Gosser, JanDienstuhl and others, “Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices”, Springer, 2004.
2. R. Waser(Ed.), “Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices” Wiley-VCH , 3rd edition.

Reference Books and other resources:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons and B. Raguse, “Nanotechnology: Basic Science and Emerging Technologies”, Chapman & Hall/CRC, 2002.
2. T. Pradeep, “NANO: The essentials – Understanding Nanoscience and Nanotechnology”, Mc-Graw Hill Education.
3. Related IEEE/IE Publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	L	H	-	-
Unit 3	-	-	H	-
Unit 4	M	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	-	-	-	-	-	-	-	L	-	-
CO2	M	-	-	M	-	-	-	-	L	-	-
CO3	M	-	-	M	-	-	-	-	L	-	-
CO4	M	-	-	H	-	-	-	-	L	-	-

COURSE NAME: SPEECH AND IMAGE PROCESSING

COURSE CODE: MTEC 614

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 10%-20%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Explain basic parameters and quality metrics in speech and image processing.
- CO2 Analyze speech signals using LPC.
- CO3 Discuss digital coding of speech and speech synthesis.
- CO4 Discuss various image enhancement and restoration techniques.
- CO5 Discuss image segmentation and image compression techniques.
- CO6 Describe speech and image processing using wavelets and curvelets.

Syllabus

Unit 1. Introduction to Digital Speech Processing

The process of speech production, acoustic phonetics, auditory models, the acoustic theory of speech production, digital models for sampled speech signals.

Unit 2. Speech Coding

linear predictive analysis of speech signals, computation of gain of model, frequency domain representation, solution of LPC equations, properties of LPC polynomial, alternative representations of LP, digital coding of speech signals, sampling speech signal, statistical model, quantization, differential quantization, delta modulation, DPCM, applications of speech coders.

Unit 3. Speech Synthesis

Sound Capturing, phonemes, Prosody, Speech Synthesis with Phonemes, Text Processing for Speech Synthesis, Letter-to-Phoneme Rules, Text-to-Phoneme Transcription, Generating Prosody, text to speech synthesis.

Unit 4. Introduction to Digital Image Processing

Image as a 2D signal, Fundamental steps in digital image processing, applications of digital image processing, quality metrics for image processing.

Unit 5. Image enhancement and restoration

Image enhancement in spatial and frequency domains, gray scale modifications, histogram equalization, image restoration, types of noises corrupting the images, denoising methods, median filtering, wiener filtering.

Unit 6. Image Compression and Image Segmentation

Image compression in spatial and transform domains, image segmentation, segmentation algorithms, edge and boundary detection, pattern recognition.

Unit 7. Advanced topics

Wavelets and curvelets in speech and image processing.

Text Books:

1. L. Rabiner and R. Schafer, “Digital speech processing”, Pearson, 2011.
2. T. F. Quatieri, “Discrete time speech signal processing”, Pearson education, 2004

Reference books and other resources:

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”, Pearson Education.
2. Related IEEE/IEE/Sciencedirect publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
Unit 1	H	-	-	-	-	-
Unit 2	-	H	H	-	-	-
Unit 3	-	-	H	-	-	-
Unit 4	H	-	-	-	-	-
Unit 5	-	-	-	H	-	-
Unit 6	-	-	-	-	H	-
Unit 7	-	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	-	-	-	-	-	-	-	-	-	-
CO2	H	-	H	-	M	-	-	-	L	-	-
CO3	H	-	H	-	M	-	-	-	L	-	-
CO4	H	-	H	-	M	-	-	-	L	-	-
CO5	H	-	H	-	M	-	-	-	L	-	-
CO6	M	-	M	H	M	-	-	-	H	-	-

COURSE NAME: ADVANCED DIGITAL SYSTEM DESIGN

COURSE CODE: MTEC-615

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 50%-60 %

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Design the different standard combinational circuits and uses these standard circuits to implement other digital circuits.
- CO2 Analyze and design the different standard synchronous sequential logic (Flip Flop, counters etc.) and other user defined synchronous sequential digital circuits using traditional approach.
- CO3 Analyze and design the different multi-input system controllers.
- CO4 Analyze different asynchronous sequential machines and design the standard and user-defined Asynchronous sequential logic.
- CO5 Design of different combinational and sequential circuits using VHDL.

Syllabus

Unit 1. Review of Digital Electronics Concept

Design and analysis of combinational circuits (Arithmetic Circuits, Comparators, Multiplexers, Code Converters) and sequential machines (State Diagram, Design Steps For Traditional Synchronous Sequential Circuits, Counters, Shift Registers and Memory)

Unit 2. Multi Input System Controller Design

System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

Unit 3. Asynchronous Finite State Machines

Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method, Electromagnetic Interference And Electromagnetic Compatibility Grounding And Shielding of Digital Circuits. Interfacing digital system with different media like fiber cable, co-axial cable etc.

Unit 4. Digital Logic Design with VHDL

Combinational Logic Design-complex Logic Gates, One-bit Half Adder, multiplexer, Thermometer-to- binary encoder, Seven-segment display driver, tri-state buffer, Sequential Logic Design-Latches and Flip-Flops, counter design, state machine design, Memories-Random Access Memory, Read-Only Memory

Text Books:

1. W. I. Fletcher, "An Engineering Approach to Digital Design", Prentice Hall India, 1990.

Reference books and other resources:

1. Robert L. Miller, "Designing with TTL Circuits", McGraw Hill.
2. Richard F. Tinder, "Engineering Digital Design", Academic Press.
3. John F. Wakerly, "Digital Design- Principles and Practices", Pearson Education.
4. David J. Comer, "Digital Logic and State Machine Design", Oxford University Press.
5. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw-Hill.
6. Related IEEE/IEE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	H	-	-	-
Unit 2	-	L	H	-	-
Unit 3	-	-	-	H	-
Unit 4	L	L	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M	-	H	-	M	-	-	-	L	-	-
CO2	M	-	H	-	M	-	-	-	L	-	-
CO3	M	-	H	-	M	-	-	-	L	-	-
CO4	M	-	H	-	M	-	-	-	L	-	-
CO5	M	-	H	-	M	-	-	-	L	-	-

COURSE NAME: COMPUTER COMMUNICATIONS AND NETWORKS

COURSE CODE: MTEC-616

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe communication protocols and their operation.
- CO2 Comprehend the structure of internetworking and its applications.
- CO3 Classify the ATM networks and LAN technology.
- CO4 Outline the techniques related to network security.
- CO5 Model and analyze the communication networks.

Syllabus

Unit 1. Review of Network Protocols

Review of Data Communication and Networking, OSI and TCP/IP Protocol Suite, Error Control, Flow Control, Bit Oriented and Character Oriented Protocol, Data Link Layer Services, X.25, Virtual Circuits and Datagram's, Medium Access Control Protocols (CSMA/CD, Token Ring, FDDI, DQDB).

Unit 2. Computer Communication Structure and Networks

Internetworking, IP addressing, Structure of IP, IPv4, IPv6, Transport Layer Protocols (TCP, UDP), Application Layer Services (DNS, e-mail, www).

Unit 3. ATM Networks and LAN's

Concept and History of ATM, ATM Architecture and its Convergence, Challenges, LAN Technology: Applications, Architecture, Bus LANs, Ring LANs, Star LANs, Wireless LANs.

Unit 4. Network Security

Security Issues, Cryptography: Symmetric Key Algorithms, Public-Key Algorithms, Concept of Firewalls, Digital Signatures, Intrusion Detection Systems.

Unit 5. Modelling and Analysis of Computer Communication Networks

Pure Birth and Birth-Death Process, Bernouli Trials-Markov Chains, Poisson Process, Calculation of Delay-Little's Formula, Burke's Theorem, Queueing Models: M/M/1, M/M/1/N, M/M/S, M/M/S/N Queues, Imbedded Markov Chains-M/G/1 Queue, Network Layout and Reliability Considerations.

Text Books:

1. W. Stallings, "Data and Computer Communication", Sixth Edition, Prentice Hall, 2002.
2. J. F. Hayes, "Modelling and Analysis of Computer Communication Networks", First Edition, Springer, 1984.

Reference books and other resources:

1. A. S. Tanenbaum, "Computer Networks", Fourth Edition, Pearson Education, 2011.
2. B. A. Forouzan, "Data Communications and Networking", Third Edition, Tata Mcgraw-Hill, 2004.
3. S. Keshav, "An Engineering Approach to Computer Networking: ATM Networks, The Internet and the Telephone Network", First Edition, Pearson Education, 1987.
4. D. P. Bertsekas, "Data Networks", Second Edition, Prentice Hall, 1992.
5. Related IEEE/IE publications.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	L	-	-	-	-	-	-	-	L	-	-
CO2	L	-	-	-	-	-	-	-	L	-	-
CO3	L	-	-	-	-	-	-	-	L	-	-
CO4	L	-	-	-	-	-	-	-	L	M	-
CO5	H	-	-	-	-	-	-	-	L	-	-

COURSE NAME: ADVANCED EMBEDDED SYSTEM DESIGN

COURSE CODE: MTEC-617

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 20%-30%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Describe, classify and illustrate the use of Embedded Systems.
- CO2 Explain the architecture and programmer's model of ARM microcontrollers.
- CO3 Apply the embedded networking concepts.
- CO4 Comprehend Real-Time Embedded System concepts.
- CO5 Develop applications based on Embedded System hardware and software.

Syllabus

Unit 1. Review of Embedded Systems

Overview of embedded systems, Embedded processors in systems, Embedded hardware units and devices, Design process in embedded systems, Classification of embedded systems, Real life examples.

Unit 2. ARM 32-Bit Microcontroller Architecture

Architecture, Registers, Pipeline, Interrupts and the vector table, Architecture revisions, ARM processor families.

Unit 3. ARM Instruction Set

Instruction Set: Data processing instructions, Branch instructions, Load-store instructions, Software interrupt instruction, Program status register instructions, Conditional execution.

Unit 4. Networked Embedded Systems

Serial bus communication protocols: I²C Bus, CAN Bus, USB Bus; Parallel Bus Communication Protocols: ISA, PCI and advanced buses; Internet Enabled Systems; Wireless and Mobile System Protocols.

Unit 5. Design Examples Using ARM7

ARM7 I/O Port Description, Interfacing Programs for UART, Timer, ADC and DAC.

Unit 6. Real-Time Embedded Systems Software

Real-time Embedded Systems, Real-Time Operating Systems (RTOS)– Key characteristics, The Scheduler, Tasks, Semaphores, Message Queues, Basic design using RTOS.

Text Books:

1. R. Kamal, “Embedded Systems, Architecture Programming and Design”, Second Edition, Tata McGraw Hill, 2008.
2. N. Sloss, D. Symes, C. Wright and J. Rayfield, “ARM System Developer’s Guide, Designing and Optimizing System Software”, Elsevier, 2004.

Reference books and other resources:

1. T. Martin, “The Insider's Guide to The Philips ARM7-Based Microcontrollers, An Engineer's Introduction to The LPC2100 Series”, Hitex, 2005.
2. Q. Li, “Real Time Concepts for Embedded Systems”, CMP Books, 2003.
3. UM10139 LPC214x User manual.
4. Website: www.arm.com.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	M
Unit 3	-	H	-	-	M
Unit 4	-	-	H	-	-
Unit 5	-	-	-	-	H
Unit 6	-	-	-	H	-

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	H	L	L	L	-	-	-	-	-	-	-
CO 2	M	M	-	M	M	-	-	-	-	-	-
CO 3	M	-	M	M	M	-	-	-	-	-	-
CO 4	M	-	H	M	M	-	-	-	-	-	-
CO 5	H	H	H	H	H	-	-	-	-	-	-

**COURSE NAME: MODEING AND SIMULATION OF COMMUNICAION
SYSTEMS**

COURSE CODE: MTEC- 618

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Minimum Numerical Content: 30-40%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Comprehend the concept of simulation and modeling of communication system.
- CO2 Explain models involved in analog channels, digital channels and light wave systems.
- CO3 Apply Random Process models on random variables.
- CO4 Estimate performance metrics of analog and digital communication system.
- CO5 Analyze different case studies of various communication links.

Syllabus

Unit 1. Introduction

Concept of simulation and modeling, Roles of Simulation, Types of Simulation, Limits of Simulation, Simulation Languages (High Level versus Low Level), Real-time Simulation.

Unit 2. Modeling of Communication System

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bustry channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system Models.

Unit 3. Simulation of Random Variables And Random Process

Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov and ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

Unit 4. Estimation of Performance Measures

Quality of an estimator, estimator of SNR, Probability density functions of analog communication system, BER of Digital communication systems, Monte Carlo method and Importance sampling method, estimation of power, Spectral density of a process.

Unit 5. Case Studies

Case Study I: 64-QAM equalized Digital Radio link in a Fading environment.

Case Study II: Lightwave communication links

Case Study III: A Satellite system Example

Text Books:

1. M. C. Jeruchim, Philip Balaban and K. Sam Shanmugam, "Simulation of communication systems", Plenum Press, New York, 1992.
2. M. Law and W. David Kelton, "Simulation Modelling and analysis", Tata McGraw Hill, New York, 2008.

Reference books and other resources:

1. M.C. Jeruchim, Philip Balaban and K. Sam shanmugam, Simulation of communication systems: Modeling, Methodology and Techniques, Kluwer academic/Plenum press, New York, 2000.
2. K. C. Raveendranathan, "Communication Systems Modelling and Simulation Using MATLAB and Simulink", Universities Press, 2011.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Unit 1	H	-	-	-	-
Unit 2	-	H	-	-	-
Unit 3	-	-	H	-	-
Unit 4	-	-	-	H	-
Unit 5	-	-	-	-	H

Mapping of CO with PO

CO	PO										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	H	H	-	-	-	-	-	-	-	-	-
CO2	H	H	H	H	H	-	-	-	-	-	-
CO3	-	-	H	H	H	-	-	-	-	-	-
CO4	-	H	H	H	H	-	-	-	-	-	-
CO5	-	-	H	H	H	-	-	-	H	-	-

COURSE NAME: CLOUD COMPUTING

COURSE CODE: MTEC-619

Internal Marks: 50

L T P

External Marks: 100

3 0 -

Numerical & Design Problems Content: 0%-10%

Note: The question paper shall consist of eight questions of twenty (20) marks each, out of which five questions are required to be attempted by the candidate.

Course Outcomes

On successful completion of this course, the students should be able to:

- CO1 Discuss cloud computing paradigms and its challenges.
- CO2 Explain cloud computing model, its services and deployment.
- CO3 Describe concept of virtualisation and its different types.
- CO4 Analyze various challenges/security issues and their possible solutions.
- CO5 Explain mobile cloud computing.

Syllabus

Unit 1. Introduction of Computing Paradigms

Overview of existing computing paradigms, Cluster computing, Grid computing, Utility computing, Autonomic computing, Introduction to cloud computing, Cloud computing history and evolution, Essential characteristics of cloud computing, Cloud benefits, The NIST model of cloud computing.

Unit 2. Cloud Computing Architecture

The cloud reference model architecture, Cloud based services, Infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a service (SaaS), Cloud deployment scenarios, Public cloud, Private cloud, Hybrid cloud and Community cloud.

Unit 3. Virtualization

Virtualization, Characteristics of virtualization, Virtualization in cloud computing, Types of virtualization- Resource virtualization, Server storage and Network virtualization, Hypervisors. Data center- Classic data center, Virtualized data center.

Unit 4. Challenges and Security Issues

Cloud computing issues and challenges like security, Elasticity, Service level agreement, Resource management and scheduling, Cloud security, Understanding security risks,

[illegible]

M. Tech. (Electronics and Communication Engineering)

Curriculum Structure - 2019 Batch onwards

Semester-1 st										
S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Core-1	MEC-101	Modern Communication Systems	3	0	0	50	100	150	3
2	Core-2	MEC-102	VLSI Physical Design and Automation	3	0	0	50	100	150	3
3	Program Elective		Elective-1 (Any one)	3	0	0	50	100	150	3
		MEC-103	[1] Modelling and Simulation of Communication Systems							
		MEC-104	[2] Semiconductor Devices Theory and Modelling							
		MEC-105	[3] Soft Computing							
4	Program Elective		Elective-2 (Any one)	3	0	0	50	100	150	3
		MEC-106	[1] Antennas and Radiating Systems							
		MEC-107	[2] Computer Communication and Network Security							
		MEC-108	[3] Advanced Embedded System Design							
5	Lab-1	LMEC-101	Modern Communication Systems - Lab	0	0	4	50	50	100	2
6	Lab-2	LMEC-102	VLSI Physical Design and Automation - Lab	0	0	4	50	50	100	2
7	MLC	MRM-101	Research Methodology and IPR	3	0	0	50	100	150	3
8	Aud-1	MAC-XXX	Audit Course-1	2	0	0	50	0	50	S/US
Total				17	0	8	400	600	1000	19

Semester-2nd

S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Core-3	MEC-109	Advanced Digital Signal Processing	3	0	0	50	100	150	3
2	Core-4	MEC-110	Advanced Optical Communication Systems	3	0	0	50	100	150	3
3	Program Elective		Elective-3 (Any one)	3	0	0	50	100	150	3
		MEC-111	[1] Advanced Digital System Design							
		MEC-112	[2] Advanced Wireless and Mobile Communication							
		MEC-113	[3] Engineering Design and Project Management							
4	Program Elective		Elective-4 (Any one)	3	0	0	50	100	150	3
		MEC-114	[1] Advanced Microwave Engineering							
		MEC-115	[2] Internet of Things							
		MEC-116	[3] Biomedical Electronics							
5	Lab-3	LMEC-103	Advanced Digital Signal Processing - Lab	0	0	4	50	50	100	2
6	Lab-4	LMEC-104	Advanced Optical Communication Systems - Lab	0	0	4	50	50	100	2
7	Core	LMPEC-101	Project	0	0	4	50	50	100	2
8	Aud-2	MAC-XXX	Audit Course-2	2	0	0	50	0	50	S/US
Total				14	0	12	400	550	950	18

Semester-3rd

S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Program Elective		Elective-5 (Any one)	3	0	0	50	100	150	3
		MEC-117	[1] Machine Learning							
		MEC-118	[2] Advanced Wireless Sensor Networks							
		MEC-119	[3] Multimedia Communication							
		MEC-120	[4] Low Power VLSI Design							
2	Open Elective	MOZZ-XXX	^Open Elective	3	0	0	50	100	150	3
3	Dissertation	MPTEC-101	Pre-Thesis	0	0	#2+*18	100	100	200	10
Total				6	0	20	200	300	500	16

^ - Open Elective for ECE students will be offered by other departments; # - Maximum hours for teacher; * - Independent study hours

Semester-4th

S. No.	Course Type	Course Code	Course Title	Hours per week			Marks			Credits
				L	T	P	Int. Marks	Ext. Marks	Total Marks	
1	Dissertation	MTEC-101	Thesis	0	0	#4+*28	100	200	300	16
Total				0	0	32	100	200	300	16

- Maximum hours for teacher; * - Independent study hours

List of Audit Courses

Sr. No.	Course Code	Course Title
1	MAC-101	English for Research Paper Writing
2	MAC-102	Disaster Management
3	MAC-103	Sanskrit for Technical Knowledge
4	MAC-104	Value Education
5	MAC-105	Constitution of India
6	MAC-106	Pedagogy Studies
7	MAC-107	Stress Management by Yoga
8	MAC-108	Personality Development through Life Enlightenment Skills

List of Open Elective Subjects offered to Other Departments

Sr. No.	Course Code	Course Title
1	MOEC-101	Probability and Stochastic Processes
2	MOEC-102	Microelectromechanical Systems
3	MOEC-103	Bio Signal Processing
4	MOEC-104	Engineering Design and Project Management
5	MOEC-105	E-Waste Management

Guru Nanak Dev Engineering College, Ludhiana

Department of Production Engineering

No. PE/159(i)

Dated: 22/3/14

MINUTES OF MEETING

Minutes of meeting of First Board of Studies held on 22-03-2014 at 10:30 AM in committee room:

The following persons were present:

1. Dr. O.P Singh	9. Dr. Jatinder Kapoor
2. Dr. Sanjeev kumar	10. Dr. Harwinder Singh
3. Dr. R.S Bhatti	11. Prof. B.S Gill
4. Prof. J.S Ratol	12. Prof. Jagdeep Singh
5. Er. Lalit Sharma	13. Prof. Jaswinder Singh
6. Prof J.S Grewal	14. Prof. Parminder Singh
7. Dr. Rupinder Singh	15. Prof. Iqwinderpreet Singh
8. Dr.J.N Jha	

The meeting started with welcome note & already circulated agenda was set in notion.

Following decisions were taken unanimously:-

Proceedings

1.1 Percentage of credit hours of existing course is given below for discussion:-

S.No.	Broad Area	Existing Percentage of credits	Range recommended as per AICTE model curriculum
1.	Humanities and Social Sciences (HS) including Management	9.1	5-10
2.	Basic sciences (including electives) and Env. Sc. Including human values	10.2	15-20
3.	Engineering sciences including materials, workshops, drawing, basics of electrical/electronics/mechanical/computer etc.	26.5	15-20
4.	Professional courses relevant to the chosen specialization/branch	39.3	30-40
5.	Professional subjects-electives relevant to chosen specialization	4	10-15
6.	Open elective from other technical and emerging subject areas	2	5-10
7.	Project work/seminar and/or internship in Industry	11.7	10-15

Discussion was made on this issue. The matter was approved in principle.

- 1.2 Industrial Training : Discussion on the Present system and suggestions for further improvement

Discussion was made on this issue. Members were interested for bifurcation of training into 2-3 parts for its effectiveness. The matter was approved in principle.

- 1.3 Credit based System to be implemented from 2015 Admission Batch

Approved

- 1.4 Core/ Elective Subjects has to be reviewed must be covering the Gate Syllabus.

Discussion was made on this issue. The matter was approved in principle

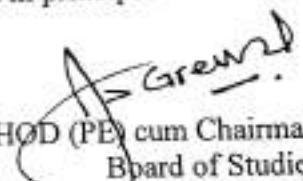
- 1.5 The question papers of End Semester examinations should be 100% internal but should be checked by a committee consisting of two external members, two internal members and HOD for proper format and standard.

Discussion was made on this issue. The matter was approved in principle.

- 1.6 The revised Scheme and syllabus should be completed before 15th june,2014 and final approval of the same should be taken by BOS before 30th june,2014 .

Discussion was made on this issue. The matter was approved in principle

The meeting ended with vote of thanks.


HOD (PE) cum Chairman
Board of Studies

Distribution:

1. Director, GNDEC, Ludhiana for kind information
2. All members of BOS (PE)
3. Dean Academics, GNDEC, Ludhiana
4. BOS file

Department of Production Engineering
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
MASTER OF TECHNOLOGY
(PRODUCTION ENGINEERING) 2019

Syllabus Scheme for Master of Technology Production Engineering Starting 2019 onwards

Total Credits: 19+18+16+16=69

1st Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks		
				L	T	P			InL	Ext.	Total
1	MPE-101	Core Course	Advanced Metal Forming	3	0	0	3	Theory	50	100	150
2	MPE-102	Core Course	Advanced Metal Casting	3	0	0	3	Theory	50	100	150
3	MPE-XXX	Program Elective	Program Elective I (Any one)								
	MPE-105		Entrepreneurship	3	0	0	3	Theory	50	100	150
	MPE-106		Jig Fixture and Press Design								
	MPE-107		Advanced Plant Layout Design								
4	MPE-XXX	Program Elective	Program Elective II (Any one)								
	MPE-108		Product Design and Development	3	0	0	3	Theory	50	100	150
	MPE-109		Additive Manufacturing Process and Applications								
	MPE-110		Flexible Manufacturing Systems								
5	LMPE-101	Core Course	Advanced Manufacturing processes Laboratory	0	0	4	2	Practical	50	50	100
6	LMPE-102	Core Course	Advanced Machining and Casting processes Laboratory	0	0	4	2	Practical	50	50	100
7	MRM-101	Core Course	Research Methodology and IPR	3	0	0	3	Theory	50	100	150
8	MAC-105	Audit Course 1	Constitution of India	2	0	0	0	Theory	50	-	50
Total				17	0	12	19		40	600	1000

2nd Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks		
				L	T	P			IntL	Ext.	Total
1	MPE-103	Core Course	Advanced Welding Processes	3	0		3	Theory	50	100	150
2	MPE-104	Core Course	Advanced Metal Cutting	3	0		3	Theory	50	100	150
3	MPE-XXX	Program Elective	Program Elective III (Any one)								
	MPE-111		Production and Inventory Control	3	0		3	Theory	50	100	150
	MPE-112		Quality Assurance								
	MPE-113		Advanced Industrial Tribology								
4	MPE-XXX	Program Elective	Program Elective IV (Any one)								
	MPE-114		Industrial Robotic Design	3	0		3	Theory	50	100	150
	MPE-115		Non-Conventional Machining Process								
	MPE-116		Computer Aided Design								
5	LMPE-103	Core Course	Advanced Welding Process Laboratory	0	0	4	2	Practical	50	50	100
6	LMPE-104	Core Course	Mechanical and Morphological characterization Laboratory	0	0	4	2	Practical	50	50	100
7	LMPE-101	Core Course	Project	0	0	4	2	Practical	50	50	100
8	MAC-106	Audit Course 2	Pedagogy Studies	2	0	0	0	Theory	50	-	50
Total				14	0	12	18		40	550	950

3rd Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks	
				L	T	P			Int.	Ext. Total
1	MPE-XXX	Program Elective	Program Elective V (Any one)							
	MPE-117		Operations Management	3	0	0	3	Theory	50	100
	MEP-118		Materials Management							150
	MPE-119		Advance Operations Research							
2	MOZZ-XXX	Open Elective	Open Elective 1	3	0	0	3	Theory	50	100
3	MPTPE-101	Pre-thesis	Formulation of research problem	0	0	20	10	Practical	10	200
Total				6	0	20	16		200	500

4th Semester

Sr. No.	Code	Course Type	Course Name	Teaching Scheme			Credits	Type of Subject	Marks	
				L	T	P			Int.	Ext. Total
1	MTPE-101	Thesis	Thesis work	0	0	32	16	Practical	10	200
Total				0	0	32	16		10	300

List of Electives

Audit course 1 & 2		List of Open Elective		Open Elective offered by Production Engineering	
MAC-101 English for Research Paper Writing MAC-102 Disaster Management MAC-103 Sanskrit for Technical Knowledge MAC-104 Value Education MAC-105 Constitution of India MAC-106 Pedagogy Studies MAC-107 Stress Management by Yoga MAC-108 Personality Development through Life Enlightenment Skills.		1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy		MPE-120 Industrial Safety MPE-121 Operations Research MPE-122 Composite Materials	

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

7th BOS meeting
of
Production Engineering
on
13-12-2019 (Friday)



Venue: Production Engg. Dept.

Guru Nanak Dev Engineering College
An Autonomous College u/s Act 2(f) and 12(B) of UGC act 1956
Gill Road, Gill Park, Ludhiana

Minutes of meeting of 7th Board of Studies Meeting of Production Engineering on 13-12-2019

A meeting of BOS (Production Engg.) was held on 13-12-2019 at 12.30PM in Production Engineering Dept.. The following members were present-

Dr. J.S.Grewal, Prof. & Head P.E GNDEC Ludhiana
Dr. Rupinder Singh, Prof. P.E GNDEC Ludhiana
Dr. Jagdeep Singh, Asst. Prof. P.E GNDEC Ludhiana.
Dr. Jatinder Kapoor, Prof. M.E GNDEC Ludhiana
Dr. Harwinder Singh, Prof. M.E GNDEC Ludhiana
Dr. O.P.Singh, Prof. M.E BCET Gurdaspur
Dr. Sanjeev Kumar, Prof. M.E PEC Chandigarh
Dr. Dixit Garg, Prof. M.E NIT Kurukshetra
Dr. Sandeep Grover, Prof. M.E YMCA Faridabad
Er. Lalit Sharma (Industrialist and Alumni GNDEC Ludhiana)
Dr. N.S.Bhangu (Nominee of Dean Academics GNDEC Ludhiana)
Er. G.S.Sodhi (TPO, GNDEC Ludhiana)
Dr. H.S.Rai (COE, GNDEC Ludhiana)

The following member was not able to attend the meeting: Dr. Harpuneet Singh, Asst. Prof. P.E GNDEC Ludhiana, Dr. J.P Singh Senior Scientific Officer, DGQA (MoD)

1. Apprising the Board of Studies about name change of UG Production Engineering course from Production Engineering to Production and Industrial Engineering

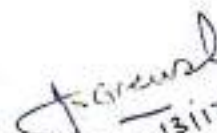
The matter was discussed at large. Approved with new nomenclature as B.Tech Mechanical (Production) in accordance with AICTE notification F.No 27/RIFD/Pay/01/2017-18, Dt. 28 April, 2017

2. To discuss and finalize the M.Tech Production Engineering syllabus

Approved

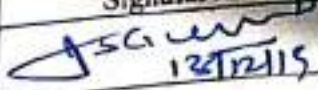
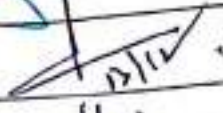
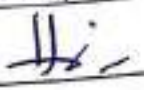
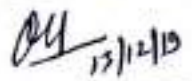
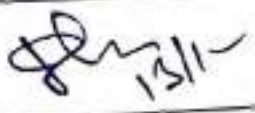
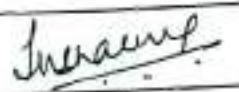
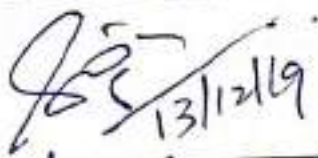
3. To start certificate course/diploma/post diploma/ post graduate diploma

Approved. Initially the course will be offered on 3D printing


13/12/2019
Chairman (BOS), P.E

3

List of BOS members

S.No.	Name	Designation	Signature
1.	Dr. J.S.Grewal, Prof. & Head	Chairman	 13/12/19
2.	Dr. Rupinder Singh, Prof.	Member	
3.	Dr. Harpuneet Singh, Asst. Prof.	Member	— As
4.	Dr. Jagdeep Singh, Asst. Prof.	Member	
5.	Dr. Jatinder Kapoor, Prof. Mechanical Engg.	Member	
6.	Dr. Harwinder Singh, Prof. Mechanical Engg.	Member	
7.	Dr. O.P.Singh, Prof. Mechanical Engg. BCET Gurdaspur	Member	 13/12/19
8.	Dr. Dixit Garg, Prof. Mechanical Engg. NIT Kurukshetra	Member	 13/11
9.	Dr. J.P.Singh, Senior Scientific Officer, DGQA (MoD)	Member	— As
10.	Er. Lalit Sharma, Industrialist	Member	
11.	Dr. Sanjeev Kumar, Prof. Mechanical Engg. PEC Chandigarh	Member	
12.	Dr. Sandeep Grover, Prof. Mechanical Engg. YMCA Univ. of Sc. & Tech., Faridabad	Member Nominated by IKGPTU Jalandhar	 13/12/19
13.	Dean Academic/ Nominee	Member	
14.	COE/Nominee	Member	
15.	Dean T & P/ Nominee	Member	

Agenda Items

1. Apprising the Board of Studies about name change of UG Production Engineering course from Production Engineering to Production and Industrial Engineering

Keeping in view of GATE 2020 requirement it is proposed to change the B.Tech Production Engineering course to B.Tech Production and Industrial Engineering. For additional subjects required in Industrial Engineering part, it is proposed to offer the same through MOOCs platform.

The syllabus for GATE 2020 under Production and Industrial Engineering is enclosed (Annex. I). Also the study scheme and syllabus for B.Tech Production Engineering is also attached (Annex. II). The courses deficit to comply by GATE 2020 may be offered through MOOCs platform.

Submitted for Consideration & Approval

2. To discuss and finalize the M.Tech Production Engineering syllabus

The detailed syllabus and scheme is enclosed (Annex. III) for discussion and ratification.

Submitted for Consideration & Approval

3. To start certificate course/diploma/post diploma/ post graduate diploma

In accordance with UGC approval to Autonomous Colleges to run certificate/diploma/post diploma/post graduate diploma it is proposed to run the same in following two specializations:

- (a) Project management
- (b) 3D printing

The syllabus for both (a) Project management and (b) 3D printing is enclosed (Annex. IV and Annex. V)

Submitted for Consideration & Approval

ACTION TAKEN REPORT

1. The syllabus of 3rd and 4th semester UG Production Engineering along with detailed scheme for UG and PG has been prepared.

Noted, Implemented.

2. Summer training was successfully completed with modified syllabus contents.
Noted, Implemented.

3. The BOS has recommended revision in syllabus of Machine drawing, Material science, Manufacturing processes, Physical metallurgy and heat treatment along with some structural changes in examination pattern.

Noted and implemented.

Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Minutes of Meeting

The 2nd meeting of Board of Studies (Civil Engineering) was held on 6th September, 2014 in the office of Head of Department, Civil department and chaired by Dr. J N Jha (Professor & Head).

Following members were present in the meeting:

- Dr. J.N.Jha – Chairman - Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harpal Singh – Member - Guru Nanak Dev Engineering College, Ludhiana,
- Dr. H S Rai –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. B S Walla –Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. K S Gill – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Harvinder Singh – Member - Guru Nanak Dev Engineering College, Ludhiana
- Er. Inderpreet Kaur – Member- Guru Nanak Dev Engineering College, Ludhiana
- Dr. Sanjeev Aggarwal – Member- GZSPTU Campus, Bathinda- Subject Expert- VC Nominee
- Dr. S P Singh – Member- NIT Jalandhar- Subject Expert
- Dr. Siby John – Member- PEC University of Technology, Chandigarh-Subject Expert- Director's Nominee
- Er. Satish Kumar Tanwar –Member- Ultratech- Industry Representative,
- Er. T S Chahal –Member- Supt. Engg.-PWD, B&R, Govt. of Punjab – alumina
- Er. Gurdeepak Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana
- Er. Harjinder Singh - Special Invitee- Guru Nanak Dev Engineering College, Ludhiana

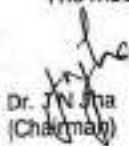
The Following decisions were taken:

1. The proposed credit system for B.Tech (Civil Engg.) -UG course (2014 admission batch onwards and to be implemented from 3rd semester i.e. Aug.2015 session) were discussed and are accepted with minor changes. The credits of two subjects (BTCE-501, BTCE502) of 5th semester were reduced from 5 to 4 and are added to subject 'Survey Camp Training' credits of same semester.
2. It was also suggested that concept of open elective should be started at UG level. This suggestion will be forwarded to Academic Council for further discussion.
3. In light of UGC recommendations the subject 'Research methodology' was made core subject in all PG courses offered in Civil Engineering Department.
4. Subject 'Air Pollution & Control' was included in the list of core subjects for the scheme of M.Tech Environmental Science & Engineering.

2014/9/6

5. The subjects 'Water & Waste Water Treatment Technologies-I' and 'Water & Waste Water Treatment Technologies-II' has been renamed as 'Physico-Chemical Treatment Methods' and 'Biological Treatment Methods' respectively in the scheme of M.Tech Environmental Science & Engineering.
6. The subject 'Advanced Solid Mechanics' has been included as a core subject for the scheme of M.Tech. Structural Engineering Scheme. 'Advanced Structural Analysis' and 'Advanced Solid mechanics' subjects were merged together to accommodate 'Research methodology' as a core subject for the scheme of M.Tech. Structural Engineering Scheme.
7. BOS was of unanimous view that the list of 'Program Electives' and 'Open Electives' should be separate and accordingly the list of 'Program Electives' and 'Open Electives' were prepared separately for all PG courses currently running in the Civil Engineering Department.
8. The proposed syllabus of 1st semester for all PG courses was approved.

The meeting ended with vote of thanks.


Dr. J.N. Jha
(Chairman)



Guru Nanak dev Engineering College, Ludhiana
(An Autonomous College under UGC Act)
Civil Engineering Department

Batch 2014 & onward

Scheme: M. Tech (Soil Mechanics & Foundation Engineering)--Part-time

Schedule of Teaching and study scheme

Semester	Subjects	Credits	Contact Hours/week			No. of subjects	Total Credits
			L	T	P		
1	Core subjects	4	4	-	-	2	11
	Program electives	3	3	-	-	1	
2	Core subjects	4	4	-	-	1	9
	Program electives	3	3	-	-	1	
	Laboratory class	2	-	-	4	1	
3	Core subject	4	4	-	-	2	11
	Program elective	3	3	-	-	1	
4	Core subjects	4	4	-	-	1	9
	Open electives	3	3	-	-	1	
	Laboratory class	2	-	-	4	1	
5	Program electives	3	3	-	-	2	14
	Pre Thesis Seminar	4	-	-	4	1	
	Pre Thesis Project	4	-	-	4	1	
6	Thesis/Dissertation	14	14	-	-	--	14
						Total Credits	68

List of Core Subjects

S. No.	Subjects	Subject Code
1	Soil Dynamics	MTGT-501
2	Advanced Foundation Engineering	MTGT-502
3	Applied Soil Mechanics	MTGT-503
4	Research Methodology	MTGT-504
5	Analysis of Settlement of Soils & Foundations	MTGT-505
6	Site Investigations	MTGT-506

List of Laboratory/Practical work

S. No.	Subject	Subject Code
1	Laboratory-1	MTGT-507
2	Laboratory-2	MTGT-508
3	Pre-thesis seminar	MTGT-509
4	Pre-thesis project	MTGT-510
5	Thesis	MTGT-511

List of Program Electives

S. No.	Subjects	Subject Code
1	Soil-Structure Interaction	MTGT-601
2	Rock Mechanics	MTGT-602
3	Geosynthetic Engineering	MTGT-603
4	Structural Design of Foundations	MTGT-604
5	Clay Mineralogy	MTGT-605
6	Retaining Structures	MTGT-606
7	Slope Stability Analysis	MTGT-607
8	Case Histories in Geotechnical Engineering	MTGT-608
9	Earth Anchors	MTGT-609
10	Design of Highway and Airport Pavements	MTGT-610
11	Strength of Materials	MTGT-611
12	Buried Structures	MTGT-612
13	Environmental Impact assessment & Management	MTGT-613
14	Advanced Soil Mechanics	MTGT-614
15	Disaster Reduction and management	MTGT-615
16	Environmental Geotechnology	MTGT-616
17	Ground Improvement	MTGT-617
18	Earthen Embankment	MTGT-618
19	Geomechanics	MTGT-619
20	Highway Materials & Construction	MTGT-620

List of subjects to be offered as ‘Open Electives’

1	Experimental Methods in Engineering	MTCE-621
2	Numerical Methods in Engineering	MTCE-622
3	Instrumentation and model simulation	MTCE-623
4	Advanced Engineering Mathematics	MTCE-624
5	Probabilistic Methods in Engineering	MTCE-625
6	Limit Analysis	MTCE-626

Minutes of Meeting

The 11th BOS meeting was held in the HoD office (Civil) on 17 July, 2019 under the chair of Dr. H. S. Rai (Professor and BOS Chairman), whereby following members were present:

Dr. H. S. Rai – Chairman - GNDEC, Ludhiana

Dr. K. S. Gill – Member - GNDEC, Ludhiana

Dr. Harpal Singh – Member- GNDEC, Ludhiana

Dr. Harvinder Singh – Member - GNDEC, Ludhiana

Dr. Jagbir Singh – Member- GNDEC, Ludhiana

Dr. Gurdeepak Singh – Member- GNDEC, Ludhiana

Dr. Prashant Garg – Member- GNDEC, Ludhiana

Dr. Puneet Pal Singh Cheema – Member- GNDEC, Ludhiana

Dr. Inderpreet Kaur – Special Invitee – GNDEC, Ludhiana

Dr. Jaspal Singh – Special Invitee – Professor, PAU, Ludhiana

Er. Rakesh Garg – Special Invitee – Xen, PWD (B&R) – Industry Expert

Dr. Akshay Girdhar – Nominated Member (COE) - GNDEC, Ludhiana

Dr. N. S. Bhangu – Nominated Member (Academic Branch) - GNDEC, Ludhiana

Er. Charanjeet Singh – Special Invitee – GNDEC, Ludhiana

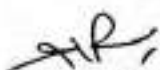
Dr. K. S. Gill relinquished the charge of BOS chairman after providing his services for three years. The department extended gratitude to him for his valuable contribution as BOS chairman.

Following decisions were taken against the agenda items:

1. Department proposed new study schemes for different M.Tech. Programs (Structural Engineering-Full Time, Geotechnical Engineering-Full Time, Environmental Science and Engineering-Full Time, Soil Mechanics & Foundation Engineering-Part Time) starting year 2019 (for Batch 2019 & onward) which were discussed & approved.
2. The syllabus for first semester pertaining to the above mentioned schemes was also discussed and approved.

3. The contents of course named "Building Information Modelling (BIM) 1425106" was proposed and approved for batch B.Tech 2017 and onward.
4. A list of 05 theory subjects (03 credits each) and 01 laboratory (01 credit) was finalized for B.Tech. (Batch 2018 & onward) students to select from, for class room study to qualify for "Civil Engineering" as Minor Engineering Branch.
5. A list of MOOC courses for the session July - November 2019 was finalized for B.Tech. (Batch 2018 & onward) students to qualify for "Civil Engineering" as Minor Engineering Branch.
6. A list of MOOC courses for the session July - November 2019 was finalized for B.Tech. (Batch 2018 & onward) students to qualify for B.Tech. Civil Engineering (Honor) degree.
7. Considering the importance and need of short term certificate course for professionals and graduate students, department proposed a certificate course on 'Analysis & Design of RC Buildings' of 60 hours (04 credits) course spread over a period of 3 months and the same was approved by the BOS.
8. Department proposed mutual swapping of "Geotechnical Engineering Lab" (Sem 5th) subject with "Transportation Engineering Lab" (Sem 6th) subject without changing the credits & total marks for B.Tech. Civil Engineering 2017 scheme. It was approved by the BOS.
9. Department proposed change in the credits of course "Environmental Systems Engineering" (MTEV - 16601) from 03 to 04 for M.Tech. (Environmental Science and Engineering) Scheme 2016 and the same was approved by BOS.

The meeting ended with vote of thanks to all present.


Dr. H. S. Rai

Encl: Copy of Study Schemes, syllabus & other items



Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department
M.Tech. (Soil Mechanics and Foundation Engineering) - Part Time

Program Outcomes (PO)

After completion of the program graduates will be able to

1. Learn the behavior of soil and rock.
2. Perform various laboratory and in-situ tests on soil/rock to find out design parameters.
3. Design shallow/deep foundations, earth retaining structures, embankment and earthen dams, tunnel support systems for given site conditions.
4. Compute factor of safety to assess stability of slopes and apply preventive measures for stability.
5. Develop numerical models to estimate response of various geotechnical structures under different loading.

Scheme Structure

Semester	Course Type	Number of course	Credit per course	Total Credits	Total Contact Hours
First	Core Theory	2	3	06	06
	Elective	1	3	03	03
	Core Lab	1	1	01	02
Second	Core Theory	2	3	06	06
	Elective	1	3	03	03
	Core Lab	1	2	02	04
Third	Elective	1	3	03	03
	Audit	1	0	00	02
	Project	1	2	02	04
	Core Lab	1	2	02	04
Fourth	Elective	1	3	03	03
	Audit	1	0	00	02
	Mandatory	1	3	03	03
	Core Lab	1	1	01	02
Fifth	Elective	1	3	03	03
	Open	1	3	03	03
	Pre-thesis	1	10	10	2*+18**
Sixth	Thesis	1	16	16	4*+28**
				67	

* Max hours for teacher

** Independent study hours

M.Tech. (Soil Mechanics and Foundation Engineering) - Part Time									
Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total Marks	
Core Theory	MGT-101	Advanced Soil Mechanics	3	0	0	50	100	150	3
Core Theory	MGT-102	Subsurface Investigations & Instrumentation	3	0	0	50	100	150	3
Elective	MGT- AAA	Program Elective I	3	0	0	50	100	150	3
Elective	MGT-BBB	Program Elective II	3	0	0	50	100	150	3
Core Lab I	LMGT-101	Soil Mechanics Laboratory - I	0	0	2	50	50	100	1
Core Lab II	LMGT-102	Soil Mechanics Laboratory - II	0	0	4	50	50	100	2
MLC	MRM-101	Research Methodology and IPR	3	0	0	50	100	150	3
Audit 1	MAC-102	Disaster Management	2	0	0	50	-	50	0
Core Theory	MGT-103	Advanced Foundation Engineering	3	0	0	50	100	150	3
Core Theory	MGT-104	Soil Dynamics	3	0	0	50	100	150	3
Elective	MGT- CCC	Program Elective III	3	0	0	50	100	150	3
Elective	MGT- DDD	Program Elective IV	3	0	0	50	100	150	3
Core Lab III	LMGT-103	Model Testing Laboratory	0	0	2	50	50	100	1
Core Lab IV	LMGT-104	Numerical Analysis Laboratory	0	0	4	50	50	100	2
Core	LMPGT-101	Project	0	0	4	50	50	100	2
Audit 2	MAC-101	English for research report / paper writing	2	0	0	50	100	150	0
Elective	MGT- EEE	Program Elective V	3	0	0	50	100	150	3
Open Elective	MOGT- XXX	Open Elective	3	0	0	50	100	150	3
Pre-thesis	MPTGT-101	Formulation of Research Problem	0	0	2*+ 18**	100	100	200	10
Thesis	MTGT-101	Thesis	0	0	4*+ 28**	100	200	300	16
* Max hours for teacher									

** Independent study hours		
List of Electives		
S No	Course Name	Course Code
1	Soil Structure Interaction	MGT – 111
2	Ground Improvement Techniques	MGT – 112
3	Pavement Analysis and Design	MGT – 113
4	FEM in Geomechanics	MGT – 114
5	Environmental Geotechnology	MGT – 115
6	Critical Soil Mechanics	MGT – 116
7	Rock mechanics	MGT – 117
8	Computational Geomechanics	MGT – 118
9	Geosynthetics Engineering	MGT – 119
10	Earth retaining structures	MGT – 120
11	Design of underground excavations	MGT – 121
12	Clay Mineralogy	MGT – 122
13	Stability Analysis of Slopes	MGT – 123
14	Geotechnical Earthquake Engineering	MGT – 124
15	Design of Foundations on Weak Soils & Rocks	MGT – 125

DEPARTMENT OF BUSINESS ADMINISTRATION
GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA.

BOARD OF STUDIES

AGENDA

&

MINUTES OF MEETING

2015 ONWARDS

Contents

S. No	Description
I	List of BOS Members
II	Agenda Items 1. To finalize the syllabus of MBA second Semester as per the AICTE model curriculum (New scheme 2019). (Annexure-I) 2. To amend and finalize the course codes of new study scheme 2019. (Annexure-II). 3. To review and finalize the courses to be offered as open electives for B.Tech and M.Tech . (Annexure-III) 4. To finalize the syllabus of the subject (Human Resource Managcment) offered as Open Elective to students of M.Tech. (Annexure-IV)

ANNEXURE-I

CORPORATE FINANCE AND FINANCIAL MARKETS

COURSE CODE: MBA-109

Max. Marks: 100
External Assessment: 60
Internal Assessment: 40

Objectives: To provide an understanding of the function, the roles, the goals and the processes of corporate financial management covering the sources of finances, investment of the resources and operations of financial system. Problem-solving methodology and case study will be used to illustrate the theories and tools in financial decision making.

Unit –I

Introduction to Financial Management: Objectives - Functions and Scope – Evolution Interface of Financial Management with Other Functional Areas - Environment of Corporate Finance. Sources of Long-Term Finance (Both domestic and Global): Equity Capital and Preference Capital – ADRs- GDRs – Foreign Bonds-Debt Capital - Term Loans and Deferred Credit. Valuation of Securities: Concept of Valuation - Bond Valuation - Equity Valuation: Dividend Capitalization Approach and Ratio Approach -Valuation of Warrants and Convertibles, Time Value of Money.

Unit –II

Financing & Investment Decisions: Basics of Capital Expenditure Decisions: The Process of Capital Budgeting - Analysis of Project Cash Flows: Cash Flow Estimation -Identifying the Relevant Cash Flows - Cash Flow Analysis Basic Principles in Estimating Cost and Benefits of Investments -Appraisal Criteria: Discounted and Non Discounted Methods (Pay-Back Period - Average rate of return - Net Present Value -Benefit Cost Ratio -Internal Rate of Return) - Replacement, Cash Flow-Estimation Bias - Evaluating Projects with Unequal Life - Adjusting Cash Flow for Inflation, Capital Rationing, Capital Structure Decisions-Leverages, Point of Indifference, Theories of Capital Structure, Cost of Capital- Cost of Debt, Cost of Preference Shares, Cost of Retained Earnings, Cost of Equity & Weighted average Cost of Capital, Working Capital Management-Estimation, Operating Cycle & Net Operating Cycle.

Unit –III

Indian Financial System: Introduction, Salient Features, Functions and Structure/ Organization, Financial System and the Indian Economy, Reforms in the Indian Financial System, Development Financial Institutions, Banking (with special reference to risk management in Banks) & Banking Financial Institutions, Insurance.

Unit -IV

Financial Markets: Functions and Organization, Organizations Resource Mobilization, Capital Market Instruments-Equity, Preference Shares, Debentures, Innovative Debt Instruments, Forward Contracts, Future Contracts, Option Contracts, Channelization of Funds, Equity, Debt and Currency Markets, Regulatory Framework of Primary Market, Regulatory Framework of Secondary Market, Primary Market Organization- Intermediaries,, Activities/ Procedures, Secondary Market Organization, Money Markets. Contemporary issues in Financial Markets.

Tutorials:

- i) Relevant Case Studies should be discussed in class.
- ii) Each student of the class shall carry a mini project on the financial practices or on financial market on the different topic of the syllabus.

The project may be carried on the basis of the primary/secondary data collected from the MNCs/ BSE 500 companies or related to financial markets.

Suggested Readings/ Books:

- LM. Pandey, Financial Management, Vikas publishers
- Khan & Jain, Financial Management, Tata McGraw Hill
- Prasanna Chandra, Financial Management (Theory & Practice), Tata McGraw Hill
- Brigham, Financial Management: Text & Cases, Cengage Learning
- Brealy & Myres, Principles of Corporate Finance, Tata McGraw Hill
- John J., Financial Decision Making: Concept, Problem & Cases, Prentice Hall
- Khan & Jain, Indian Financial System, McGraw Hill Education (India) Private Limited
- Pathak Bharati V, The Indian Financial System- Markets, Institutions and Services, Pearson
- Madura Jeff, " Financial Institutions and Markets", Cenage Learning
- Fabozzi Frank J. & Modigliani Franco, "Capital Markets- Institutions and Instruments", PHI Learning Private Limited.

HUMAN RESOURCE MANAGEMENT

COURSE CODE: MBA-110

Max Marks: 100
External Assessment: 60
Internal Assessment: 40

Objectives: The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting task for any organization today.

Unit-I

Human Resources Management: Nature, scope, objectives & functions of HRM, HR as a competitive advantage, line & staff responsibility of HR manager, Competencies of HR Manager, Human Resource Planning, Job Analysis.

Unit – II

Recruitment & Selection: Meaning, Process & methods for recruitment. **Selection:** Need, Importance and the methods of selection. **Induction & Placement:** Need, Induction process, methods and evaluation of different methods. **Training & Development:** Training need Analysis, Methods of training.

Unit – III

Performance Appraisal: Meaning, Methods & Process, Issues in Performance Appraisal, Potential Appraisal. **Compensation Management:** Concept, elements, Job evaluation, wage & Salary fixation, Incentives, bonus, ESOPs, Fringe Benefits compensation, career planning & development, HRIS, **Industrial Relation & Labour laws:** basic concepts.

Unit – IV

Managerial Skills for effectiveness: Building organizational culture, networking skills, interaction across business functions, collaboration and presentation skills, development of a project that addresses an organizational challenge, Negotiation & Assertiveness skills, Mapping personal leadership and learning journey, Expanding professional and personal networks.

Tutorial: Relevant case study on the application of various

- Job Analysis
- Human Resource Planning
- Performance Appraisal

Group Discussion on emerging issues and Presentation on topics related to managerial skills would be conducted to enhance the student's personality and leadership skills.

MARKETING MANAGEMENT

COURSE CODE: MBA-111

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: The course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm in changing business environment. It would provide the students with the opportunity to apply the key concepts to practical business situations.

Unit –I

Understanding Marketing and Consumers: Introduction to Marketing Management, Definition, Importance, Scope, Basic Marketing Concepts, Marketing Mix, Marketing vs selling.

Marketing Environment and Competition: Analyzing Marketing Environment- Micro, Macro, Impact of environment on marketing. **Marketing Information System:** Concept and Components. **Consumer Behaviour:** Consumer buying process, Factors Influencing Consumer Buying Behaviour.

Unit –II

Market Segmentation & Targeting: Concepts and types of Market segmentation, **Targeting:** need and methods. **Positioning:** concepts and position for competitive advantage. **Product Decisions:** Product Mix, Packaging and Labelling, Branding, Brand value & Brand Equity. **New Product Development:** Need, Process and Product Life Cycle and marketing mix strategies. **Pricing Decisions:** Objectives, Factors Affecting Pricing Decisions and Pricing Methods.

Unit –III

Delivering and Promoting Product: Supply Chain Decisions Nature, Types, Channel Design and Channel Management Decisions, Retailing, Wholesaling. **Personal Selling:** Personal Selling Process, Managing the Sales Force. **Promotion Mix:** Advertising, Sales Promotion, Public Relations. **Emerging Trends in Marketing:** Green Marketing, Event Marketing, Network Marketing, Social Marketing, Viral Marketing, Customer Relationship Management (CRM), Rural Marketing and Marketing in the Digital Age.

Unit -IV

Bottom of Pyramid Marketing: Understanding poverty and the Base of the Pyramid, understanding their basic needs wants and demands. **Design-Develop-Distribute** approach towards Bottom of Pyramid. Consumption and marketing practices, challenges. **The institutional context of Bottom of Pyramid markets,** Conducting Marketing Research in Bottom of Pyramid. Alternative Market initiatives at Bottom of Pyramid. **Ethical issues associated with Bottom of Pyramid.**

LEGAL AND BUSINESS ENVIRONMENT

COURSE CODE: MBA-112

Max. Marks: 100
External Assessment: 60
Internal Assessment: 40

Objectives: The course aims to provide an understanding of corporate legal framework prevalent in the country. This course seeks to sensitize the students to the broader business environment at micro and macro level and economic environment within which they will operate as managers. The course seeks to examine the interaction between the economy, policy and society at different perspective and enable the students to be more effective managers in today's global economy.

Unit-I

Legal aspect of Business: Introduction to business laws; Structure of the Indian legal systems, sources of law; Fundamentals of contract laws- formation of contracts; **Principles of contract laws-** legality of object consideration, performance of contract- discharge of contract- breach of contract, **Quasi contracts-**contract management, special contracts.- laws of agency; principal-agent- problem-bailment, pledge, guarantee and indemnity.

Unit II

Sales of Goods- principles of sales of goods-transfer of ownership & property- performance of contract-**Consumer Protection Laws-** Law relating to business organizations –Partnership Trusts- company form of organization; Protecting the property of Business-Copyright, Trademark, secret, Geographical Indications- Alternate dispute resolutions.

Unit-III

Macro & Micro indicators in business environment, assessing risk in business environment; Emerging sectors of Indian economy, relative size and growth of public and private sectors- design and strategy of economic reforms; current rate of growth and investment, interest rate structure & Monetary policy, fiscal environment, current inflationary position and its impact on business sector. Public and private partnership; intellectual property regime and environment for the SME sector; Trends in service sector growth; banking reforms and challenges; business opportunities in the rural sector.

Unit-IV

Globalization trends and challenges: balance of payment trends, environment for foreign trade and investment; exchange rate movements and their impact, India's competitiveness in the world economy; external influences on India's business environment.

Operations Management

Course code: MBA-113

Max. Marks: 100
External Assessment: 60
Internal Assessment: 40

Objectives: Develop knowledge of concepts and skills required to equip the learner in practising global standards for managing the operations of a manufacturing/service organization.

Unit - I

Operations management-Concept; functions; transformation process model - inputs, process and outputs difference between manufacturing and service operations; Recent trends in operations management; operations management in corporate profitability and competitiveness.

Designing products, services and processes- New product design; Product development process; product-process mix; design of services and service processes; service process matrix.

Process decisions- process choice; Relationship of process choice with volume in both manufacturing and services. **Facility Location** – importance, factors in location analysis, location decision issues for multinational firms.

Unit - II

Facility Layout – Objectives, Advantages, Basic Types of Layouts, Problems in facility layout.

Capacity Planning – Concepts, Factors affecting Capacity Planning, Capacity Planning Decisions. **Forecasting** -Importance of Forecasting in managerial decision making, Demand characteristics and its patterns, designing the forecasting system, type of forecasting techniques, role of computers in forecasting, forecast error, selection of the forecasting model.

Unit - III

Inventory Management - Concept, Objectives, Inventory costs, Inventory classification, Factors Affecting Inventory Control Policy, Basic stock control methods, Continuous and Periodic review Inventory models, **Deterministic Economic Order Quantity (EOQ) Models**- Basic EOQ Model, EOQ and Quantity Discount, EOQ Model with Non-instantaneous Receipt (Production-run formula), EOQ Model with Planned Shortages or where stockout is permitted, Stochastic inventory models, single period model for perishable products and services.

Supply Chain Management (SCM) meaning; nature of SCM for both manufacturers and service providers; role of purchasing and distribution in designing effective supply chains; measures of supply chain performance and their linkage to key financial measures; Lean and Agile supply chains and their design.

Unit - IV

Total Quality Management (TQM) – customer driven concept of quality; total quality management concept; **Principles of Total Quality management** :- Customer satisfaction, Employee involvement and Continuous improvement; major costs of poor quality; Improving quality through TQM;

JIT and Lean Production System– Concept; characteristics; Kanban System; JIT system in services; strategic implications of JIT systems; Problems in implementing JIT systems; Total quality control (TQC) concept; Deming's contribution to TQC; Contribution of Crosby to Quality management.

Sustainable Operations management- concept; need; Triple bottom line (TBL) concept; Sustainable operations strategies and their linkage with TBL.

Tutorials:

1. A total of four case Studies on the various concepts of Operations management will be discussed.
2. Additionally Monte Carlo Simulation model for capacity planning and inventory analysis; Break even method and transportation method for location analysis and financial analyses techniques for assessing the relative attractiveness of projects with respect to other investment opportunities shall be discussed.

Suggested Readings/Books:

- Operations Management Strategy and Analysis by Lee J. Krajewski, Manoj K. Malhotra, Larry P. Ritzman.; Publisher: Pearson Education
- Production and Operations Management by Everette E. Adam, Jr. Ronald J. Ebert; Publisher: Prentice Hall of India
- Production and Operations Management by N.G. Nair; Publisher: Tata Mc. Graw Hill
- Production and Operations Management by Panneerselvam R; Publisher: Prentice Hall of India.
- Operations Management Theory & Practice, B. Mahadevan; Publisher: Pearson Education.

SEMINAR ON SOCIAL RESPONSIVENESS

COURSE CODE: MBA-114

Max Marks: 50
External Assessment: 0
Internal Assessment: 50

Objectives: The main objectives of the course include developing an attitude of responsiveness to contextual social issues / problems and exploring solutions, understanding business ethics and corporate social responsibility in the students pursuing the course. Students are expected to identify the contemporary social problems, exploring the opportunities for social entrepreneurship, designing business solutions and demonstrating ethical standards in organizational decision making.

Unit-I

Corporate Social Responsibility: Concept, Definition, Need, Arguments in favour of and against CSR. Historical Phases of Corporate Social Responsibility, Perspectives of CSR. Models of CSR, Drivers of CSR, Business Ethics and CSR, CSR Practices in India, Case Studies of Major CSR Initiatives.

Unit-II

Corporate Sustainability: Meaning, Need and importance of Sustainability, Sustainability Case Studies-Triple Bottom Line (TBL). Corporate Sustainability Reporting Frameworks- Global Reporting Initiative Guidelines, National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business.

Unit-III

Eco-Efficiency & Pollution: Advantages of saving energy and reducing waste to business, Global warming, Green House effect, Carbon neutrality, Benefits to businesses in reducing carbon footprints, carbon credits.

Unit-IV

Drug De-addiction and Traffic Rules: Causes, remedies, and societal impact of drug abuse, Traffic Rules and regulations, road signs, punishment for violations (Eminent experts of the subject will be called for the Seminar at least once during the semester. It will be binding for all the students to attend the seminar.

RESEARCH METHODOLOGY

COURSE CODE: MBA-115

Max.Marks-100

External Assessment-60

Internal Assessment-40

Objectives: To Equip the students with the basic understanding of the research methodology in changing business scenario. To provide an insight into the application of dynamic analytical techniques to face the stormy challenges, aimed at fulfilling the objectives of business decision making.

Unit-I

Introduction to Research- Meaning of research; Types of research and research process; Features of good research study. **Research problem-** Defining research problem; Problem identification process; Components of research problem. **Formulating the research hypothesis-** Meaning of hypothesis; Types of research hypothesis. **Scaling techniques-** Meaning, types of scales, scale construction techniques.

Unit-II

Data Collection- Types of data; Sources of data collection; Tools of data collection; Methods of data collection. **Questionnaire Design-** Questionnaire method; Types of questionnaire; Process of questionnaire designing. **Sampling-** Concepts; sampling vs census; sampling vs non sampling error; **Sampling Design-** Probability and Non Probability sampling.

Unit-III

Test of Significance- Assumption about Parametric and Non Parametric tests; Chi-square test for the goodness of fit; T-test; F-test; Z-test; ANNOVA; **Non Parametric test-** Sign test, Run test; Krushall-Wallis test, Maan Whitney U test.

Unit-IV

Research Report writing- Types of research reports: Brief reports and Detailed reports. Report writing: structure of research report- Preliminary section, main report; formulation rules for writing the report; Appendix- norms of using Index and Bibliography.

Tutorial: Problems related to practical topics will be discussed and sorted out.
Questionnaire will be prepared by using different techniques.
Students will be prepared to construct different scales.

ANNEXURE-II

Guru Nanak Dev Engineering College, Ludhiana.
Department of Business Administration
Study Scheme 2019.

SEMESTER -I

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T*	P	Internal	External		
MBA-101	Fundamentals of Management	Core	3	1		40	60	100	4
MBA-102	Managerial Economics	Core	3	1		40	60	100	4
MBA-103	Financial Reporting & Analysis	Core	3	1		40	60	100	4
MBA-104	Organisational Behaviour & Design	Core	3	1		40	60	100	4
MBA-105	Business Analytics	Core	3	1		40	60	100	4
MBA-106	Business communications**	Core	2	2		50	50	100	4
MBA-107	Computer Applications for Business	Core			2	40	60	100	1
MBA-108	Seminar on Indian Ethos and Ethics	Core		4		50		50	4
	TOTAL		17	11	2	340	410	750	29

* Separate syllabi shall be designed for Lecture and Tutorial classes. The syllabus for tutorial classes would be Practical / Task oriented.

** The students shall compulsorily submit a report on the topics covered in the course which shall be the eligibility criteria for passing in this course.

Guru Nanak Dev Engineering College, Ludhiana.
Department of Business Administration
Study Scheme 2019.

SEMESTER-II

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T*	P	Internal	External		
MBA-109	Corporate Finance and Financial Markets.	Core	3	1		40	60	100	4
MBA-110	Human Resource Management	Core	3	1		40	60	100	4
MBA-111	Marketing Management	Core	3	1		40	60	100	4
MBA-112	Legal and Business Environment	Core	3	1		40	60	100	4
MBA-113	Operations Management	Core	3	1		40	60	100	4
MBA-114	Seminar on Social Responsiveness	Core		4		50		50	4
MBA-115	Research Methodology***	Core	3	1		40	60	50	4
##	Open Elective/ MOOCS****	OE	3			40	60	100	3
			21	10		330	420	750	31

1. *** The students shall compulsorily submit a mini project report as an eligibility criteria for passing in this course.
2. **** Student opting for MOOCS course shall have to undergo 12 weeks course which shall be considered equivalent to open elective.
3. ## The students shall opt from the open elective courses being offered by other departments (M.TECH / M.C.A) and accordingly the same course code shall be applicable. For these open elective courses the students shall be attending the classes in the department offering the selected course.
4. Evaluation of the papers MBA-108 (Seminar on Indian Ethos and Ethics) and MBA-114 (Seminar on Social Responsiveness) will be Internal and the bifurcation of the marks would be:
 - MST - 24 Marks
 - Attendance and Class behavior - 6 Marks
 - Assignments and class tasks - 5 Marks
 - Field Work/Practical - 15 Marks

Guru Nanak Dev Engineering College, Ludhiana.
Department of Business Administration
Study Scheme 2019.

SEMESTER-III

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T*	P	Internal	External		
MBA-116	Entrepreneurship and Project Management	Core	3	1		40	60	100	4
MBA-XXX	Program Elective-I*	Electives	3	1		40	60	100	4
MBA-XXX	Program Elective-II*	Electives	3	1		40	60	100	4
MBA-XXX	Program Elective-III*	Electives	3	1		40	60	100	4
MBA-XXX	Program Elective-IV*	Electives	3	1		40	60	100	4
MBA-117	Industrial/ Institutional Training	Internship			2	50		50	1
MBAD-130	Dissertation Phase-I	Field work			4	50		50	2
			15	5	6	300	300	600	23

Guru Nanak Dev Engineering College, Ludhiana.
Department of Business Administration
Study Scheme 2019.

SEMESTER- IV

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T	P	Internal	External		
MBA-132	Corporate Strategy	Core	3	1		40	60	100	4
MBA-XXX	Elective-V**	Elective	3	1		40	60	100	4
MBA-XXX	Elective-VI**	Elective	3	1		40	60	100	4
MBA-XXX	Elective-VII**	Elective	3	1		40	60	100	4
MBA-XXX	Elective-VIII**	Elective	3	1		40	60	100	4
MBAD-131	Dissertation Phase -2		---	---	6		50	50	3
##	Open Elective/MOOCs	OE	3			40	60	100	3
			18	5	6	240	410	650	26

The students shall opt from the open elective courses being offered by other departments (M.Tech /M.C.A) and accordingly the same course code shall be applicable. For these open elective courses the students shall be attending the classes in the department offering the selected course.

Note on Elective Subjects

*The programme shall be dual specialization offering a total of 6 departmental electives in third and fourth semester each (2 from each specialization). The students shall opt for two subjects each in the selected specialization I (Elective -I & Elective-II) & specialization II (Elective -III & Elective-IV) of choice from the list of offered electives in each specialization in third semester
 **Similarly the students shall opt for two subjects each in the specialization I (Elective -V & Elective-VI) & specialization II (Elective -VII & Elective-VIII) of choice from the list of offered electives in each specialization in fourth semester.

Further the minimum number of students required to offer an elective course shall be ten

TOTAL CREDITS FOR MBA PROGRAM: 109

DEPARTMENTAL ELECTIVE COURSES

Specialization Finance 3rd Semester

- MBA-118 Investment Analysis and Portfolio Management
- MBA-119 Project Appraisal and Finance
- MBA-120 Financial Markets and Services
- MBA-121 Mergers, Acquisitions and Corporate Restructuring

Specialization Human Resource Management 3rd Semester

- MBA-126 Manpower Planning, Recruitment, and Selection
- MBA-127 Employee Relations
- MBA-128 Compensation and Benefits Management
- MBA-129 Understanding self-Indian Perspective

Specialization Finance 4th Semester

- MBA-133 International Finance
- MBA-134 Managing Banks and Financial Institutions
- MBA-135 Valuation
- MBA-136 Behavioral Finance

Specialization Human Resource Management 4th Semester

- MBA-141 Cross Cultural Management
- MBA-142 Team Dynamics at Work
- MBA-143 International HRM
- MBA-144 Strategic HRM

Specialization Marketing 3rd Semester

- MBA-122 Consumer Behaviour
- MBA-123 Integrated Marketing Communication
- MBA-124 Digital and Social Media Marketing
- MBA-125 Product and Brand Management

Specialization Marketing 4th Semester

- MBA-136 Services Marketing
- MBA-138 Retail Management
- MBA-139 International Marketing
- MBA-140 Sales and Distribution Management

Teachers need to submit the detailed course plan for both theory and tutorial subjects to the HOD before the commencement of each semester. Committee shall be formed by HOD for the approval of the submitted course plan.

OPEN ELECTIVES BEING OFFERED FOR UG STUDENTS

Subjects to be offered as Open Electives by the Department of Business Administration for B.Tech (U.G) courses.

• OEMBA-201	Corporate Finance and Financial Markets
• OEMBA-202	Human Resource Management
• OEMBA-203	Marketing Management
• OEMBA-204	Operation Management
• OEMBA-205	Services Marketing
• OEMBA-206	International HRM

OPEN ELECTIVES BEING OFFERED FOR PG (M.TECH/M.C.A) STUDENTS

• MOBA-301	Fundamentals of Management
• MOBA-302	Organisational Behaviour & Design
• MOBA-303	Financial Markets and Services
• MOBA-304	Consumer Behaviour
• MOBA-305	Manpower Planning, Recruitment, and Selection
• MOBA-306	International HRM.
• MOBA-307	Human Resource Management

The classes for the open elective courses for students of other departments shall preferably be held along with the students of M.B.A. program.

ANNEXURE-II

OPEN ELECTIVES BEING OFFERED FOR UG STUDENTS

Subjects to be offered as Open Electives by the Department of Business Administration for B.Tech (U.G) courses

• OEMBA-201	Corporate Finance and Financial Markets
• OEMBA-202	Human Resource Management
• OEMBA-203	Marketing Management
• OEMBA-204	Operation Management
• OEMBA-205	Services Marketing
• OEMBA-206	International HRM

OPEN ELECTIVES BEING OFFERED FOR PG (M.TECH/M.C.A) STUDENTS

• MOBA- 301	Fundamentals of Management
• MOBA- 302	Organisational Behaviour & Design
• MOBA- 303	Financial Markets and Services
• MOBA -304	Consumer Behaviour
• MOBA -305	Manpower Planning, Recruitment, and Selection
• MOBA-306	International HRM
• MOBA-307	Human Resource Management

The classes for the open elective courses for students of other departments shall preferably be held along with the students of M.B.A. program.

ANNEXURE-IV

Human Resource Management MOBA-307

(Credits: 3)

Teaching Scheme

Lectures: 3 hrs/ week

Human Resources Management: Meaning, Scope, Objective, Functions, Roles and Importance. Interaction with other functional areas. HRM & HRD a comparative analysis. Human Resource Management practices in India. Human Resource Planning: Meaning & Concept, Process and importance, Methods of Human Resources Planning, Importance of HRIS. Job Analysis, Job Description, Job Specification & Job Evaluation – Meaning, Concepts and Methods.

Recruitment & Selection: Meaning & Concept, Process & Methods Recruitment & Selections. Induction & Placement Process. Training & Development: Meaning & Concept of Training & Development, Methods of Training & Development, Difference Between Training & Development, Aligning Training to Business Needs, Future of Training & development. Career Planning & Coaching & Mentoring.

Performance Appraisal: Meaning & Concept of Performance Appraisal, Methods & Process Of Performance Appraisal. Issues in Performance Appraisal and Potential Appraisal. Compensation Management- Wage & Salary Administration: Meaning & Concept of Wage & Salary Administration, Elements & Methods of Wage & Salary, Incentive Plans & Fringe Benefits. Internal Mobility: Promotion, Transfer, Demotion, Separation. Quality of work life (QWL): Meaning, Concept, Development and Various Approaches of QWL, Techniques for improving QWL. Health, Safety & Employee Welfare, Social Security, Job Stress, Counseling and Monitoring, Job Satisfaction and Morale. Competency Mapping Unit

Industrial Relations: Meaning & Concept of Industrial Relations. Collective Bargaining – Meaning, Scope and Objectives; Collective Bargaining – Issues and Strategies; Negotiations Skills and Strategies; Participative Management; Employee Grievances and their Resolution – Model for Grievance Resolution Procedure, Quality Circles: Concept, Structure. Role of Management, Quality Circle in India, HR Audit, Contemporary Issues in HRM.

Suggested Readings/ Books:

- V.S.P.Rao, Human Resource Management, Excel Books
- C.B. Memoria, Personal Management, Himalaya Publications
- Edwin B. Flippo, Personal Management, Tata Mc Graw Hill
- K. Aswathappa, Human Resource Management, Tata McGrawHill
- Bohlander, Snell & Vohra, Human Resource Management, Cengage Learning
- Dale Yoder, Personal Management & Industrial Relations, Tata McGraw Hill C.B. Gupta, Human Resource Management, Sultan Chand and Sons
- R.S. Dwivedi, HRD in India Companies, Himalaya publications
- Gary Dessler, Human Resource Management, McMillan
- Gomez-Mejia, Managing Human Resources, Pearson Education

(October 11, 2019)

Item
No: 1

Agenda Items:-

To Finalize the syllabus of MBA second Semester as per the AICTE model curriculum (New scheme 2019). (Annexure-I)

Corporate Finance and Financial Markets(MBA-109) –approved

Human Resource Management (MBA-110) In 3rd Unit Strategic HR Practices to be added. In Unit-I HR Audit needs to be incorporated.

Marketing Management (MBA-111) In Unit II concepts of service marketing to be added. Emerging Trends to be shifted to Unit –IV.

Legal and Business Environment(MBA-112) Introduction of Company Law, Liabilities of company formation, Qualifications, Rights and duties of Board of directors / to be added in IInd Unit. Partnership, trust to be deleted and add the trade secret. In Unit IV, concept of BOP to be added.

Operation Management (MBA-113) Unit-II capacity Planning to be removed. Unit –III- Introduction of MRP, MRP2&ERP to be added and supply chain management to be removed. In Unit-IV concept of SQC, Quality Circles to be added. JIT to be added in Unit –III. Sustainable operations management to be removed.

Seminar on Social Responsiveness (MBA-114) The syllabus not to be divided unit wise. Concept like Eco-efficiency, eco service system evaluation, renewable energy form (EVs & BS6 norms), Carbon credits to

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	be added Research Methodology (MBA -115) In Unit -III Under non parametric tests sign and run test to be removed and introduction to multi-variate/ factor /discriminant /conjoint/cluster/ multiple regression to be added. Relevant software's to be introduced to the students.
Item No: 2	To amend and finalize the course codes of new study scheme 2019, (Annexure-II). Approved The students can opt 8 weeks /12 weeks MOOC subjects for desired credits as per SWAYAM Guidelines.
Item No: 3	To review and finalize the courses to be offered as open electives for B.Tech and M.Tech.(Annexure-III) Approved M.TECH - Subjects titled Operation Management (MOBA-308) and Marketing Management (MOBA-309) to be offered as open electives.
Item No: 4	To finalize the syllabus of the course HRM to be offered as open electives for B.Tech and M.Tech courses. (Annexure-IV) Approved

sig.

R. Sir

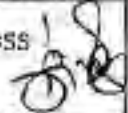
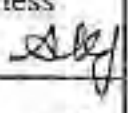
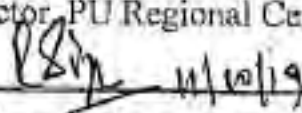
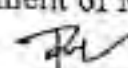
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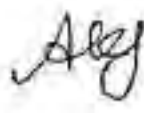
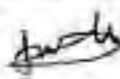
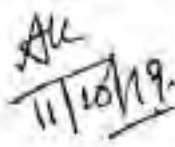
List of BOS Members

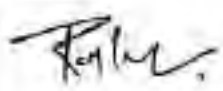
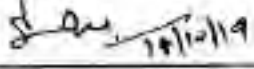
1	Dr. Sukhdev Singh, Professor & Head, Department of Business Administration, GNDEC, Ludhiana (Chairman). 
2	Dr. Parampal Singh, Associate Professor, Department of Business Administration, GNDEC, Ludhiana (Member). 
3	Dr. Amanjot Kaur Gill, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member). 
4	Dr. Harmohan Singh Dhall, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member). 
5	Dr. Navdeep Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member). 
6	Ms. Amarpreet Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member). 
EXTERNAL MEMBERS	
7	Dr. Ravi Inder Singh, Director, PU Regional Centre, Fountain Chowk, Ludhiana (Member). 
8	Dr. Rajat Aggarwal, Associate Professor, Department of Management Studies, IIT Roorkee (Member). 
9	Dr. Ajesh Kaura, Vice -President, Nahar Group, Ludhiana, (Member).
10	Dr. Harmeen Soch, Associate Professor, PIT (PTU main campus), Kapurthala (Member nominated by IKGPTU).
11	Mr. Inderjit Singh, Deputy Director, Department of Expenditure Ministry of Finance GOI, New Delhi. (Member) 

Nominated Members	
1	Dean (Academics)/Nominee <i>J. A.</i> 11.10.19
2	COE/ Nominee <i>J. A.</i>
3	Dean(T&P)/ Nominee <i>N. S.</i>
	Speical Invitee: Ms.Mandeep Kaur Khosa <i>Khosa</i> Assistant Professor, Deptt. of Business Administration, Guru Nanak Dev Engineering College Ludhiana

BOS Members

The following members were present during the meeting of BOS on 11th October, 2019.

1	Dr. Sukhdev Singh, Professor & Head, Department of Business Administration, GNDEC, Ludhiana (Chairman).	 11/10/19
2	Dr. Parampal Singh, Associate Professor, Department of Business Administration, GNDEC, Ludhiana (Member).	 11/10/19
3	Dr. Amanjot Kaur Gill, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 11/10/19
4	Dr. Harmohan Singh Dhall, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 11/10/19
5	Dr. Navdeep Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 11/10/19
6	Ms. Amarpreet Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 11/10/19
EXTERNAL MEMBERS		
7	Dr. Ravi Inder Singh, Director, PU Regional Centre, Fountain Chowk, Ludhiana (Member).	 11/10/19

8	Dr. Rajat Aggarwal, Associate Professor, Department of Management Studies, IIT Roorkee (Member).	
9	Dr. Ajesh Kaura, Vice -President, Nahar Group, Ludhiana, (Member).	
10	Dr. Harmeen Soch, Associate Professor. PIT (PTU main campus), Kapurthala (Member nominated by IKGPTU).	
11*	Mr. Inderjit Singh, Assistant Director (Cost) Tariff commission, Ministry of Commerce and Industry, GOI, New Delhi. (Member)	
	Nominated Members	
1	Dean (Academics)/Nominee.	
2	COE/ Nominee	
3	Dean(T&P)/ Nominee	

* Designation - Mr. Inderjit Singh Deputy Director,
Department of Expenditure,
Ministry of Finance,
New Delhi.

⇒ Special Invitee :- Ms. Mandeep Kaur Khosa 
Assistant Professor,
Dept. of Business Administration
GNDEC, Ludhiana.

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GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

Department of Business Administration

No. MBA 202 / 1011

Dated 28-8-19

Dean Academics

Sub: **Minor Alternation in the proposed scheme of MBA Programme 2019.**

Sir,

In the above proposed scheme, the department of Business Administration has offered open electives for the students of B.Tech. & M.Tech. As per proposed scheme, these elective are offered in 2nd & 4th semester. As the teaching classes in M. Tech. are not held in 4th semester so this proposed scheme of open elective for M. Tech. may be introduced in M. Tech. (3rd semester) subject to approval of competent authority.

Thanking you,



Department of Business Administration

Encl:-

Relevant page of the proposed scheme.

M L
28/8/19


Professor & Head,
Department of Management,
Guru Nanak Dev Engg. College,
Ludhiana (Punjab) - 141005.

ok

OPEN ELECTIVE FOR OTHER DEPARTMENTS

Subjects to be offered as Open Electives by the Department of Business Administration for B.Tech and M.Tech courses

2nd Semester of MBA program

- MBA-19201 Corporate Finance and Financial Markets
- MBA-19203 Marketing Management

The classes for the open elective courses for students of other departments shall be held alongwith the students of M.B.A. program.

4th Semester of MBA program#

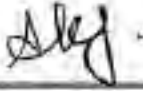
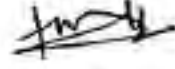
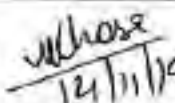
- MBA-19925 International Finance
- MBA-19926 Managing Banks and Financial Institutions
- MBA-19927 Valuation
- MBA-19928 Behavioral Finance
- MBA-19905 Services Marketing
- MBA-19906 Retail Management
- MBA-19907 International Marketing
- MBA-19908 Sales and Distribution Management
- MBA-19970 Cross Cultural Management
- MBA-19971 Team Dynamics at Work
- MBA-19972 International HRM
- MBA-19973 Strategic HRM

Subjects offered as electives in MBA 4th semester from the above list would be available as Open Electives for B.Tech and M.Tech branches. The classes for the open elective courses for students of other departments shall be held alongwith the students of M.B.A. program.


 Professor & Head,
 Department of Management,
 Guru Nanak Dev Engg. College,
 Ludhiana (Punjab) - 141006.

Minutes of the meeting

The internal members of the BOS (Department of Business Administration) in the meeting held on 14/11/19 hereby approve the Question paper pattern of the Subject: **Business Communication (MBA-106)** (Marks: 50) of 1st semester (**Annexure-I**) from Nov-Dec 2019 examinations onwards.

	BOS Members	Signatures
1	Dr. Parampal Singh, Head & Associate Professor, Department of Business Administration, GNDEC, Ludhiana (Chairman).	 14/11/19
2	Dr. Amanjot Kaur Gill, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 14/11/19
3	Dr. Harmohan Singh Dhall, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 14/11/19
4	Dr. Navdeep Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 14/11/19
5	Ms. Amarpreet Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).	 14/11/19
6	Ms Mandeep kaur Khosa, Assistant Professor Department of Business Administration, GNDEC, Ludhiana.	 14/11/19


 Head,
 Department of Management,
 Guru Nanak Dev Engg. College
 Ludhiana (Punjab) - 141005.

ANNEXURE- I

Program/Course: MBA(Sem Ist)
Name of the Subject: Business Communication
Subject Code: MBA-106
Paper ID:

Time Allowed: 03 Hours

Max. Marks: 50

NOTE:

- 1) Part C is Compulsory
- 2) Attempt any Five questions from Part-A, and any one questions from each of the Sections B1, B2, B3 and B4 of Part-B.
- 3) Any missing data may be assumed appropriately.

Part -A

[Marks: 04 each]

Q1.

Part- B

Section-B1

[Marks: 06 each]

Q2

Q3

Section-B2

[Marks: 06 each]

Q4

Q5

Section-B3

[Marks: 06 each]

Q6

Q7

Section-B4

[Marks: 06 each]

Q8

Q9

Part -C

[Marks: 06]

Q10 Case Study:


Professor & Head,
Department of Management,
Guru Nanak Dev Engg. College,
Ludhiana (Punjab) - 141006.

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GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
Department of Business Administration

No. MBA-39/34

Dated--13-01-18

Principal,

Through: Dean Academics

Sir,

In reference to letter No. RK-38/2042 dated 16.11.17 regarding constitution of the BOS, it is submitted that to the best of my knowledge, Dr. Prem Kumar, Vice Chancellor, GNA University Phagwara was nominated as member of BOS of the Department of Business Administration (please refer Serial No. 8) and now he has quit the university and went abroad. Dr. Prem Kumar was in the category of subject experts. So, you are requested to proceed to replace this expert and seek necessary approval. Sir, another member of BOS as PTU nominee is Dr. Harveen Soch (please refer serial no. 11). The spellings of her name may be corrected as she is mentioned as Harneeh Soch.

The proposed replacements are:-

1. Dr. G.S. Batra, Prof. School of Management Studies and
Dean Research, Punjabi University, Patiala.
2. Dr. B.S. Bhatia, Pro. Vice Chancellor
RIMT University, Mandi Gobindgarh
3. Dr. Rajat Aggarwal, Associate Professor,
Department of Management Studies, IIT Roorkee



Head
Department of Business Administration

AGENDA - 4th Meeting BOS, 2018

Contents

S. No	Description
1	List of BOS Members
2	Agenda Items • Proposed scheme for MBA programme as per AICTE norms 2018. (Annexure-I) • Offering open electives to the MBA students. • The department shall offer open electives to the students of other departments. • To introduce Ph.D in Management under self-financed scheme with effect from session 2019-20. • Basis for Rationalization of awards in the Internal Assessment. • To Introduce one year Part Time Post Graduate Diploma in Management for Working Executives. • To introduce full time regular three year Graduate Programs in 1. Business Administration (BBA) & 2. Commerce (B.Com).

List of BOS Members

1	Dr. Sukhdev Singh, Professor & Head, Department of Business Administration, GNDEC, Ludhiana (Chairman).
2	Dr. Parampal Singh, Associate Professor, Department of Business Administration, GNDEC, Ludhiana (Member).
3	Ms. Amanjot Kaur Gill, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).
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6	Ms. Amarpreet Kaur, Assistant Professor Department of Business Administration, GNDEC, Ludhiana (Member).
EXTERNAL MEMBERS	
7	Dr. Ravi Inder Singh, Director, PU Regional Centre, Fountain Chowk, Ludhiana (Member).
8	Dr. Rajat Aggarwal, Associate Professor, Department of Management Studies, IIT Roorkee. (Member)
9	Dr. Ajesh Kaura, Vice –President, Nahar Group, Ludhiana, (Member).
10	Dr. Harmeen Soch, Associate Professor. PIT (PTU main campus), Kapurthala (Member nominated by IKGPTU).

11	Mr. Inderjit Singh, Assistant Director (Cost) Tariff commission, Ministry of Commerce and Industry, GOI, New Delhi.
	Nominated Members
1	Dean (Academics)/Nominee
2	COE/ Nominee
3	Dean(T&P)/ Nominee

Department of Business Administration's Agenda of ^{4th} Meeting of BOS on 20th September 2018

Guru Nanak Dev Engineering College, Ludhiana.Department of Business AdministrationMinutes of Meeting of BOS Meeting(September 20th 2018)

Item No.1	Proposed scheme for MBA programme as per AICTE norms 2018.(Annexure-I) Approved with changes
Item No.2	Offering open electives to MBA students. Approved
Item No.3	The department shall offer open electives to the students of other departments. Approved
Item No.4	To introduce Ph.D in Management under self-financed scheme with effect from session 2019-20. Approved but Dissented by Dr.Harmeen Soch as it is not prevalent in other universities and the college needs to meet with many requisite resources before such a strategic decision can be taken at University level.
Item No.5	Basis for Rationalization of awards in the Internal Assessment. Approved. (It should be followed with bell shaped probability distribution)
Item No.6	To Introduce one year Part Time Post Graduate Diploma in Management

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20/9/18

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20/9/18

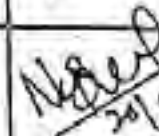
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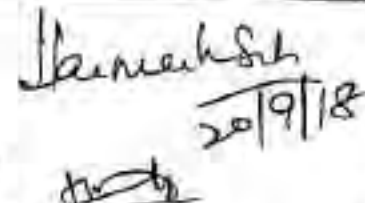
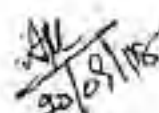
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	for Working Executives. Approved (To introduce three(3)years part-time MBA program. It is resolved that if a candidate passes one year course he/she shall be given Diploma in Management).
Item No.7	1. To introduce full time regular three year Graduate Programs in 1. Business Administration (BBA) & 2. Commerce (B.Com). Approved

Following members were present during the ^{44th} Board of Studies meeting held on 20 September, 2018 in the seminar room of Department of Business Administration.

List of BOS Members who were present during meeting.

	Internal members	Signature
1	Dr. Sukhdev Singh, Professor & Head, Department of Business Administration, GNDEC, Ludhiana (Chairman).	
2	Dr. Parampal Singh, Associate Professor, Department of Business Administration, GNDEC, Ludhiana (Member).	
3	Dr. Harmohan Singh Dhall, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana (Member).	
4	Dr. Navdeep Kaur, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana (Member).	 20/9/2018
5	Ms. Amarpreet Kaur, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana (Member).	 20/9/18

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 20/9/2018

	External members	
6	Dr. Ravi Inder Singh, Director, PU Regional Centre, Fountain Chowk, Ludhiana (Member) .	<i>R Singh</i> 20/9/18
7	Dr. Rajat Aggarwal, Associate Professor, Department of Management Studies, IIT Roorkee (Member) .	<i>Rajat Aggarwal</i> 20-9-18
8	Dr. Harmeen Soch, Associate Professor. PIT (PTU main campus), Kapurthala (Member nominated by IKGPTU) .	<i>Harmeen Soch</i> 20/9/18
9	Mr. Inderjit Singh, Assistant Director (Cost) Tariff commission, Ministry of Commerce and Industry, GOI, New Delhi. (Member)	<i>Inderjit Singh</i> 20-9-18

No. MBA-39/2225

Dated-8-8-17

To
Dean Academics,

In reference to your letter no. RK38/997 dated 02.08.2017, the proposed members of BOS for the subsequent term are as:-

BOS Members**Two Subject Experts from outside Parent University:-**

1. Dr. G.S. Batra, Prof. & Head, School of Management Studies, Punjabi University, Patiala.
2. Dr. B.S. Bhatia, Former & Dean Research, Guru Granth Sahib World Sikh University, Fatehgarh - Sahib
3. Dr. Ravi Inder Singh, Professor, University Business School, P.U. Regional Centre Fountain Chouk, Ludhiana.
4. Dr. Prem Kumar, V.C. Chancellor GNA University, Phagwara.

One industry representative to be nominated by the Director:-

1. Sh. V.K. Goyal, Executive Director and Group CEO, S.E.L. Manufacturing Co. Ltd, 274, Dhandari Khurd, G.T. Road, Ldh.
2. S. Sohinder Singh, President Marketing, DWM, Nahar Spinning Mills, Ldh.
3. Mr. Ajesh Kaura, Vice President, Nahar Group, Ldh.
4. Mr. Anil Kumar, Executive Director & CEO, Syrians Industries, Ldh.

One expert to be nominated by Vice Chancellor from a panel of six recommended by Director:-

1. Dr. Ashwani Bhatta, Professor, SCD Govt. College, Ludhiana.
2. Dr. Harmeen Soch, Associate Professor, PIT (PTU main campus), Kapurthala.
3. Dr. Sanjiv Bansal, Assistant Professor, Department of Commerce /Management, PTU Jalandhar.
4. Dr. Mandeep Kaur, Assistant Professor, Department of Commerce /Management, PTU Jalandhar.
5. Dr. Nitya, Assistant Professor, Department of Commerce /Management, PTU Jalandhar.
6. Dr. Kapil Gupta, Deputy Registrar, Department of Commerce /Management, PTU Jalandhar.

One postgraduate meritorious Alumnus to be nominated by the Director:-

1. Mr. Inderjit Singh, Assistant Director (cost) Tariff commission, Ministry of Commerce and Industry, GOI, New Delhi.
2. Mr. Akash Suri, Manager Marketing, Life Styles International Private Ltd., IFFCO Building, Surendra Jhakar Bhawan, Ground Floor Plot No.-3, Industrial area, Sector 32, Gurgaon.

Faculty of MBA Department as Internal Members:-

1. Dr. Sukhdev Singh, Professor & Head, Department of Business Administration, GNDEC, Ludhiana. (Chairman)
2. Dr. Parampal Singh, Associate Professor, Department of Business Administration, GNDEC, Ludhiana. (Member)
3. Pf. Amanjot Kaur Gill, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana. (Member)
4. Pf. Harmohan Singh Dhall, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana. (Member)
5. Dr. Navdeep Kaur, Department of Business Administration, GNDEC, Ludhiana. (Member)
6. Pf. Amarpreet Kaur, Department of Business Administration, GNDEC, Ludhiana. (Member)

Head,
Department of Business Administration,
Guru Nanak Dev Engg. College,
Ludhiana.

Agenda Items of Third BOS Meeting (August 5th 2017)

1	a) Formal approval of the DRC (Departmental Research Committee) by BOS. Annexure -I b) Approval of the Guidelines for Research Project Report (MBA-15407) by BOS as formulated and approved by DRC. Annexure -II
2	Evaluation of the Research Project Report would be done by single External examiner.
3	The marks distribution of the paper "Presentation on Training Report" (MBA-15307) in third semester would be divided into Internal (40 marks) and External (60 marks). After completion of the training, students would be required to make presentation of training report in the department. DRC would be evaluating the students. The internal marks would have the segregation of Contents of the Report: 20 Marks and Presentation: 20 marks.
4	Proposed format for "Presentation on Training Report" would be • Introduction • Review of Literature* • Research Methodology* • Analysis & Discussion • Findings *To discuss whether Review of Literature and Research Methodology should be a part of Training Report or not.
5	Approval of the list of External paper setters Annexure-III.
6	Other relevant issues related to MBA Programme.

Department of Business Administration's Agenda of 3rd Meeting of BOS on 05th August 2017

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ANNEXURE-I

DRC (Departmental Research Committee) formed at the departmental level would constitute following members:

1. Dr. Parampal Singh, Convenor (Research Committee)
2. Prof. Amanjot Kaur Gill
3. Prof. H.S. Dhall
4. Dr. Navdeep Kaur
5. Prof. Amarpreet Kaur.

Approval of BOS

1. Sh. V.K. Goyal.
2. Dr. B.S. Bhatia.
3. Dr. Karamjit Singh.
4. Dr. Harmeen Soch.
5. Sh. Sanjiv Khara.
6. Mr. Inderjit Singh.
7. Mr. Akash Suri.

Department of Business Administration's Agenda of 3rd Meeting of BOS on 05th August 2017

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Department of Management.

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ANNEXURE-II

Guidelines for Research Project Report (MBA-15407)

1. Tentative title of the research project to be submitted by the students to respective guides in 3rd semester by November before preparatory holidays.
2. Internal evaluation of research project is based on 40 marks; Segregation of the marks:
Synopsis presentation: 10 marks
Project progress report: 15 Marks
Pre-submission presentation of research project report: 15 marks
3. Student is free to opt for Co-Guide (in case of multi-disciplinary project).
4. Since, the student has an option to carry out the research project in any of his specialization; the committee decided that student would be required to convey their preference in writing and seek approval from HOD.
5. Synopsis submission to be done by the last week of January.
6. Maximum limit of Synopsis is of 10 pages which include:
 - INTRODUCTION
 - REVIEW OF LITERATURE (Latest reviews are more relevant)
 - OBJECTIVES
 - RESEARCH METHODOLOGY (Statistical Tools & concepts of research methodology like sample size, sampling techniques etc).
 - BIBLIOGRAPHY.
7. Students are required to submit two hard copies of Synopsis.
8. Synopsis presentation will be held in the first week of February.
9. For Synopsis Presentation (PPT) maximum number of slides has to be 10.
10. Review of Literature should be in tabular form and sources to be given in the Bibliography.
11. If special permission for synopsis presentation is to be taken then prior written permission of the respective guide and HOD would be taken and such cases will be considered as second time evaluation.
12. Second time evaluation would be done from 6 marks instead of 10 marks.
13. Performance will be evaluated by DRC members (Individually) on prescribed format.

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ANNEXURE-II

Guidelines for Research Project Report (MBA-15407)

1. Tentative title of the research project to be submitted by the students to respective guides in 3rd semester by November before preparatory holidays.
2. Internal evaluation of research project is based on 40 marks. Segregation of the marks:
Synopsis presentation: 10 marks
Project progress report: 15 Marks
Pre-submission presentation of research project report: 15 marks
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4. Since, the student has an option to carry out the research project in any of his specialization; the committee decided that student would be required to convey their preference in writing and seek approval from HOD.
5. Synopsis submission to be done by the last week of January.
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 - INTRODUCTION
 - REVIEW OF LITERATURE (Latest reviews are more relevant)
 - OBJECTIVES
 - RESEARCH METHODOLOGY (Statistical Tools & concepts of research methodology like sample size, sampling techniques etc).
 - BIBLIOGRAPHY.
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9. For Synopsis Presentation (PPT) maximum number of slides has to be 10.
10. Review of Literature should be in tabular form and sources to be given in the Bibliography.
11. If special permission for synopsis presentation is to be taken then prior written permission of the respective guide and HOD would be taken and such cases will be considered as second time evaluation.
12. Second time evaluation would be done from 6 marks instead of 10 marks.
13. Performance will be evaluated by DRC members (Individually) on prescribed format.

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14. Pre-submission presentation will to be held in last week of March and presentations would be taken specialization wise.

15. Format of PPT presentation for pre-submission is-

- i) Title and objectives,
- ii) Research Methodology
- iii) Analysis and Interpretation
- iv) Major Findings
- v) Limitations

16. Plagiarism policy is same as followed at the Institute level i.e maximum of 20% (Similarity Index) is allowed.

17. Plagiarism checking of research projects has be completed by 2nd week of April.

18. Final submission of the Research project report has to be done by 3rd week of April.

19. The format of Research project report submission

i) Preliminary pages

- Title page
- Acknowledgement
- Certificate of originality endorsed by the student and guide/co-guide.
- Abstract
- Originality report
- Table of Contents with page number.
- List of Figures
- List of Tables

ii) Chapter scheme

- Chapter -I Introduction
- Chapter -II Review of Literature
- Chapter -III Research Methodology
- Chapter -IV Data Analysis and Interpretation
- Chapter- V Findings, Recommendations and Future scope
- Bibliography
- Annexure (Questionnaire)

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Jai Narain Dev Engg. College,
Ludhiana (Punjab) - 141007

20. Guides would convey to their respective students about the format and ensure that research project report is as per guidelines issued by DRC.

21. It was decided that the Hard Binding of the research project would be of specific colour according to Specialisations.

- Brown hard cover for Marketing
- Black hard cover is for HRM
- White hard cover is for Finance

22. Two copies of the research project need to be submitted in the Department.

23. Guides to submit the details of the internal marks out of 40 for finalization to the DRC.

APPROVAL OF BOS

Signatures: BOS MEMBERS:-

EXTERNAL

- 1 Dr. B.S. BHATIA
- 2 Dr. HARMEEN SOCH
- 3 SHRI. V.K. GOYAL
- 4 SHRI. SANJEEV KHERA
- 5 MR. AKASH SURI
- 6 MR. Inderjeet Singh
- 7 Dr. KARAMJIT SINGH

B.S. Bhatia

05/08

5-8-17

INTERNAL

- 1 Dr. Parampal Singh
- 2 Prof. Amanjot Kaur Gill
- 3 Prof. H.S. Dhali
- 4 Dr. Navdeep Kaur
- 5 Prof. Amarpreet Kaur

Special
Inviter

HEAD & CHAIRMAN- BOARD OF
STUDIES:-

Dr. SUKHDEV SINGH

Department of Business Administration's Agenda of 3rd Meeting of BOS on 25th August

ANNEXURE -III
DEPARTMENT OF BUSINESS ADMINISTRATION, GNDEC, LUDHIANA
LIST OF EXTERNAL PAPER SETTERS

Prefix Name	Name	Designation	Department & Institute
Dr.	Pratibha Goyal	Professor	School of Business Studies, PAU, Ludhiana
Dr.	Navjot Kaur	Professor	School of Management Studies, Punjabi University, Patiala
Dr.	Gagandeep Kaur Banga	Associate Professor	School of Business Studies, PAU, Ludhiana
Dr.	Mohit Gupta	Assistant Professor	School of Business Studies, PAU, Ludhiana
Dr.	Ravi Inder Singh	Associate Professor	University Business School, PU Regional Centre, P.U., Gurgaon
Dr.	Harsh Vineet Kaur	Assistant Professor	Commerce and Management, SGGS World University
Dr.	Puran Singh	Associate Professor	P.G. Department of Economics, S.C.D. Government College
Dr.	Jagwinder Singh	Associate Professor	Deptt. of Entrepreneurship, NIT Jalandhar
Dr.	Jeewan Jyoti Maini	Assistant Professor	School of Management Studies, MIMIT, Malout
Prof.	Ajay Samyal	Assistant Professor	School of Management Studies, MIMIT, Malout
Dr.	Meenakshi Rana	Assistant Professor	School of Mathematics, Thapar University
Dr.	Manish Bansal	Associate Professor	School of Management Studies, MIMIT, Malout
Dr.	Bhupinder P S Chahal	Associate Professor	University School of Business, Chandigarh University
Dr.	Anil Angrish	Associate Professor	Business Administration, N.J.P.E.R. Mohali
Dr.	Sukhmani	Assistant Professor	School of Business Studies, PAU, Ludhiana
Dr.	Navdeep Aggarwal	Assistant Professor	School of Business Studies, PAU, Ludhiana
Dr.	Khushdeep Dharni	Assistant Professor	School of Business Studies, PAU, Ludhiana
Dr.	Ashwani Bhatta	Professor	Deptt. of Commerce, SCD Govt. College Ludhiana
Dr.	Rajesh Gupta	Associate Professor	Centre for Mathematics and Statistics, Central Univ.
Dr.	Aparna Bhatia	Assistant Professor	Commerce, GNDU Amritsar
Dr.	Balljit Kaur	Assistant Professor	Punjab School of Economics, GNDU Amritsar
Dr.	Sumninder Kaur Bawa	Associate Professor	University Business School, GNDU Amritsar
Dr.	Sangeeta Arora	Associate Professor	Commerce, GNDU Amritsar
Dr.	Sandeep Virdi	Assistant Professor	School of Management Studies, Pbl. Univ., Patiala
Dr.	Vikas Singla	Assistant Professor	School of Management Studies, Pbl. Univ., Patiala
Dr.	Rajwinder Singh	Assistant Professor	School of Management Studies, Pbl. Univ., Patiala
Dr.	Niti Chatterji	Assistant Professor	School of Management, Thapar University, Dera B
Dr.	Rupali Arora	Associate Professor	University School of Business, Chandigarh University
Dr.	Rupinderbir Kaur	Assistant Professor	University Business School, Punjab University

|| Item || Proposed revision for the format of "Presentation on Training"

It is decided that the current Format

Professor S. Bhatta,
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 Guru Nanak Dev Engineering College,
 Ludhiana, Punjab - 141005.

30	Ms.	Ritu Sharma	Assistant Professor	University School of Business, Chandigarh
31	Dr.	Luxmi	Associate Professor	University Business School, Punjab University
33	Dr.	Tejinderpal Singh	Assistant Professor	University Business School, Punjab University
34	Dr.	Anil Chadhok	Professor	University School of Business, Chandigarh
35	Dr.	Monika Bedi	Assistant Professor	University Business School, Punjab University
36	Dr.	Karminder Singh Ghuman	Associate Professor	School of Management, Thapar University
37	Dr.	Amarjit Singh Sidhu	Professor	University Business School, GNDU Amritsar
39	Dr.	Bikramjit Singh Mann	Professor	University Business School, GNDU Amritsar
40	Dr.	Bikram Singh Hundal	Professor	University Business School, GNDU Amritsar
41	Dr.	B.B Singla	Associate Professor	University Business School, Punjab University
42	Dr.	Pavleen	Assistant Professor	University Business School, GNDU Amritsar
43	Dr.	Jasleen Kaur	Assistant Professor	Management, BBSBEC, Fatehgarh Sahib
44	Dr.	Amandeep Kaur	Assistant Professor	Business Management, G.N.D.U. Regional

Signatures: BOS MEMBERS:-

EXTERNAL

- 1 Dr. B.S. BHATIA
- 2 Dr. HARMEEN SOCH
- 3 SHRI. V.K. GOYAL
- 4 SHRI. SANJEEV KHERA
- 5 MR. AKASH SURI
- 6 MR.INDERJEET SINGH
- 7 Dr. KARAMJIT SINGH

B. Bhatia

Dr. Soch

Dr. Goyal

Dr. Khera

Dr. Suri

Dr. Singh

Dr. Singh

INTERNAL

- 1 Dr. Parampal Singh
- 2 Prof. Amanjot Kaur Gill
- 3 Prof. H.S. Dhall

Dr. Singh

Dr. Gill

Dr. Dhall

Special Invitee:

- Dr. Navdeep Kaur
- Prof. Amarpreet Kaur

Dr. Kaur

Dr. Kaur

HEAD & CHAIRMAN- BOARD OF STUDIES:-

Dr. SUKHDEV SINGH

Dr. Singh

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Guru Nanak Dev Engineering College, Ludhiana.

Department of Business Administration

Minutes of Meeting of 3rd BOS Meeting

(August 5th, 2017)

Item No.1	a) Formal approval of the DRC (Departmental Research Committee) by BOS. Annexure -I b) Approval of the Guidelines for Research Project Report (MBA-15407) by BOS as formulated and approved by DRC. Annexure -II Approved
Item No.2	Evaluation of the Research Project Report would be done by single External examiner. Approved
Item No.3	The marks distribution of the paper "Presentation on Training Report" (MBA-15307) in third semester would be divided into Internal (40 marks) and External (60 marks). After completion of the training, students would be required to make presentation of training report in the department. DRC would be evaluating the students. The internal marks would have the segregation of Contents of the Report: 20 Marks and Presentation: 20 marks. Approved
Item No.4	Proposed revision for the format of "Presentation on Training Report" The members of BOS unanimously decided that the current Format as such would continue without excluding Review of Literature and Research Methodology.

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Item No.5	Approval of the list of External paper setters Annexure-III. Approved
Item No.6	Other relevant issues related to MBA Programme. It was mooted to plan an Academic Audit of the department.

The meeting ended with a vote of thanks.

The following members were present in the meeting:-

Signatures: BOS MEMBERS:-

EXTERNAL

- 1 Dr.B.S.BHATIA
- 2 MR.AKASH SURI
- 3 MR.INDERJEET SINGH

B.S. Bhatia
A. Suri
I. Singh
5/8/17

INTERNAL

- 1 DR.PARAMPAL SINGH
- 2 PROF.AMANJOT KAUR GILL
- 3 PROF.H.S.DHALL

P. Singh
A. Gill
H.S. Dhall

Special Invitee:

- DR.NAVDEEP KAUR
PROF.AMARPREET KAUR

N. Kaur
A.P. Kaur
15/08/17
25/08/17

HEAD & CHAIRMAN- BOARD OF STUDIES:-

Dr.SUKHDEV SINGH

Contents

S. No	Description
1	List of BOS Members
2	Agenda Items • Introduction of CGPA System batch (2015-17) onwards • Approval of changes in the Curriculum of MBA programme. • Setting of the question papers for the end semester examination.

Department of Business Administration's Agenda of 2nd Meeting of BOS on 10th June 2015

Professor & Head,
Department of Management,
Guru Nanak Dev Engg. College,
Ludhiana (Punjab) - 141006.

Agenda Items

1	Introduction of the CGPA system batch 2015-17 onwards.
2	The marks distribution of the paper 'Presentation on Training Report' (MBA-307) in third semester would be divided into 50 Internal and 50 External. Students would be required to make training report presentation in the department after its completion.
3	The Title of the Final Research project (MBA-407) will be assigned to the students by the end of 3rd semester and its evaluation will be based on the following criteria: • Total marks for the Final research project will be 100. • Marks distribution will be Internal 40 marks and External 60 marks. • Internal marks (40) will have further bifurcation of Synopsis Presentation : 10 Marks Project Progress Report: 15 Marks Pre submission Presentation: 15 Marks.* *Students will have to make the presentation of the Final research project before the Research Project Evaluation committee who would evaluate the research project. • The student can be supervised by two guides in case the student decides to carry out research in Multi-functional area. • Evaluation of the Final Research Project would be done by the External examiner separately for each area of specializations offered.
4	Amendments in the Curriculum of MBA programme for 2015-17 batch onwards. • Change in the Syllabi of the subjects offered (Details attached in Annexure-I). • The subjects to be offered in respective areas of specializations will be decided from the list of 5 subjects for the IIIrd semester and 5 for the IVth semester by the teacher

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	taking into consideration the relevance of that subject according to the changing business/Industry environment. The marks distribution of the internal assessment (40 marks) of the subjects will have the following bifurcation. Midterm Tests : 20 Marks Assignments/ Case discussions: 10 Marks Attendance: 4 Marks Lead role/Participation of the students: 6 Marks.
5	Setting of the question papers for the end semester examination - Question paper of Practical subjects should have at least 50 % Numerical content. - Section C of the question paper would be of the Case study that would be compulsory.

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Department of Business Administration's Agenda of 2nd Meeting of BOS on 10th June 2015

1. Approval for changes in the Curriculum of MBA Programme.

The changes (Highlighted) in curriculum of the MBA programme is mentioned below:

Scheme of Masters in Business Administration (MBA) Batch 2015 onwards

First Semester

Contact Hours: 35 Hrs

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MBA-15101	Principles and Practices of Management	4	1	-	40	60	100	5
MBA-15102	Organizational Behaviour	4	1	-	40	60	100	5
MBA-15103	Accounting for Management	4	1	-	40	60	100	5
MBA-15104	Quantitative Techniques	4	1	-	40	60	100	5
MBA-15105	Managerial Economics	4	1	-	40	60	100	5
MBA-15106	Business Communication	4	1	-	40	60	100	5
MBA-15107	Information Technology for Management	3	2	-	40	60	100	5
MBA-15108	Viva Voce	-	-	-	-	50	50	2
Total		27	8	-	280	470	750	37

Department of Business Administration's Agenda of 2nd Meeting of BOS on 10th June 2015

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Second Semester

Contact Hours: 33 Hrs

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MBA 201	Business Environment	4	1	-	40	60	100	5
MBA 202	Production and Operation Management	4	1	-	40	60	100	5
MBA 203	Human Resource Management	4	1	-	40	60	100	5
MBA 204	Marketing Management	4	1	-	40	60	100	5
MBA 205	Financial Management	4	1	-	40	60	100	5
MBA 206	Research Methodology	4	1	-	40	60	100	5
BTHU 101*	Human Values and Professional Ethics	3	-	-	40	60	100	3
MBA 207	Viva Voce	-	-	-	-	50	50	2
Total		27	6	-	280	470	750	35

Third Semester

Contact Hours: 33 Hrs

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MBA 301	Applied Operations Research	4	1	-	40	60	100	5
MBA 302	Corporate Legal Environment	4	1	-	40	60	100	5
MBA XXX***	Specialization I	4	1	-	40	60	100	5
MBA XXX***	Specialization II	4	1	-	40	60	100	5
MBA XXX***	Specialization -III	4	1	-	40	60	100	5
MBA XXX***	Specialization -IV	4	1	-	40	60	100	5
MBA 307**	Presentation on Training Reports	3	-	-	50	50	100	2
MBA 308	Viva Voce	-	-	-	-	50	50	2
Total		27	6	-	290	460	750	34

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Dr. Manoj Dev Singh, C.A.S.,
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Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MBA 401	Strategic Management	4	1	-	40	60	100	5
MBA 402	Entrepreneurship and Managing Small Medium Business	4	1	-	40	60	100	5
MBA XXX***	Specialization I	4	1	-	40	60	100	5
MBA XXX***	Specialization II	4	1	-	40	60	100	5
MBA XXX***	Specialization -III	4	1	-	40	60	100	5
MBA XXX***	Specialization -IV	4	1	-	40	60	100	5
MBA 407	Research Project Report	-	-	-	40	60	100	2
MBA 408	Viva Voce	-	-	-	-	50	50	2
Total		24	6	-	280	470	750	34

*** represents the subject code as per specialization

* The internal assessment of this course is based on the report to be prepared individually by the students. Such reports may be checked and signed by external examiner / University official at the time of subject viva voce examination.

** The experts from industry/ academia may be invited for evaluation.

Note: The viva voce examination of MBA 308 will be held on the basis of Sumer Training report and other subjects of 3rd semester. Such reports may be checked and signed by external examiner at the time of subject viva voce examination.

The student can opt for either Super specialization or Dual combination.

* In Super specialization the student will study the following subjects

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Semester III; 04 subjects and Semester IV 04 subjects

- In Dual specialization the student will study the following subjects

Semester III (2+2) and Semester IV (2+2)

The student may opt for either super specialization or dual specialization. The students opting for super specialization must study 04 subjects of the chosen specialization in Semester III and Semester IV. Thus student must opt for 08 subjects in all specialization either as super specialization or as a dual must study these subjects in the respective semester. The student opting for dual specialization must study 02 subjects of each of these specializations in Semester III and Semester IV. Thus the student must study a total of 04 subjects of each specialization. In Semester III two subjects each from 02 specializations. In semester IV two subjects each from 02 specializations.

- Presently the students are being offered Dual Specialization

*** Semester III (Specialization)

MARKETING

- MBA 901 Consumer Behaviour
- MBA 902 Advertising Management
- MBA 903 Product and Brand Management
- MBA 904 Retail and Franchising
- MBA 905 Rural and Industrial Marketing

FINANCE

- MBA 921 Security Analysis and Portfolio Management
- MBA 922 Management of Financial Services
- MBA 923 Direct Tax Planning
- MBA 924 Strategic Financial Management
- MBA 925 Treasury and Credit risk Management

HUMAN RESOURCE MANAGEMENT

- MBA 961 Social Security & Labour Welfare
- MBA962 Training & Development
- MBA963 Industrial Psychology
- MBA 964 Manpower planning
- MBA 965 Conflict and Negotiations

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***** Semester IV (Specialization)****MARKETING**

- MBA 906 Service Marketing
- MBA 907 International Marketing
- MBA 908 Sales and Distribution Management
- MBA 909 Logistics Management
- MBA 910 Customer Relationship Management

FINANCE

- MBA 926 International Finance
- MBA 927 Banking and Insurance Operations
- MBA 928 Global Capital Market
- MBA 929 Management Control System
- MBA 930 Financial Engineering

HUMAN RESOURCE MANAGEMENT

- MBA 966 Organization Development
- MBA 967 International Human Resource Management
- MBA 968 Industrial Relations and Labour Laws
- MBA 969 People Management and Leadership
- MBA 970 Stress Management

Submitted for Consideration and Approval

2. Setting of the Question Papers for the End semester Examinations.

- Question paper of Practical subjects should have at least 50 % Numerical content.
- Section C of the question paper will be of the Case study that would be compulsory.

Submitted for Consideration and Approval

Department of Business Administration
Guru Nanak Dev Engineering College, Ludhiana

Dated : 10/06/2015

Hereunder follow the Minutes of Second Meeting of Board of Studies held on 10/06/2015 at 10:00 am in committee room.

The following persons were present:

1. Dr. B.S. Bhatia	5. Dr. Parampal Singh
2. Sh. Sanjiv Khera	6. Prof. Amanjot Kaur Gill
3. Mr. Akash Suri	7. Prof. Harmohan Singh
4. Dr. Sukhdev Singh	Dhall

The meeting was initiated with a welcome note by the chairman & thereafter the pre-circulated agenda was set in motion.

Proceedings:

1. A detailed discussion was made on the introduction of CGPA system from batch 2015-17 onwards. The house raised the point that the introduction of CGPA is subject to the broader policy as adopted by the administration of the institute specifically with respect to the proportion of core /allied/free choice courses to be offered. Special reference was made to free choice courses as it was suggested that this aspect had direct implications for number of faculty required.

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It was mooted that the agenda item be firstly discussed and decided with the college administration and a policy in principle be devised for the institute. This policy framework shall then act as a reference for introduction of CGPA system in M.B.A programme.

2. The marks distribution for the paper titled "Presentation on Training Report- MBA 307" in third semester was decided as under:

Internal evaluation: 40 marks

External evaluation: 60 marks

Additionally the students shall be required to make a presentation of this report in the department.

3. The discussion related to third agenda item had following outcomes:

-Maximum marks for the paper titled "Research project Report (MBA-407)" shall be 100

- Marks distribution will be as :---
internal : external :: 40:60

-Internal marks of 40 shall have further bifurcation as :

Synopsis presentation : 10 marks

Project progress report: 15 marks

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Pre-submission presentation : 15 marks

The students shall be required to make the pre-submission presentation before the Research project evaluation committee nominated by the Head of the Department.

-The students can opt for a co-guide in case the student decides to carry out research in multi-functional area.

-External evaluation of the project shall be done by separate external examiners for separate specializations offered . In this evaluation the internal examiner (nominated by the H.O.D) shall carry out the role of facilitator.

- The synopsis presentation and pre-submission presentation shall both be time bound and shall be informed to the students suitably.

4. a) Changes proposed in the i) load allocation in the curriculum of M.BA programme and ii)content of some of the courses offered were acceptable to the house.

b) The two subjects to be offered in the respective areas of specializations in the third and fourth semester each shall be decided from the list of five subjects as mentioned in the current syllabus. This decision shall be taken by the teachers concerned taking into consideration its due relevance.

c) The marks distribution for the internal assessment of the subjects shall be as per below pattern:

Mid term tests: - 20 marks

Assignments*/case discussions: - 10 marks

Attendance :- 4 marks

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Warananasi, Warananasi - 422 005.

Lead role/ Participation of the students:- 6marks

*Assignments should preferably be related to some real life industry issue.

5. The end semester examination question papers shall have :
 - a) maximum 50% numerical content in case of subjects which are numerical in nature.
 - b) one compulsory section comprising of a caselet/small case study carrying eight marks.

In addition to the above outcomes for agenda items, following suggestions were made by the house:

- i) Greater choice be provided as regards to number of elective/free choice subjects as is emphasized by the NBA and NAAC . More faculty be hired in accomplishing this if need be.
- ii) A six-point model for policy formulation for CGPA system at institute level :
 - a. List down courses which may be available for free choice.
 - b. Divide the courses for odd and even semesters.
 - c. Decide about the minimum number of students required for offering a specific free choice course.
 - d. Fix the credits for each free choice course.
 - e. Fix teaching hours for free choice courses before finalization of the time table at institute level.

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iii) As regards the anti-Plagiarism check policy adopted by the institute for the Research project Report (MBA-407), carried out in the fourth semester, the house suggested to keep a similarity index tolerance level of zero percentage for the same except for the initial two chapters viz. a) Introduction and b) Literature Review for which the similarity index may be ignored.

Remark: The meeting was joined by Dr. Navdeep Kaur (Asstt. professor, Department of Business Administration, G.N.D.E.C.) and Prof. Gurpreet Kaur Kang (Asstt. professor, Department of Business Administration, G.N.D.E.C.). The presence of these faculty members was required in order to explain the changes proposed in the syllabus content of the subjects taught by them, to the house against point no. 1 of agenda item 4.

The meeting ended with a vote of thanks.

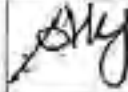
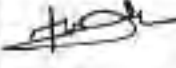
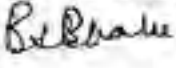
1. Dr. B.S. Bhatia *B.S. Bhatia*
2. Sh. Sanjiv Khara
3. Mr. Akash Suri
4. Dr. Sukhdev Singh *Dr. Sukhdev Singh*
5. Dr. Parampal Singh *Dr. Parampal Singh*
6. Prof. Amanjot Kaur Gill *Prof. Amanjot Kaur Gill*
7. Prof. Harmohan Singh Dhall *Prof. Harmohan Singh Dhall*
8. Dr. Navdeep Kaur (NBK) *Dr. Navdeep Kaur (NBK)*

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA**Department of Business Administration**

No. MBA _____

Dated-10.6.15

List of Members of Board of Studies, Department of Business Administration**Attendance**

Sr.No.	Name	Designation	Signature
1	Dr. Sukhdev Singh, Professor & Head, Department of Business Administration, GNDEC, Ludhiana.	Chairman	
2	Dr. Parampal Singh, Associate Professor, Department of Business Administration, GNDEC, Ludhiana.	Member	
3	Prof. Amanjot Kaur Gill, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana.	Member	
4	Prof. Harmohan Singh Dhall, Assistant Professor, Department of Business Administration, GNDEC, Ludhiana.	Member	
5	Dr. B.S. Bhatia, Professor & Head, Guru Granth Sahib World Sikh University, Fatehgarh Sahib	Member (Academics)	
6	Sh. V.K. Goyal, Executive Director & Group CEO, S.E.I., Manufacturing Co. Ltd., 274, Dhandari Khurd, G.T. Road, Ludhiana.	Member (Industry)	
7	Sh. Sanjiv Khara, Senior General Manager, Atlas Cycles (Haryana) Ltd. Sahibabad (U.P.)	Member (Industry)	
8	Dr. Karamjit Singh, Professor, Punjab University Chandigarh	Member (Academics)	
9	Dr. Harveen Soch, Associate Professor, PIT (PTU Main Campus) Kapurthala.	Member (PTU Nominee)	
10	Mr. Akash Suri, Marketing R5, Life Styles International Private Limited, Viva Palace Mall, G.T. Road, Jalandhar	Member (Alumni)	
11	Mr. Inderjit Singh, Assistant Director (Cos), Ministry of Commerce & Industry Govt. of India, New Delhi.	Member (Alumni)	

5th BOS Meeting 11/10/2019

Guru Nanak Dev Engineering College, Ludhiana.
Department of Business Administration
Study Scheme 2019.

SEMESTER -I

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T*	P	Internal	External		
MBA-101	Fundamentals of Management	Core	3	1		40	60	100	4
MBA-102	Managerial Economics	Core	3	1		40	60	100	4
MBA-103	Financial Reporting & Analysis	Core	3	1		40	60	100	4
MBA-104	Organisational Behaviour & Design	Core	3	1		40	60	100	4
MBA-105	Business Analytics	Core	3	1		40	60	100	4
MBA-106	Business communication**	Core	2	2		50	50	100	4
MBA-107	Computer Applications for Business	Core			2	40	60	100	1
MBA-108	Seminar on Indian Ethos and Ethics	Core		4		50		50	4
	TOTAL		17	11	2	340	410	750	29

* Separate syllabi shall be designed for Lecture and Tutorial classes. The syllabus for tutorial classes would be Practical / Task oriented.

** The students shall compulsorily submit a report on the topics covered in the course which shall be the eligibility criteria for passing in this course.


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Guru Nanak Dev Engineering College, Ludhiana.
Department of Business Administration
Study Scheme 2019.

SEMESTER-II

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T*	P	Internal	External		
MBA-109	Corporate Finance and Financial Markets.	Core	3	1		40	60	100	4
MBA-110	Human Resource Management	Core	3	1		40	60	100	4
MBA-111	Marketing Management	Core	3	1		40	60	100	4
MBA-112	Legal and Business Environment	Core	3	1		40	60	100	4
MBA-113	Operations Management	Core	3	1		40	60	100	4
MBA-114	Seminar on Social Responsiveness	Core		4		50		50	4
MBA-115	Research Methodology***	Core	3	1		40	60	50	4
##	Open Elective/ MOOCS****	OE	3			40	60	100	3
			21	10		330	420	750	31

1. *** The students shall compulsorily submit a mini project report as an eligibility criteria for passing in this course.
2. **** Student opting for MOOCS course shall have to undergo 8/12 weeks course which shall be considered equivalent to open elective. The credits for this course would be as per SWAYAM guidelines.
3. ## The students shall opt from the open elective courses being offered by other departments (M.TECH / M.C.A) and accordingly the same course code shall be applicable. For these open elective courses the students shall be attending the classes in the department offering the selected course.
4. Evaluation of the papers MBA-108 (Seminar on Indian Ethos and Ethics) and MBA-114 (Seminar on Social Responsiveness) will be Internal and the bifurcation of the marks would be:
 - **MST** - 24 Marks
 - **Attendance and Class behavior** - 6 Marks
 - **Assignments and class tasks** - 5 Marks
 - **Field Work/Practical** - 15 Marks

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Department of Business Administration
Study Scheme 2019.

SEMESTER-III

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T*	P	Internal	External		
MBA-116	Entrepreneurship and Project Management	Core	3	1		40	60	100	4
MBA-XXX	Program Elective-I*	Electives	3	1		40	60	100	4
MBA-XXX	Program Elective-II*	Electives	3	1		40	60	100	4
MBA-XXX	Program Elective-III*	Electives	3	1		40	60	100	4
MBA-XXX	Program Elective-IV*	Electives	3	1		40	60	100	4
MBA-117	Industrial/ Institutional Training	Internship			2	50	-	50	1
MBAD-130	Dissertation Phase-I	Field work			4	50		50	2
			15	5	6	300	300	600	23

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Department of Business Administration
Study Scheme 2019.

SEMESTER- IV

Course Code	Course Title	Course Type	Load Allocation			Marks Distribution		Total Marks	Total Credits
			L	T	P	Internal	External		
MBA-132	Corporate Strategy	Core	3	1		40	60	100	4
MBA -XXX	Elective-V**	Elective	3	1		40	60	100	4
MBA-XXX	Elective-VI**	Elective	3	1		40	60	100	4
MBA-XXX	Elective-VII**	Elective	3	1		40	60	100	4
MBA-XXX	Elective-VIII**	Elective	3	1		40	60	100	4
MBAD-131	Dissertation Phase -2		---	---	6		50	50	3
##	Open Elective/MOOCs	OE	3			40	60	100	3
			18	5	6	240	410	650	26

The students shall opt from the open elective courses being offered by other departments (M.Tech /M.C.A) and accordingly the same course code shall be applicable. For these open elective courses the students shall be attending the classes in the department offering the selected course.

Note on Elective Subjects

*The programme shall be dual specialization offering a total of 6 departmental electives in third and fourth semester each (2 from each specialization). The students shall opt for two subjects each in the selected specialization I (Elective –I & Elective-II) & specialization II (Elective –III & Elective-IV) of choice from the list of offered electives in each specialization in third semester

**Similarly the students shall opt for two subjects each in the specialization I (Elective –V & Elective-VI) & specialization II (Elective –VII & Elective-VIII) of choice from the list of offered electives in each specialization in fourth semester.

Further the minimum number of students required to offer an elective course shall be ten.

TOTAL CREDITS FOR MBA PROGRAM: 109

DEPARTMENTAL ELECTIVE COURSES

Specialization Finance 3rd Semester

- MBA-118 Investment Analysis and Portfolio Management
- MBA-119 Project Appraisal and Finance
- MBA-120 Financial Markets and Services
- MBA-121 Mergers, Acquisitions and Corporate Restructuring

Specialization Human Resource Management 3rd Semester

- MBA-126 Manpower Planning, Recruitment, and Selection
- MBA-127 Employee Relations
- MBA-128 Compensation and Benefits Management
- MBA-129 Understanding self-Indian Perspective

Specialization Finance 4th Semester

- MBA-133 International Finance
- MBA-134 Managing Banks and Financial Institutions
- MBA-135 Valuation
- MBA-136 Behavioral Finance

Specialization Marketing 3rd Semester

- MBA-122 Consumer Behaviour
- MBA-123 Integrated Marketing Communication
- MBA-124 Digital and Social Media Marketi
- MBA-125 Product and Brand Management

Specialization Marketing 4th Semester

- MBA-136 Services Marketing
- MBA-138 Retail Management
- MBA-139 International Marketing
- MBA-140 Sales and Distribution Management

Specialization Human Resource Management 4th Semester

- MBA-141 Cross Cultural Management
- MBA-142 Team Dynamics at Work
- MBA-143 International HRM
- MBA-144 Strategic HRM

Teachers need to submit the detailed course plan for both theory and tutorial subjects to the HOD before the commencement of each semester. Committee shall be formed by HOD for the approval of the submitted course plan.

OPEN ELECTIVES BEING OFFERED FOR UG STUDENTS

Subjects to be offered as Open Electives by the Department of Business Administration for B.Tech(U.G) courses

- OEMBA-201 Corporate Finance and Financial Markets
- OEMBA-202 Human Resource Management
- OEMBA-203 Marketing Management
- OEMBA-204 Operation Management
- OEMBA-205 Services Marketing
- OEMBA-206 International HRM

OPEN ELECTIVES BEING OFFERED FOR PG (M.TECH/M.C.A) STUDENTS

- MOBA-301 Fundamentals of Management
- MOBA-302 Organisational Behaviour & Design
- MOBA-303 Financial Markets and Services
- MOBA-304 Consumer Behaviour
- MOBA-305 Manpower Planning, Recruitment, and Selection
- MOBA-306 International HRM.
- MOBA-307 Human Resource Management
- MOBA-308 Operations Management
- MOBA-309 Marketing Management

The classes for the open elective courses for students of other departments shall preferably be held along with the students of M.B.A. program.

FUNDAMENTALS OF MANAGEMENT

COURSE CODE: MBA-101

Credit hours: 3:1:0

Credit:4

Max Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: Develop knowledge of fundamental management concepts and skills. Identify the internal and external factors and forces confronting management in various organizations. Examine the functions of management: such as planning, organizing, staffing, controlling, and decision-making. Identify the key competencies needed to be an effective manager.

Unit I

Introduction: Definition, nature, scope, importance, Functions, Managerial roles and skills.

Evolution of management thought and Management thinkers: Classical Approach, Neo Classical Approach, Quantitative approach, Behavioral approach, Systems approach, Contingency approach. Contributions of F. W. Taylor, Henry Fayol, Mary Parker Follet, Chester Bernard, Max Weber, Peter, F. Drucker, Gilbreths, Henry Gantt, Abraham Maslow, Herzberg and McGregor.

Unit II

Planning: Importance, Types of Plans, and Process of Planning, MBO: Concept, Importance and Process.

Strategic Management: Nature, Importance, Purpose, Types, Process and Major Kinds of Strategies, McKinsey's 7-S Approach.

Decision-Making: Importance, Types, Steps and Approaches, Decision Making in various conditions, Group Problem Solving and Decision Making.

Unit III

Organizing: Concept and process of Organizing, Formal Vs Informal organization, Organizational structure: Types of Organizational structure, Bases of Departmentalization.

Authority & Power: Concept, Responsibility and Accountability. **Delegation:** Concept, Importance, factors affecting Delegation, Effective Delegation, Span of Management, Decentralization and Centralization, **Staffing:** Importance and process. **Coordination:** Concept, importance, difficulties and techniques to ensure effective coordination.

Unit IV

Control: Concept, importance, characteristics, Process of Control, Types and techniques of controlling.

Comparative Study: Japanese Management and Z-culture of American Companies, Chinese Style Management,

Modern Management Techniques: an overview of various latest techniques: Business process Re-engineering, Business outsourcing, knowledge management, E-Business Management.

Tutorials: Relevant Case Studies on the application of various

- Management principles.
- Strategic planning.
- Organizing and decision making.
- Global issues

Will be discussed.

Team building exercises, Business management crossword puzzles and other related activities that enhance essential leadership capabilities among students to be taken up.

Suggested Readings/Books:

- Harold Koontz, and Heinz Weihrich, *Essentials of Management: An International Perspective*, New Delhi, McGraw-Hill, 2010.
- Richard L Daft, *The New Era of Management*, New Delhi, Thomson, 2007.
- Stephen P Robbins, Mary Coulter and Neharika Vohra, *Managemnt*, New Delhi, Pearson, 2011.
- V S P Rao & V H Krishna, *Management*, Excel Books.
- P.Subba Rao, *Principles of Management*, Himalaya Publishing.
- Dubrin, *Management: Concepts & Cases*, Cengage Learning.

MANAGERIAL ECONOMICS

COURSE CODE: MBA-102

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: The course aims to acquaint the students with the economic concepts and principles and enable the students to address business problems in economic environment and also provides the macroeconomic understanding of the Indian economy.

Unit-I

Managerial Economics: Meaning, Nature & scope, relation with other Disciplines, Role of Managerial Economics in decision making, Fundamental concepts used in Business decisions. **Demand Analysis:** Law of demand & Elasticity of demand, Demand forecasting.

Unit II

Production Functions: meaning, concept of productivity, short run and long run production functions, Isoquants. Laws of return to scale; **Theory of cost:** concept and determinants of cost, Traditional & Modern theory of cost.

Unit-III

Market Structure: meaning, assumptions and equilibrium of perfect competition, monopoly, monopolistic competition, Oligopoly competition, Applications in Managerial decision making, **Behaviour of firms and Game theory;** Nash Equilibrium, Prisoner's Dilemma.

Unit-IV

Indian Economy: Colonialism & development of Indian economy, Frame of Indian economy, demographic features and Indicators of economic growth and development. Poverty Debate & Inequality, Nature, policy & Implications, **Fiscal and Monetary policy, New Industrial Policy,** Marketing and financing of primary sector.

Tutorial : Relevant case study on the application of various

- Managerial Economics
- Demand Analysis
- Pricing Decisions
- Demand Forecasting
- Group Discussion on Industrial policy, Inequality
- Presentation on topics related to Syllabus
Will be discussed

Suggested Readings/ Books:

- K.K. Dewett, Modern Economic Theory, S. Chand Publication
- D.M. Mithani, Managerial Economics Theory and Applications, Himalaya Publication
- D.N. Dwivedi, Managerial economics, Vikas Publications
- Gupta, Managerial Economics , Tata Macgraw Hills
- Peterson and Lewis , Managerial Economics, Prentice Hall of India
- Goel Dean, managerial Economics , Prentice Hall of India, Pvt. Ltd , New Delhi
- Ramesh Singh , Indian Economy, McGraw Hill Education; 8 edition.
- Sanjiv Verma, The Indian Economy Unique Publishers India Pvt. Ltd (2018)

FINANCIAL REPORTING AND ANALYSIS

COURSE CODE: MBA-103

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objective: The objective of this course is to acquaint the students regarding various accounting concepts and its application in managerial decision making. The course attempts to build potential to use appropriate accounting tools and techniques of financial accounting and management accounting. for preparing and analyzing financial statements

Unit –I

Accounting as an information system, Concepts, Convention and Principles of Accounting, Role of Accountant in an organization. **Accounting Cycle-** Journal, Ledger, and Trial Balance. **Branches of Accounting:** Financial, Cost and Management Accounting, **Role of Accounting Standards/IFRS** (Introduction only).

Unit-II

Preparation of Financial statements- Manufacturing Account, Trading Account, Profit & Loss Account and Balance Sheet.

Preparation of Income Statement, Balance Sheet (With simple Adjustments) of Limited Companies as per Companies Act, 2013.

Unit- III

Financial Analysis- Concepts and objectives, Tools of Financial Analysis: Trend Analysis, Common Size statements, Comparative Statements, Introduction to Ratio Analysis & Computation of various Ratios, Fund Flow and Cash Flow Statements (without adjustment).

Unit- IV

Corporate Reporting: Types & Periodicity of Reports, Contents of Report- Chairman's Speech, Directors' Report, Auditors' Report, Corporate Governance Report, Social Responsibility Reporting, Segment Reporting, Consolidated Financial Reporting, Contemporary Issues in Financial Reporting and Miscellaneous Contents of Annual Report.

Tutorials

1. Relevant Case Studies should be discussed in class
2. Each student of the class shall select at least one different company out of BSE 500 Companies and study the Annual Report for 5-10 years and comment:

- i) On the Accounting Practices of the company in the assignment given to him/her.
- ii) Apply tools of Financial Statement Analysis to the data Compiled from the Annual report/s, interpret the results and comment on the implications of the analysis for the various stakeholders.

Suggested Readings/ Books

- Garrison, Managerial Accounting, Tata McGraw
- Gupta, Ambrish , Pearson
- Khan and Jain, Management Accounting, Tata McGraw
- Ramchandran, Financial Accounting for Management, Tata McGraw
- JawaharLal, Accounting For Management, Himalaya Publishing
- J.Madegowda, Accounting For Managers, Himalaya Publishing
- Sankar, Narayana, Ramanathan, Financial Accounting for Managers, Cengage Learning

ORGANISATIONAL BEHAVIOUR AND DESIGN

COURSE CODE: MBA-104

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: The course aims to provide an understanding of basic concepts, theories and techniques in the field of human behavior at individual, group and organizational levels. It facilitates a critical evaluation of organizational practices and their impact on work behaviours, attitudes and performance and it also recognizes various organizational structures.

Unit-I

Organizational Behavior: Definition of OB, contributing disciplines to OB, challenges and opportunities for OB. **Foundations of Individual Behavior:** biographical characteristics, **Learning** Theories of Learning, **Attitudes**, Attitude Change, **Values & Beliefs**, **Personality:** Determinants of Personality, **Perception**, Attribution Theory, Person's Perception. **Emotional Intelligence (EI):** concept, definition and interaction with other phenomena.

Unit II

Motivation: Definition & Process of Motivation, Theories of Motivation, Nature and process of Motivation, Application of Motivation Concept. **Leadership:** concept & theories of Leadership; Leadership in Indian Culture; Nature & Significance of Leadership; Leadership traits & Skills; **Transactional Analysis**, Life Position, Johari Window Model.

Unit-III

Foundations of Group Behavior: Concept of Group Formation, Stages of Group Formation, Theories of Group Formation. **Teams** Difference between Group & Team. **Group Decision Making:** Meaning & Nature; Decision making in groups; Process; Steps & Styles in Decision making; Techniques of Decision Making; Group Size & cohesiveness. **Conflict Management:** Definition of Conflict, Functional Vs Dysfunctional Conflict; Conflict Process; Individual & Group Level Conflict; Organization level Conflict; Conflict Management.

Unit-IV

Organization Design: Basic of an organization design, **Organization & stakeholders** Environmental influences, organizational strategy-organizational design-alternative structures- management process- authority and organizational control mechanisms, Managing organizational culture, **Technology & Organizational Design, Organizational Control Decision Making, Organizational Learning & Knowledge Management, Organizational Life Cycle & Change Management, Managing Organizational Conflict, Power & Politics.**

Tutorial:

Relevant case studies on the application of various

- Organization concepts
- Global issues
- Organization and decision making

Will be discussed

Team building exercises and other related activities that enhance the students personality and leadership among students to be taken up.

Suggested Readings/ Books:

- Robbins, *Organization Behaviour*, Pearson Education.
- Luthans ,*OrganizationBehaviour*,Tata McGraw Hill.
- Newstrom, *Organizational Behaviour: Human Behaviour at work*, Tata McGraw Hill.
- Kalliath, *Organization Behaviour*, The McGraw –Hill.
- Hersey, *Management of Organizational Behaviour*, Prentice Hall India.
- Parikh, Gupta, *OrganisationalBehaviour*, Tata McGraw Hill.
- Locum, *Fundamentals of OrganisationalBehaviour*, Cengage Learning.
- Saiyadain , M.S. : *Organization Behaviour* , Tata McGraw Hill.
- Paul S Myers: *Knowledge Management and Organizational Design*.Routledge; 1stEdition.
- John Roberts: *The Modern Firm: Organizational Design for Performance and Growth*, Oxford University Press, Oxford, 2004

BUSINESS ANALYTICS
COURSE CODE: MBA-105

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objective: The objective of this paper is to acquaint the students with various statistical tools and techniques used in business decision making. . The course aims at providing fundamental knowledge and exposure to the students to use various statistical methods in order to understand, analyze and interpret data for decision making.

Unit-I

Introduction to statistics: meaning, scope, importance and limitations, applications of inferential statistics in managerial decision-making. **Analysis of data:** source of data, collection, classification, tabulation, depiction of data. **Measures of Central tendency:** Arithmetic mean, geometric mean, median and mode. **Measures of Dispersion:** Range, Quartile deviation, Mean deviation, Standard deviation, Coefficient of variation, Skewness and Kurtosis.

Unit-IV

Time Series Analysis: Meaning, Components and various methods of time series analysis, Trend analysis: Least Square method - Linear equations.

Correlation Analysis: Significance, types, Methods of correlation analysis: Scatter diagrams, Graphic method, Karl Pearson's correlation co-efficient, Rank correlation coefficient, Properties of Correlation.

Unit-III

Regression analysis: meaning, application of regression analysis, difference between correlation & regression analysis, regression equations, standard error and Regression coefficients.

Sampling and Sampling Distribution: Concept and definitions, census and sampling, probability samples and non-probability samples, relationship between sample size and errors, Sampling distribution, Standard error, Central Limit theorem, Interval estimates and Confidence intervals.

Unit-IV

Hypothesis Testing-1: Basic concepts – Significance level, Type-I and Type-II errors, One tailed and two tailed testing. Procedure for Hypothesis testing.

Hypothesis Testing –II: One sample Tests, Two sample tests, Chi Square and Analysis of Variance

Tutorials

1. A total of four case studies relevant to the four units of theory syllabus to be discussed in the classroom for reinforcing the concepts studied.
2. The statistical methods in the syllabus to also be covered using MS excel software wherever possible.

Suggested Readings:

- Jain & Aggarwal, Business Statistics, VK Publications
- S P Gupta, *Statistical Methods*, Sultan Chand & Sons
- Levin & Rubin, *Statistics for Management*, Prentice Hall
- Levins, Krehbiel, *Business Statistics*, Pearson Education

BUSINESS COMMUNICATION

COURSE CODE: MBA-106

Credit hours: 2:2:0

Credit:4

Max Marks: 100

External Assessment: 50

Internal Assessment: 50

Objective: This course presents communication as integral to management and as a critical component for success in the workplace. The students will develop a foundation for designing effective messages, both written and oral, from concept to delivery. They will use various communication models to identify objectives, analyze audiences, choose information, and create the most effective arrangement and channel for that message. Particularly, the course emphasizes elements of persuasive communication: how to design messages for diverse and possibly resistant audiences and how to present that information in a credible and convincing way. In addition, they will develop and deliver an individual presentation, using appropriate and effective visual support, and will learn and practice group communication.

UNIT - 1

Introduction and Communication basics: Business Communication concepts, Communication Models, Communication Process, Characteristics of effective business communication, Barriers in communication environment, Communication and Ethics, Cross Cultural Communication, Social networking technologies in business communication, Importance of listening, business etiquette & nonverbal Communication.

UNIT - II

Written Communication Skills: Importance of analyzing the situation before writing a message, Information-gathering options, Information organization, Writing Business Communication: Adapting to your audience, Crafting brief messages, Crafting messages for electronic media, Writing routine, positive and negative messages; Planning, Writing, and Completing Reports, Proposals and Emails.

UNIT – III

Oral and Online Communication Skills: Developing oral and online presentations, Enhancing presentations with slides and other visual aids, Just-A-Minute Presentation, Individual/Group Presentations, Feedback and overcoming Glossophobia, Group discussion.

UNIT - IV

Communication skills for interview preparation: Employment strategy, Planning, writing and completing your resume, Applying and Interviewing for Employment: Understanding, preparing and follow-up, Role Play and Simulation games – Employer - employee and Interviewer – interviewee relationship.

Tutorials on:

- Use of social networking technologies in business communication.
- Planning and preparing a presentation.
- Just-A-Minute presentation and on use of audio visual aids in presentation (Group & Individual)
- Writing resume, mock interviews, role play & simulation games.

Suggested Readings/ Books:

- Penrose/Rasberry/Myers, Business Communication for Managers, (5th edition) Cengage Learning.
- Courtland/John/Roshan, Business Communication Today, (13th edition) Pearson.
- Rizvi, Effective Technical Communication Tata Mcgraw Hill.
- Raymond/Marie/Kathryn/Neerja, Business Communication, Tata Mcgraw Hill.

COMPUTER APPLICATIONS FOR BUSINESS

COURSE CODE: MBA-107

Credit hours: 0:0:2

Credit: 1

Max Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: Develop knowledge of fundamental concepts and skills of computing. Exposure to the operating and office management tools. Working knowledge of MS word including PowerPoint, Working knowledge of MS Excel and its applications.

Unit I

Introduction to Computer: Definition, Features of Modern Computer. Input Unit, Output unit, Central Processing Unit, Various Input and Output Devices, Internal and External Memory Storage. **Operating System:** Concepts, types. **Window:** Introduction to Window (Working of Windows, Basic commands of windows. MSOffice: Introduction, Components of Office.

Unit II

MS-Word: History, working with MS word, (Creating, Saving, Opening, Importing, Exporting and Inserting document, Formatting pages, Alignment, Paragraphs and Sections).

MS-PowerPoint: History, Creating, Saving, Opening, existing presentation, Creating and Saving a Presentation, Auto Content Wizard, Design Template, Slide Sorter View, Slide Show, Inserting pictures and graphics and Printing Slides. **MS-Excel:** Introduction, Components of spread sheets and its applications, Calculation of various Financial and Statistical Functions using Formulas. **MS Access:** Introduction to Data Base, Viewing and Editing Data; Sorting and Indexing Printing Reports and Labels, Managing Multiple Tables, Forms, Queries, Reports. **Computer Networks:** Overview of a Network–Communication processors–Communications Media–Types of Network–Network Topologies- Networkprotocols–Network Architecture.

Suggested Readings/Books:

- Ram, B, (2018).Computer Fundamentals Architecture and Organization. New Age Publications.

- Sinha, P.K. and Sinha, P. (2017).Foundation of computing. New Delhi: BPB Publications.
- Arora, A.(2015) Computer fundamentals and applications. Vikas Publishing
- Rajaraman, V.(2014).Fundamentals of Computers. Delhi: Prentice-Hall
- Forouzan, (2009).Basics of Computer Science. India Cengage Learning.

SEMINAR ON INDIAN ETHOS AND ETHICS

COURSE CODE: MBA-108

Credit hours: 0:4:0

Credit:4

Max. Marks: 50

External Assessment:-

Internal Assessment: 50

Objectives: The main objective of the course is to acquaint the students with Ethics and Indian Ethos and values along with its relevance to managerial decision making. The course is also to develop an understanding and appreciation of the importance of Indian ethos and value system for ethical conduct in business.

Unit-I

Introduction to Indian Ethos: Indian Ethos- Meaning, Features, Need, History, Relevance, Principles Practiced by Indian Companies, Requisites, Elements, Role of Indian Ethos in Managerial Practices, Model of management in the Indian sociopolitical environment, Management Lessons from Kautilya's Arthashastra, Indian Heritage in Business, Management, Production and Consumption. Ethics v/s Ethos Indian Management v/s Western Management.

Unit II

Indian Systems of Learning: Learning: Meaning, Mechanisms; Gurukul System of Learning - Meaning, Features, Advantages, Disadvantages; Modern System of Learning- Meanings, Features, Advantages, Disadvantages; Karma- Meaning, Importance of Karma to Managers, Nishkama Karma Laws of Karma: The Great Law, Law of Creation, Law of Humility, Law of Growth, Law of Responsibility, Law of Connection, Corporate Karma: Meaning, Methodology, Guidelines for good Corporate Karma.

Unit III

Work Ethos and Values: Work Ethos- Meaning, Levels, Dimensions, Steps, Factors Responsible for Poor Work Ethos. Values: Meaning, Features, Values for Indian Managers, Relevance of Value Based Management in Global Change, Impact of Values on Stakeholders: Employees, Customers, Government, Competitors and Society. Relevance of values in management: need for values in global change- Indian perspective; values for managers; holistic approach for managers in decision making; secular versus spiritual

values in management, Trans-Cultural Human Values in Management and Management Education, Importance of Value System in Work Culture, teaching ethics.

Unit IV

Understanding the need for ethics: Ethical values, myths and ambiguity. Ethical codes, Ethical principles in Business; Theories of Ethics, Kohlberg's six stages of moral development (CMD), Managing Ethical Dilemma, Characteristics, Ethical decision making, Ethical reasoning, the dilemma resolution process; Ethical dilemmas in different business areas. Ethical culture in organization. Developing codes of Ethics and conduct, Ethical and value based leadership. Role of scriptures in understanding ethics, Indian wisdom & Indian approaches towards business ethics.

Suggested Readings/ Books:

- R Nandagopal, AjithSankar RN: Indian Ethics and Values in Management, Tata McGraw Hill.
- Bhatta, S.K., Business Ethics & Managerial Values.
- Chakraborty, S.K.: Foundation of Managerial Work-Contributions from Indian Thought, Himalaya Publication House, Delhi.
- Nandagopal, Ajith Shankar, Indian Ethos and Values in Management, Tata McGraw Hill, 2010
- Khandelwal Indian Ethos and Values for Managers, Himalaya Publishing House.
- Biswanath Ghosh, Ethics in Management and Indian Ethos, Vikas Publishing House, 2009.
- S K Chakraborty, Management by Values, Oxford University Press, New Delhi, 2009.
- John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi.
- Hartman, Laura P. and Joe DesJardins, Business Ethics: Decision-Making for Personal Integrity & Social Responsibility. McGraw-Hill/Irwin.
- Gini Al, Case Studies in Business Ethics, 6th edition, Pearson Education, 2009.
- Kautilya's Arthashastra, King, Governance, and Law in Ancient India, Oxford University Press, 2016.
- Murthy, C.S.R. Business Ethics, Himalaya Publishing House, Mumbai, 2009.
- Rangnathananda Swami, Universal Message of the Bhagvad Gita, Vol.1,2, and 3, Caicuna, 2000.
- Kanagasabapathi, P. Indian Models of Economy, Business and Management, Third Edition, PHI Learning Ltd., New Delhi, 2012.
- Brately Peter, "The Essence of Business Ethics", New Delhi, Prentice Hall of India, 1997.

E Resources:

- <http://www.lifepositive.com/lpevents/lppublicevent.asp>
- <http://www.trcb.com/business/management.htm>
- <http://www.valuequotes.net/chronological.html>

SYLLABUS FOR SECOND SEMESTER

CORPORATE FINANCE AND FINANCIAL MARKETS

COURSE CODE: MBA-109

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: To provide an understanding of the function, the roles, the goals and the processes of corporate financial management covering the sources of finances, investment of the resources and operations of ,financial system.Problem-solving methodology and case study will be used to illustrate the theories and tools in financial decision making.

Unit –I

Introduction to Financial Management: Objectives - Functions and Scope – Evolution Interface of Financial Management with Other Functional Areas - Environment of Corporate Finance. Sources of Long-Term Finance (Both domestic and Global): Equity Capital and Preference Capital – ADRs- GDRs – Foreign Bonds-Debenture Capital - Term Loans and Deferred Credit,. Valuation of Securities: Concept of Valuation - Bond Valuation - Equity Valuation: Dividend Capitalization Approach and Ratio Approach - Valuation of Warrants and Convertibles,Time Value of Money.

Unit –II

Financing & Investment Decisions: Basics of Capital Expenditure Decisions: The Process of Capital Budgeting - Analysis of Project Cash Flows: Cash Flow Estimation -Identifying the Relevant Cash Flows - Cash Flow Analysis Basic Principles in Estimating Cost and Benefits of Investments -Appraisal Criteria: Discounted and NonDiscounted Methods (Pay-Back Period -Average rate of return - Net Present Value -Benefit Cost Ratio -Internal Rate of Return) - Replacement, Cash Flow-Estimation Bias - Evaluating Projects with Unequal Life - Adjusting Cash Flow for Inflation, Capital Rationing, Capital Structure Decisions-Leverages, Point of Indifference, Theories of Capital Structure, Cost of Capital- Cost of Debt, Cost of Preference Shares, Cost of Retained Earnings, Cost of Equity & Weighted average Cost of Capital, Working Capital Management-Estimation, Operating Cycle & Net Operating Cycle.

Unit –III

Indian Financial System: Introduction, Salient Features, Functions and Structure/ Organization,Financial System and the Indian Economy, Reforms in the Indian Financial System, Development Financial Institutions, Banking (with special reference to risk management in Banks) & Banking Financial Institutions, Insurance.

Unit –IV

Financial Markets: Functions and Organization, Organizations Resource Mobilization, Capital Market Instruments-Equity, Preference Shares, Debentures, Innovative Debt Instruments, Forward Contracts, Future Contracts, Option Contracts, Channelization of Funds, Equity, Debt and Currency Markets, Regulatory Framework of Primary Market, Regulatory Framework of Secondary Market, Primary Market Organization- Intermediaries,, Activities/ Procedures, Secondary Market Organization, Money Markets.Contemporary issues in Financial Markets.

Tutorials:

i) Relevant Case Studies should be discussed in class.

ii) Each student of the class shall carry a mini project on the financial practices or on financial market on the different topic of the syllabus.

The project may be carried on the basis of the primary/secondary data collected from the MNCs/ BSE 500 companies or related to financial markets.

Suggested Readings/ Books:

- I.M. Pandey, Financial Management, Vikas publishers
- Khan & Jain, Financial Management, Tata McGraw Hill
- Prasanna Chandra, Financial Management (Theory& Practice), Tata McGraw Hill
- Brigham, Financial Management: Text & Cases, Cengage Learning
- Brealy&Myres, Principles of Corporate Finance, Tata McGraw Hill
- John J., Financial Decision Making: Concept, Problem & Cases, Prentice Hall
- Khan & Jain, Indian Financial System, McGraw Hill Education (India) Private Limited
- Pathak Bharati V, The Indian Financial System- Markets, Institutions and Services, Pearson
- Madura Jeff, " Financial Institutions and Markets", Cenage Learning
- Fabozzi Frank J. & Modigliani Franco, "Capital Markets- Institutions and Instruments", PHI Learning Private Limited.

HUMAN RESOURCE MANAGEMENT

COURSE CODE: MBA-110

Credit hours: 3:1:0

Credit:4

Max Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting look for any organization today.

Unit-I

Human Resources Management: Nature, scope, objectives & functions of HRM, HR as a competitive advantage, line & staff responsibility of HR manager. Competencies of HR Manager, Human Resource Planning, Job Analysis, Strategic HR Practices, HR Audit.

Unit – II

Recruitment & Selection: Meaning, Process & methods for recruitment. **Selection:** Need, Importance and the methods of selection. **Induction & Placement:** Need, Induction process, methods and evaluation of different methods. **Training & Development:** Training need Analysis, Methods of training.

Unit – III

Performance Appraisal: Meaning, Methods, 360 Degree Performance Appraisal & Process, Issues in Performance Appraisal, Potential Appraisal. **Compensation Management:** Concept, elements, Job evaluation, wage & Salary fixation, Incentives, bonus, ESOPS, Fringe Benefits compensation, career planning & development, HRIS, **Industrial Relation & Labour laws:** basic concepts.

Unit – IV

Managerial Skills for effectiveness: Building organizational culture, networking skills, interaction across business functions, collaboration and presentation skills, development of a project that addresses an organizational challenge, Negotiation & Assertiveness skills, Mapping personal leadership and learning journey, Expanding professional and personal networks.

Tutorial: Relevant case study on the application of various

- Job Analysis
- Human Resource Planning
- Performance Appraisal

Group Discussion on emerging issues and Presentation on topics related to managerial skills would be conducted to enhance the student's personality and leadership skills.

Suggested Readings/ Books:

- Aswathappa, K.. Human Resource Management, Text and Cases (7th ed.). McGraw Hill.
- Edwin B.Flippo, Personal Management,TataMcGraw Hill.
- V.S.P.Rao, Human Resource Management, Excel Books.
- C.B. Memoria, Personal Management, Himalaya Publications.
- C.B. Gupta, Human Resource Management, Sultan Chand and Sons.
- R.S. Dwivedi, HRD in India Companies, Himalaya publications.
- Gary Dessler, Human Resource Management, McMillan.
- Gomez-Mejia, Managing Human Resources, Pearson Education.

MARKETING MANAGEMENT

COURSE CODE:MBA-111

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Objectives: The course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm in changing business environment. It would provide the students with the opportunity to apply the key concepts to practical business situations.

Unit –I

Understanding Marketing and Consumers: Introduction to Marketing Management, Definition, Importance, Scope, Basic Marketing Concepts, Marketing Mix, Marketing vs selling.

Marketing Environment and CompetitionAnalyzing Marketing Environment-Micro, Macro, Impact of environment on marketing.

Marketing Information System:Concept and Components. **Consumer Behaviour:** Consumer buying process, Factors Influencing Consumer Buying Behaviour,

Unit –II

Market Segmentation & Targeting.Concepts and types of Market segmentation, **Targeting:** need and methods. **Positioning:** concepts and position for competitive advantage.**Product Decisions:** Product Mix, Packaging and Labelling, Branding, Brand value & Brand Equity.**New Product Development:** Need, Process and Product Life Cycle and marketing mix strategies.

Pricing Decisions: Objectives, Factors Affecting Pricing Decisions and Pricing Methods.Introduction to Services Marketing.

Unit –III

Delivering and Promoting Product: Supply Chain Decisions Nature, Types, Channel Design and Channel Management Decisions, Retailing, Wholesaling, **Personal Selling:** Personal Selling Process, Managing the Sales Force. **Promotion Mix:** Advertising, Sales Promotion, Public Relations.

Unit -IV

Bottom of Pyramid Marketing: Understanding poverty and the Base of the Pyramid, **Design-Develop-Distribute** approach towards Bottom of Pyramid. Consumption and marketing practices, challenges. **The institutional context of Bottom of Pyramid markets,** Conducting Marketing Research in Bottom of Pyramid. **Ethical issues associated with** Bottom of Pyramid. **Emerging Trends in Marketing:** Green Marketing, Event Marketing, Network Marketing, Social Marketing, Viral Marketing, Customer Relationship Management (CRM), Rural Marketing and Marketing in the Digital Age.

Tutorials: Relevant Case Studies on the application of various

- Marketing principles.
- Segmentation and pricing.
- Advertising and New Product Development.
- Bottom of Pyramid and its Issues

Will be discussed.

Marketing games, Marketing management crossword puzzles and other related activities that enhance essential marketing capabilities among students to be taken up.

Suggested Readings/Books:

- Kotler & Koshy, *Marketing Management*, Pearsons Education.
- McMeztel, Walker, Stanton, and Pandit, *Marketing Management*, Tata McGraw Hill
- Kotler & Armstrong, *Principles of Marketing*, Prentice Hall
- Biplab S. Bose, *Marketing Management*, Himalaya Publications
- Subhash c. Jain, *Marketing Management*, Cengage Learning
- RajanSaxena,,*Marketing Management*, Tata McGraw Hill.

LEGAL AND BUSINESS ENVIRONMENT

COURSE CODE: MBA-112

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60;

Internal Assessment: 40

Objectives: The course aims to provide an understanding of corporate legal framework prevalent in the country. This course seeks to sensitize the students to the broader business environment at micro and macro level and economic environment within which they will operate as managers. The course seeks to examine the interaction between the economy, policy and society at different perspective and enable the students to be more effective managers in today's global economy.

Unit-I

Legal aspect of business: Introduction to business laws; Structure of the Indian legal systems, sources of law; Fundamentals of contract laws- formation of contracts; Principles of contract act- legality of object consideration, performance of contract- discharge of contract- breach of contract, quasi contracts, contract management, special contracts.- laws of agency; principal-agent- problem-bailment, pledge, guarantee and indemnity.

Unit II

Sales of Goods: principles of sales of goods-transfer of ownership & property- performance of contract, Consumer Protection Act, 2019, Law relating to business organizations – introduction to company law; protecting the property of business- Copyright, Trademark, trade secret, Geographical Indications- Alternate dispute resolutions.

Unit-III

Micro & Macro indicators in business environment: assessing risk in business environment; Emerging sectors of Indian economy, relative size and growth of public and private sectors- design and strategy of economic reforms; current rate of growth and investment, interest rate structure & Monetary policy, fiscal environment, current inflationary position and its impact on business sector. Public and private partnership; intellectual property regime and environment; Trends in service sector growth; banking reforms and challenges; business opportunities in the rural sector.

Unit-IV

Globalization trends and challenges: concept of balance of payment & its trends, environment for foreign trade and investment; exchange rate movements and their impact, India's competitiveness in the world economy; external influences on India's business environment.

Tutorial:

Relevant case studies on the application of various

- Business environment (micro/macro level)
- Global issues

Will be discussed and other related activities that enhance the student's knowledge will be taken up.

Suggested Readings / Books:

- Majumdar A. K. and Kapoor G. K. Company Law' Taxmann Publishers.
- Bansal C. L. Business Laws Taxmann Publishers.
- Singhanian V. K. and Singhanian K. Direct Tax Laws and Practice Taxmann Publishers.
- Chawla, Garg and Sarin Mercantile Law Kalyani Publishers.
- Dr Francis Cherunilam, Business Environment Text & Cases, Himalaya Publishing
- S.K. Mishra, and V.K Puri, Economic Environment of Business, Himalaya Publishing
- Paul Justice, Business Environment- Text and Cases, TATA McGraw Hill.
- Aswathappa, Essential of Business Environment, Himalaya Publishing
- Sengupta, Government & Business. Vikas Publishing House
- Economic Survey, Government of India (Latest)

Operations Management

Course Code: MBA-113

Credit hours: 3:1:0

Credit:4

Max. Marks: 100

External Assessment: 60

Internal Assessment: 40

Credits: 04

Objective: Develop knowledge of concepts and skills required to equip the learner in practising global standards for managing the operations of a manufacturing/service organization.

Unit-1

Operations management-Concept; functions; transformation process model - inputs, process and outputs difference between manufacturing and service operations; Recent trends in operations management; operations management in corporate profitability and competitiveness.

Designing products, services and processes- New product design; Product development process; product-process mix; design of services and service processes; service process matrix.

Process decisions- process choice; Relationship of process choice with volume and variety in both manufacturing and services.

Facility Location– importance, factors in location analysis, location decision issues for multinational firms

Unit- 2

Facility Layout– Objectives, Advantages, Basic Types of Layouts, Problems in facility layout.

Forecasting -Importance of Forecasting in managerial decision making, Demand characteristics and its patterns, Designing the forecasting system, type of forecasting techniques, role of computers in forecasting, forecast error, selection of the forecasting model.

Unit - 3

Materials Management - Concept, Objectives, Inventory costs, Inventory classification, Factors Affecting Inventory Control Policy, Basic stock control methods, Continuous and Periodic review Inventory models ,Deterministic Economic Order Quantity (EOQ) Models- Basic EOQ Model, EOQ and Quantity Discount, EOQ Model with Non-instantaneous Receipt (Production-run formula), EOQ Model with Planned Shortages or where stockout is permitted, Stochastic inventory models, single period model for perishable products and services. Introduction to MRP, MRP-II and ERP

JIT and Lean Production System- Concept; characteristics; Kanban System; JIT system in services; strategic implications of JIT systems; Problems in implementing JIT systems; Total quality control (TQC) concept; Deming's contribution to TQC; Contribution of Crosby to Quality management.

Unit - 4

Total Quality Management(TQM) – customer driven concept of quality; total quality management concept; principles of Total Quality management :- Customer satisfaction, Employee involvement and Continuous improvement; major costs of poor quality; Improving quality through TQM, Quality Circles
Introduction to SQC and QC charts

Tutorials:

1. Two/Three case Studies on the various concepts of Operations management will be discussed.
2. Additionally Monte Carlo Simulation model for inventory analysis shall be discussed.

Suggested Readings/Books:

- Lee J. Krajewski, Manoj K. Malhotra, Larry P. Ritzman- Operations Management, publisher :by Pearson Education
- Everette E. Adam, Jr. Ronald J. Ebert - Production and Operations Management,Publisher: Prentice Hall of India
- N.G. Nair - Production and Operations Management, Publisher: Tata Mc. Graw Hill
- P.Panneerselvam R - Production and Operations Management , Publisher: Prentice Hall of India.
- B. Mahadevan - Operations Management Theory & Practice, Publisher: Pearson Education.

SEMINAR ON SOCIAL RESPONSIVENESS

COURSE CODE: MBA-114

Credit hours: 0:4:0

Credit:4

Max Marks: 50

External Assessment:0

Internal Assessment: 0

Objectives: The main objectives of the course include developing an attitude of responsiveness to contextual social issues / problems and exploring solutions, understanding business ethics and corporate social responsibility in the students pursuing the course. Students are expected to identify the contemporary social problems, exploring the opportunities for social entrepreneurship, designing business solutions and demonstrating ethical standards in organizational decision making.

Corporate Social Responsibility: Concept, Definition, Need, Arguments in favour of and against CSR. Historical Phases of Corporate Social Responsibility, Models of CSR, Business Ethics and CSR, CSR Practices in India, Case Studies of Major CSR Initiatives.

Corporate Sustainability: Meaning, Need and importance of Sustainability, Sustainability Case Studies-Triple Bottom Line (TBL). Corporate Sustainability Reporting Frameworks- Global Reporting Initiative Guidelines, National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business.

Eco-Efficiency & Pollution: Advantages of saving energy and reducing waste to business, eco energy system evaluation, Global warming, Green House effect, Carbon neutrality, Benefits to businesses in reducing carbon footprints, carbon credits, renewable energy form (EVs & BS6 norms).

Drug De-addiction and Traffic Rules: Causes, remedies, and societal impact of drug abuse, Traffic Rules and regulations, road signs, punishment for violations (Eminent experts of the subject will be called for the Seminar at least once during the semester. It will be binding for all the students to attend the seminar)

Tutorials: Relevant Case Studies from India and abroad in the areas of Corporate social responsibility, corporate sustainability, Energy and waste management, drug consumption and traffic issues shall be discussed.

Suggested Readings/Books:

Aggarwal S. K. (2008). Corporate Social Responsibility in India. Sage Publishers.

Chatterji M. (2011). Corporate Social Responsibility. Oxford Publishers

Fernando, A. C. (2010). Business Ethics and corporate governance. Pearson Education.
Velasquez, M. G. (2011). Business Ethics: Concepts and Cases. PHI Learning.
Gosh, B. N. (2009). Business Ethics and Corporate Governance. Tata McGraw Hill.
Internet Resources

RESEARCH METHODOLOGY

COURSE CODE: MBA-115

Credit hours: 3:1:0

Credit:4

Max.Marks-100

External Assessment-60

Internal Assessment-40

Objectives:

- To Equip the students with the basic understanding of the research methodology in changing business scenario.
- To provide an insight into the application of dynamic analytical techniques to face the stormy challenges, aimed at fulfilling the objective of business decision making.

Unit I

Introduction to Research- Meaning of research; Types of research and research process; Features of good research study. Research problem- Defining research problem; Problem identification process; Components of research problem. Formulating the research hypothesis-Meaning of hypothesis; Types of research hypothesis. Scaling techniques- Meaning, types of scales, scale construction techniques.

Unit II

Data Collection- Types of data; Sources of data collection; Tools of data collection; Methods of data collection. Questionnaire Design- Questionnaire method; Types of questionnaire; Process of questionnaire designing. Sampling- Concepts; sampling vs census; sampling vs non sampling error; Sampling Design- Probability and Non Probability sampling.

Unit III

Introduction to multivariate analysis, Factor analysis, Discriminant Analysis, Conjoint Analysis, Cluster Analysis, Multi Regression; Mann-Whitney test; Krushall-Wallis test.

Unit IV

Research Report writing- Types of research reports: Brief reports and Detailed reports. Report writing: structure of research report- Preliminary section, main report; formulation rules for writing the report; Appendix- norms of using Index and Bibliography.

Note: Relevant case studies should be discussed in class.

Tutorial: Problems related to practical topics will be discussed and sorted out.

Questionnaire will be prepared by using different techniques.

Students will be prepared to construct different scales.

Relevant software related to topic will be introduced.

Reference Books:

- Business Research Methods, by Cooper et.al, McGraw Hill
- Research Methodology- C.R. Kothari
- Assignment and Thesis writing- Anderson et.al.
- Research Methodology- by V..Upadade& A Shende (S. Chand)

Guru Nanak Dev Engineering College,
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(An Autonomous College under UGC Act 1956 [2(f) and 12(b)])
Department of Computer Applications

No.MCA/45/1106

Dated: 15-09-2016

Minutes of Meeting

Minutes of meeting of 3rd Board of Studies held on 14/09/2016 at 10 AM in committee room:

Following members were present in the meeting:

External Members

1. Dr. O.P. Gupta, Deputy Director, School of IT, Punjab Agricultural University, Ludhiana (Member)
2. Mr. Kashmir Singh, District Information Officer, New Courts, DC Office, Ludhiana (Member)

Internal Members

3. Prof. Jasbir Singh Saini Associate Professor & HOD Department of Computer Applications, Guru Nanak Dev Engineering College (Chairman)
4. Prof. Inderjit Singh Assistant Professor, Department of Computer Applications, Guru Nanak Dev Engineering College (Member)
5. Prof. Dinesh Anand Assistant Professor, Department of Computer Applications, Guru Nanak Dev Engineering College (Member)
6. Prof. Gurdeep Singh Assistant Professor, Department of Computer Applications, Guru Nanak Dev Engineering College (Member)
7. Prof. Daljeet Singh, Assistant Professor, Department of Computer Applications, Guru Nanak Dev Engineering College (Member)
8. Prof. Mandeep Kaur Assistant Professor, Department of Computer Applications, Guru Nanak Dev Engineering College (Member)

1. Dr. O.P Gupta 14/9/16

2. Mr. Kashmir Singh 14/9/16

3. Prof. Inderjit Singh 14/9/16

4. Prof. Dinesh Anand 14/9/16

5. Prof. Gurdeep Singh 14/9/16

6. Prof. Mandeep Kaur 14/9/16

7. Prof. Daljeet Singh 14/9/16

14/9/16

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Department of Computer Applications

Meeting started with welcome address by chairman BOS and the already circulated agenda was put up for discussion. Following decisions were taken unanimously:

Proceedings

AGENDA ITEM 1:

To approve the changed subject codes of already finalized course scheme of MCA (Batch 2015 onwards)

The scheme of MCA Batch 2015 onwards is given in Annexure-I

Considered and approved

AGENDA ITEM 2:

Approval for change in marks distribution and credits of MCA scheme 2015

The scheme of MCA Batch 2015 onwards is given in Annexure-I

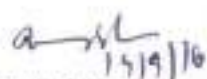
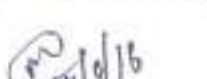
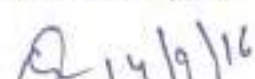
Considered and approved

AGENDA ITEM 3:

Approval of bifurcation in two components of six month training in 5th/6th semester of MCA scheme 2015

The scheme of MCA Batch 2015 onwards is given in Annexure-I

Considered and approved

 1. Dr. O.P Gupta	 2. Mr. Kashmir Singh	 3. Prof. Indrajit Singh	 4. Prof. Dinesh Anand
 5. Prof. Gurdeep Singh	 6. Prof. Mandeeep Kaur	 7. Prof. Daljeet Singh	


14/09/16

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AGENDA ITEM 4:

Introduction of new electives in 4th and 5th semester of MCA scheme (Batch 2015 onwards) and finalizing the subjects with syllabus of the same

The syllabus of new elective subjects of 4th and 5th semester is given in Annexure – II.

Considered and approved

AGENDA ITEM 5:

Approval of the panel of external examiners for paper setting of end semester examinations of MCA course

The list of external examiners for question paper setting is given in Annexure-III

Considered and approved

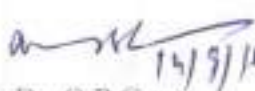
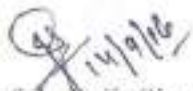
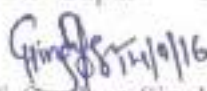
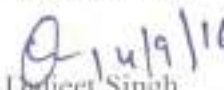
AGENDA ITEM 6:

Any other item with permission of the Chair

Noted and approved

Meeting ended with vote of Thanks


14/09/16
HOD (MCA) Cum Chairman
Board of Studies

 14/9/16 1. Dr. O.P. Gupta	 14/9/16 2. Mr. Kashmir Singh	 14/9/16 3. Prof. Inderjit Singh	 14/9/16 4. Prof. Dinesh Anand
 14/9/16 5. Prof. Gurdeep Singh	 14/9/16 6. Prof. Manpreet Naur	 14/9/16 7. Prof. Dajeet Singh	


14/9/16

Guru Nanak Dev Engineering College, Ludhiana

(An Autonomous College u/s 2(f) and 12(B) of UGC Act 1956)

(Affiliated to I.K. Gujral Punjab Technical University, Jalandhar)

Scheme and Syllabus of Master in Computer Applications (MCA)

Batch 2015 Onwards

**By
Board of Studies
Department of Computer Applications**

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

First Semester

Contact Hours: 34 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15101	Information Management	4	1	-	40	60	100	5
MCA-15102	Object Oriented Programming in C++	4	1	-	40	60	100	5
MCA-15103	Computer Organization and Assembly Language	4	1	-	40	60	100	5
MCA-15104	Accounting & Financial Management	4	1	-	40	60	100	5
MCA-15105	Technical Communication*	3	1	2	40	60	100	5
MCA-15106	Software Lab-I(Information Management)	-	-	4	60	40	100	2
MCA-15107	Software Lab-II(Object Oriented Programming in C++)	-	-	4	60	40	100	2
Total		19	5	10	320	380	700	29

*There will be no practical Examination for Technical Communication. Faculty must include the performance in the internal assessment of theory.

Second Semester

Contact Hours: 35 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15201	Mathematical Foundations of Computer Science	4	1	-	40	60	100	5
MCA-15202	Relational Database Management System	4	1	-	40	60	100	5
MCA-15203	Data Structures	4	1	-	40	60	100	5
MCA-15204	Data Communication and Networks	4	1	-	40	60	100	5
MCA-15205	Linux Operating System	4	1	-	40	60	100	5
MCA-15206	Software Lab-III(Relational Database Management System)	-	-	4	60	40	100	2
MCA-15207	Software Lab-IV(Data Structures)	-	-	4	60	40	100	2
MCA-15208	Software Lab-V(Based on Linux Operating System)	-	-	2	60	40	100	1
Total		20	5	10	380	420	800	30

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Third Semester

Contact Hours: 32 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15301	Database Administration	4	1	-	40	60	100	5
MCA-15302	Computer Based Optimization Techniques	4	1	-	40	60	100	5
MCA-15303	Software Engineering	4	1	-	40	60	100	5
MCA-15304	Java Programming	4	1	-	40	60	100	5
DEMCA-15xxx	Elective-I	3	1	-	40	60	100	4
MCA-15305	Software Lab-VI(Database Administration)	-	-	4	60	40	100	2
MCA-15306	Software Lab-VII(Java Programming)	-	-	4	60	40	100	2
Total		19	5	8	320	380	700	28

Fourth Semester

Contact Hours: 31 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15401	Programming Languages	4	1	-	40	60	100	5
MCA-15402	E-Commerce & Web Application Development	4	1	-	40	60	100	5
DEMCA-15xxx	Elective-II	3	1	-	40	60	100	4
MCA-15403	Advanced Operating Systems	4	1	-	40	60	100	5
MCA-15404	Software Lab-VIII(E-Commerce & Web Application Development)	-	-	4	60	40	100	2
MCA-15405	Major Project & Seminar	-	-	4	100	---	100	4
MCA-15406	Software Lab-IX(Advanced Operating Systems)	-	-	4	60	40	100	2
Total		15	4	12	380	320	700	27

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Fifth Semester

Contact Hours: 31 Hrs.

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
MCA-15501	Interactive Computer Graphics	4	1	-	40	60	100	5
DEMCA-15xxx	Elective-III	3	1	-	40	60	100	4
MCA-15502	Web Technologies	4	1	-	40	60	100	5
MCA-15503	Object Oriented Analysis & design with UML	4	1	-	40	60	100	5
MCA-15504	Software Lab-X(Interactive Computer Graphics)	-	-	4	60	40	100	2
MCA-15505	Software Lab-XI(Web Technologies)	-	-	4	60	40	100	2
MCA-15506	Software Lab-XII(Object Oriented Analysis & design with UML)	-	-	4	60	40	100	2
Total		15	4	12	340	360	700	25

Sixth Semester

Course Code	Course Title	Load Allocation	Marks Distribution		Total Marks	Credits
			Internal	External		
MCA-15601	Industry Oriented Training*	One Week	100	-----	100	1
	Industrial Training	Minimum Four Months	200	300	500	24
	Total		300	300	600	25

*During Industry Oriented Training, students will finalize their project work and report based on the industry training as per T&P Cell guidelines. The projects of students would be evaluated by their internal guides during orientation week in college.

Course Total	Marks	Credits
	4200	164

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List of Elective-I (Core Group)

Course Code	Course Title	Course Code	Course Title
DEMCA-15307	System Programming	DEMCA-15309	Embedded Systems
DEMCA-15308	Theory of Computation		

List of Elective-II (Data Analysis Group)

Course Code	Course Title	Course Code	Course Title
DEMCA-15407	Data Warehousing & Mining	DEMCA-15409	Big Data Analytics
DEMCA-15408	ERP Systems		

List of Elective-III (Computing Group)

Course Code	Course Title	Course Code	Course Title
DEMCA-15507	Network Security & Administration	DEMCA-15509	Advanced Computer Networks
DEMCA-15508	Cloud Computing		

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First Semester

MCA-15101 Information Management

Section-A

Introduction to Information Technology - Definition, Applications in various sectors, Different types of software, Generations of Computers, Input and output Devices, Various storage devices like HDD, Optical Disks, Flash Drives. Different Types of data file formats: Types and Applications.

Section-B

IT Infrastructure in India – Telecommunication, Internet research and Broadband Data Collection and Data Management, Data Models, Information vs. Knowledge, Various techniques to derive information, Information Management.

Section-C

Management Information System – Definition, Strategic Management of Information, Decision Making, Development Process of MIS, Strategic Design of MIS, Business Process Reengineering. Understanding Knowledge Management, Designing a Knowledge Management System, Nature and Scope of Business Intelligence, Information Security- Meaning and Importance, Organizational Security Policy and Planning, Access Control and Operations Security.

Section-D

Office Automation (Word processing, Spreadsheet, Presentation, E-Mail Clients), Content Management System and Architecture.

Suggested Books:

1. **Introduction to Information Technology, Second Edition**, Turban, Rainer, Potter, WSE, Wiley India.
2. **Data Warehousing Fundamentals: A Comprehensive Study For IT Professionals**, Paulraj Ponnian BWSTN, Wiley India.
3. **Information Assurance For The Enterprise: A Roadmap To Information Security**- Corey Schou, Daniel Shoemaker, Mc-Graw Hill Publications.
4. **Management Information System: Text And Cases**, Waman Jawadekar, Mc-Graw Hill Publications.

MCA-15102 Object Oriented Programming in C++

Section-A

Evolution of OOP, OOP Paradigm, advantages of OOP, Comparison between functional programming and OOP Approach, characteristics of object oriented language – objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading. Introduction to C++, Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, features of iostream.h and iomanip.h input and output, conditional expression loop statements, breaking control statements.

Section-B

Defining function, types of functions, storage class specifiers, recursion, pre-processor, header files and standard functions, Arrays, pointer arithmetic's, structures, pointers and structures, unions, bit fields typed, enumerations. Passing array as an argument to function.

Section-C

Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors, inline member functions, static class member, friend functions, dynamic memory allocation. Inheritance, single inheritance, types of base classes, types of derivations, multiple inheritance, container classes, member access control

Section-D

Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, virtual destructors, late binding, pure virtual functions, opening and closing of files, stream state member functions, binary file operations, structures and file operations, classes and file operations, random access file processing. Exception Handling.

Suggested Readings / Books:

1. **Object Oriented Programming in Turbo C++**, Robert Lafore, Galgotia Publications, 1994.
2. **The C++ Programming Language**, Bjarne Wesley Publications, 1994.
3. **Object Oriented Programming with C++**, E. Balagurusamy, Tata McGraw Hill
4. **Object Oriented Software Engineering**, S. Halladay and M. Wiebel, BPB Publications, 1995.

MCA-15103 Computer Organization and Assembly Language

Objectives: The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system. To introduce students to the design and organization of modern digital computers & basic assembly language.

Section-A

Computer Organization: Basic Computer Organization, Bus & Memory Transfer, Stored Program Organization, Computer Registers, Computer Instructions, Timing and Control, Hardwired based design of Control Unit, Instruction Cycle, Formats of Various types of Instructions- Memory Reference Instructions, Register Reference Instructions & I/O Instructions , General Register Organization-Control word, Design of Adder & Logic Unit, Stack Organization-Register Stack, Memory Stack, Reverse Polish Notation, Addressing Modes, RISC vs CISC Architectures, Interrupts & types.

Section-B

Pipeline & Vector Processing: Parallel Processing, Pipelining-Arithmetic & Instruction Pipeline, Vector Processing-Vector operations, Memory Interleaving, Array Processors.

Input – Output Organization: Input-Output Interface- I/O vs Memory Bus, Isolated vs Memory mapped I/O, Synchronous Data Transfer, Asynchronous Data Transfer-Strobe Control, Handshaking, Asynchronous Communication Interface, Modes of Transfer-Programmed I/O, Interrupt Initiated I/O, Interrupt Cycle, Priority Interrupt Controller, DMA Controller & DMA Transfer.

Section-C

Memory Organization: Main Memory-Memory Address Map, Memory connection to CPU, Associative Memory-Hardware organization, Match Logic, Cache Memory-Levels of Cache, Associative Mapping, Direct Mapping, Set-Associative Mapping, writing into Cache, Cache coherence, Virtual Memory-Address space & Memory space, Address mapping using pages, Associative memory page table, Page replacement . Memory Management Hardware – Segmented page mapping, Multiport memory, Memory protection.

Section-D

Multiprocessors: Characteristics of Multiprocessors, Interconnection structures-Time Shared Common Bus, Crossbar switch, Multistage Switching Network, Hypercube interconnection, Interprocessor communication & synchronization.

Assembly Language Programming: Example of a typical 8 bit processor (8085 microprocessor)—Registers, Addressing modes, Instruction Set-Data transfer Instructions, Arithmetic Instructions, Logical Instructions, Program Control Instructions, Machine Control Instructions, Use of an Assembly Language for specific programs : Simple numeric manipulations, Sorting of a list and use of I/O instructions.

Suggested Books:

1. **Computer Organization-** Car Hamacher, Zvonks Vranesic, Safwat Zaky, V Edition, McGraw Hill.
2. **Computer System Architecture,** Mano, M.M., 1986: Prentice Hall of India.
3. **Computer Architecture and Organization,** John Paul Hayes: McGraw-Hill International Edition
4. **Structured Computer Organization,** Tanenbaum, A.S.: Prentice Hall of India.

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MCA-15104 Accounting and Financial Management

Section-A

Accounting: Principles, concepts and conventions, double entry system of accounting, introduction to basic books of accounts of sole proprietary concern, partnership, organization & company, closing of books of accounts and preparation of trial balance.

Final Accounts: Trading, Profit and Loss accounts and Balance sheet (without adjustment)

Section-B

Financial Management: Meaning, scope and role, a brief study of functional areas of financial management. Introduction to various FM tools: Ratio Analysis, Fund Flow statement and cash flow statement (without adjustments)

Section-C

Costing: Nature, importance and basic principles, Marginal costing: Nature scope and importance, Break even analysis, its uses and limitations, construction of break even chart, Standard costing: Nature, scope and variances, Budgetary Control (only introduction)

Section-D

Computerized Accounting: Advantages, Computer Programs for accounting, Computer based Auditing.

Suggested Books:

1. **Principles: A Book-Keeping** by J.C.Katyal
2. **Principles of Accounting** by Jain and Narang,.
3. **Financial Management** by I.M.Pandey, Vikas Publications.
4. **Management Accounting**, by Sharma, Gupta & Bhall,.
5. **Cost Accounting** by Jain and Narang
6. **Cost Accounting** by Katyal,.
7. **Basic Accounting, Second Edition** by Rajni Sofat, Preeti Hiro, PHI.

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MCA-15105 Technical Communication

Section-A

Basics of Technical Communication- Functions of Communication-Internal & External Functions, Models-Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7 C's and other principles), Non-verbal Communication.

Section-B

Basic Technical Writing: Paragraph writing (descriptive, Imaginative etc.), Precise writing, reading and comprehension, Letters – Format & various types.

Section-C

Advanced Technical Writing: Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, and Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports, Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography.

Section-D

Verbal Communication- Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences. Technical Communication- MS-Word, Adobe Frame maker and ROBO Help

Suggested Books:

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi
2. KK Ramchandran, et al Business Communication, Macmillan, New Delhi
3. Swati Samantaray, Busines Commnication and Commnicative English, Sultan Chand, New Delhi.
4. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD)

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MCA-15106 Software Lab-I (Information Management)

This laboratory course will mainly comprise of exercises on Section-D of the Course MCA-15101 [Information Management]

MCA-15107 Software Lab- II (Object Oriented Programming in C++)

This laboratory course will mainly comprise of exercises on what is learnt under paper: MCA-15102
[Object Oriented Programming in C++]

Note: Program should be fully documented with simple I/O data. Flow charts should be developed wherever necessary.

Write program in 'C++' language

1. Using input and output statements
2. Using control statements.
3. Using functions.
4. Using array
5. Using Classes and implementation of Constructor and Destructor.
6. Using files.
7. Using OOP's Concepts (Inheritance, Polymorphism, Encapsulation, Friend and Static Functions)

Second Semester

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MCA-15201 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Internal Assessment: 40

External Assessment: 60

Section A

A general introduction, simple and multipgraphs, directed and undirected graphs, Eulerian and Hamiltonian Graphs, Shortest path algorithms, Chromatic number, Bipartite graph, graph coloring.

Section B

Sets and Relations: Definition of sets, subsets, complement of a set, universal set, intersection and union of sets, De-Morgan's laws, Cartesian products, Equivalent sets, Countable and uncountable sets, minset, Partitions of sets, Relations: Basic definitions, graphs of relations, properties of relations

Section C

Algebra of logic, Propositions, Connectives, Tautologies and contradiction, Equivalence and implication, Principle of Mathematical induction, quantifiers.

Section D

Introduction of a Matrix, its different kinds, matrix addition and scalar multiplication, multiplication of matrices, transpose etc. Square matrices, inverse and rank of a square matrix, solving simultaneous equations using Gauss elimination, Gauss Jordan Methods, Matrix Inversion method.

Suggested Books:

1. Alan Doerr, Applied Discrete Structures for Computer Science, Galgotia Publications.
2. Kolman and Busby, Discrete Mathematical structures for Computer Sciences, PHI.

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MCA-15202 Relational Database Management Systems

Internal Assessment: 40

External Assessment: 60

Section – A

Basic DBMS terminology; Architecture of a DBMS: Data Independence - Physical and Logical Independence, Degree of Data Abstraction, Initial Study of the Database, Database Design, Implementation and Loading, Testing and Evaluation, Operation, Maintenance and Evaluation.

Conceptual Model:

Entity Relationship Model, Importance of ERD, Symbols (Entity: Types of Entities, weak Entity, Composite Entity, Strong Entity, Attribute: Types of Attribute, Relationship: Type of relationship, Connectivity, Cardinality).

Database Models and Normalization:

Section – B

Comparison of Network, Hierarchical and Relational Models, Object Oriented Database, Object Relational Database, Comparison of OOD & ORD; Normalization and its various forms, De-Normalization, Functional Dependencies, Multi-valued Dependencies, Database Integrity: Domain, Entity, Referential Integrity Constraints.

Transaction Management and Concurrency Control:

Client/ Server Architecture and implementation issues, Transaction: Properties, Transaction Management with SQL, Concurrency; Concurrency Control: Locking Methods: (Lock Granularity, Lock Types, Two Phase Locking, Deadlocks), Time Stamping Method, Optimistic Method, Database Recovery Management.

Distributed Databases:

Section – C

Centralized Verses Decentralized Design; Distributed Database Management Systems (DDBMS): Advantage and Disadvantages; Characteristics, Distributed Database Structure, Components, Distributed Database Design, Homogeneous and Heterogeneous DBMS.

Levels of Data and Process Distribution:

SPSD (Single-Site Processing, Single-Site Data), MPSD (Multiple-Site Processing, Single Site Data), MPMD (Multiple –Site Processing, Multiple-Site Data), Distributed Database Transaction Features, Transaction Transparency, Client/ Server Vs DDBMS.

Section – D

Business Intelligence and Decision Support System:

The need for Data Analysis, Business Intelligence, Operational Data vs. Decision Support Data, DSS Database properties and importance, DSS Database Requirements.

OLAP and Database Administration:

Introduction to Online Analytical Processing (OLAP), OLAP Architecture Relational, Star Schemas, Database Security, Database administration tools, Developing a Data Administration Strategy.

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Suggested Books:

1. Data Base Systems, Peter Rob Carlos Coronel, Cengage Learning, 8th ed.
2. Database System Concepts, Henry F. korth, Abraham, McGraw-Hill, 4th ed.
3. An Introduction to Database Systems, C.J.Date, Pearson Education, 8th ed.
4. Principles of Database Systems, Ullman, Galgotia Publication, 3rd ed.
5. An Introduction to Database Systems, Bipin C. Desai, Galgotia Publication

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MCA-15203 DATA STRUCTURES

Internal Assessment: 40

External Assessment: 60

Section-A

Introduction to Data Structure: Concept of data, problem analysis, data structures and data structure operations, notations, mathematical notation and functions, algorithmic complexity, Big-O Notation and time space trade off. Overview of Arrays, Recursion, Pointers, Pointer Arithmetic, Array of pointers, Arrays in terms of pointers, Static and Dynamic Memory Management, Garbage Collection.

Understanding and Implementation of various Data Structures with applications

Stack: operations like push, pop and various applications like conversion from infix to postfix and prefix expressions, evaluation of postfix expression using stacks

Queues: operations like enqueue, dequeue on simple, circular and priority queues. Linked Lists: operations like creations, insertion, deletion, retrieval and traversal on single, circular and doubly linked list.

Section-B

Trees definitions and concepts: Root, Node, Leaf Node, Level, Degree, Height and Tree representation using Linked List and Array Types of Trees: Binary trees, Binary search tree, Height balanced (AVL) tree, B- trees, B+ Tree Tree operations: creation, insertion, deletion and traversals (Preorder, In-order, Post- ordered) and searching on various types of trees

Section-C

Heap: Definition, Structure, Algorithms and applications

Graph definitions and concepts: Edge, Vertices, and Graph representation using Adjacency matrix, Adjacency lists

Types of graphs: Weighted, Unweighted, Directed, Undirected Graphs

Graph operations: creation, insertion, deletion, traversals and searching (depth-first, breadth-first) of various types of graphs and Dijkstra's algorithm for shortest distance calculation.

Section-D

Searching: Concept and efficiency of linear and binary search algorithms.

Sorting: Concepts, Order, Stability, Efficiency of various algorithms (Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Radix Sort)

Hashing: Definition, Implementation and applications

Note:

Programs are to be implemented in C++

Suggested Books:

1. Data Structures ,A Pseudo code Approach with C++ - Gilberg and Forouzan by Cengage Hill
2. Schaum's Outline of Data Structures with C++ - Hubbard John. R by Tata McGraw-
3. Data Structures Using C and C++ - Langsam, Augenstein, Tanenbaum by Pearson Education

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MCA-15204 DATA COMMUNICATION AND NETWORKS

Internal Assessment: 40 Marks

External Assessment: 60 Marks

SECTION-A

Introduction to Data Communication: Components of Data Communication, Data Representation, Transmission Impairments, Switching, Modulation, Multiplexing.

Review of Network Hardware: LAN, MAN, WAN, Wireless networks, Internetworks.

Review of Network Software: Layer, Protocols, Interfaces and Services.

Review of Reference Models: OSI, TCP/IP and their comparison.

Physical Layer

Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (Radio, Microwave, Infrared). Introduction to ATM, ISDN, Cellular Radio and Communication Satellites.

SECTION-B

Data Link Layer

Services provided by DLL: FRAMING, ERROR CONTROL, FLOW CONTROL, MEDIUM ACCESS

Medium Access Sub layer

Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison.

Network Layer

SECTION-C

Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast). Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding), Internetworking, IP Protocol, ARP, RARP.

Network Trouble Shooting

Using Ping, Traceroute, IPconfig, Netstat, nslookup

Transport Layer

SECTION-D

Addressing, Establishing and Releasing Connection, Flow Control, Buffering, Internet Transport Protocol (TCP and UDP).

Application Layer

Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web.

Suggested Books: -

1. Tanenbaum, Andrew S., 2009: Computer Networks(4thEdition), PHI.
2. Forouzan, B. A., 2009: Data Communications and Networking, Fourth Edition, Tata McGrawHill.
3. Douglas E. Comer, 2004: Internetworking with TCP/IP (Vol.1, 4th Edition), CPE.
4. Stallings, William 2008: Data and Computer Communications(8th Edition), PHI.
5. Nance, Bary, 1997: Introduction to Networking, PHI, 4th Edition.

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MCA-15205 LINUX OPERATING SYSTEM

Internal Assessment: 40 Marks

External Assessment: 60 Marks

SECTION –A

INTRODUCTION TO LINUX OPERATING SYSTEM:

Introduction and Types of Operating Systems, Linux Operating System, Features, Architecture Of Linux OS and Shell Interface, Linux System Calls, Linux Shared Memory Management, Device and Disk Management in Linux, Swap space and its management. File System and Directory Structure in Linux. Multi-Processing, load sharing and Multi-Threading in Linux, Types of Users in Linux, Capabilities of Super Users and equivalents.

INSTALLING LINUX AS A SERVER : Linux and Linux Distributions ;Major differences between various Operating Systems (on the basis of: Single Users vs Multiusers vs Network Users; Separation of the GUI and the Kernel; Domains; Active Directory;).

INSTALLING LINUX IN A SERVER CONFIGURATION : Before Installation; Hardware; Server Design ;Dual-Booting Issues; Modes of Installation; Installing Fedora Linux; Creating a Boot Disk; Starting the Installation; GNOME AND KDE : The History of X Windows; The Downside; Enter GNOME; About GNOME ;Starting X Windows and GNOME; GNOME Basics; The GNOME Configuration Tool.

SECTION -B

INSTALLING SOFTWARE : The Fedora Package Manager; Installing a New Package using dpkg and RPM; Querying a Package; Uninstalling a Package using dpkg and RPM; Compiling Software; Getting and Unpacking the Package; Looking for Documentation; Configuring the Package; Compiling Your Package; Installing the Package, Driver Support for various devices in linux.

MANAGING USERS: Home Directories ;Passwords; Shells; Startup Scripts; Mail; User Databases; The / etc /passwd File; The / etc / shadow File; The / etc /group File; User Management Tools; Command-Line User Management; User LinuxConf to Manipulate Users and Groups; SetUID and SetGID Programs

SECTION -C

THE COMMAND LINE : An Introduction to BASH, KORN, C, A Shell etc. ; BASH commands: Job Control; Environment Variables; Pipes; Redirection; Command-Line Shortcuts; Documentation Tools; The man Command; the text info System; File Listings; Ownership and permissions; Listing Files; File and Directory Types; Change Ownership; Change Group; Change Mode ; File Management and Manipulation; Process Manipulation; Miscellaneous Tools; Various Editors Available like: Vi and its modes, Pico, Joe and emacs, , Su Command.

SECTION -D

BOOTING AND SHUTTING DOWN: LILO and GRUB; Configuring LILO; Additional LILO options; Adding a New Kernel to Boot ; Running LILO; The Steps of Booting; Enabling and disabling Services

FILE SYSTEMS: The Makeup File Systems; Managing File Systems; Adding and Partitioning a Disk; Network File Systems; Quota Management;

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CORE SYSTEM SERVICES: The init Service; The inetd and xinetd Processes; The syslogd Daemon; The cron Program

PRINTING : The Basic of lpd; Installing LPRng; Configuring /etc/printcap; The /ETC/lpd.perms File; Clients of lpd, Interfacing Printer through Operating System.

Suggested Books:

1. *Linux Administration : A Beginner's Guide* by **Steve Shah** , Wale Soyinka, ISBN 0072262591 (0-07-226259-1), McGraw-Hill Education
2. Unix Shell Programming, Yashavant P. Kanetkar
3. UNIX Concepts and Applications by Sumitabha Das
4. Operating System Concepts 8th edition, by Galvin

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MCA-15206 Software Lab –III (Relational Database Management System)

Internal Assessment: 60

External Assessment: 40

Learning Objectives:

1. Comparative study of various Database Management Systems
2. Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL)
3. How to apply Constraints at various levels.
4. View data in the required form using Operators, Functions and Joins.
5. Creating different types of Views for tailored presentation of data
6. How to apply Conditional Controls in PL/SQL
7. Error Handling using Internal Exceptions and External Exceptions
8. Using various types of Cursors
9. How to run Stored Procedures and Functions
10. Creating Packages and applying Triggers
11. Creating Arrays and Nested Tables.

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Batch 2015 Onwards

MCA-15207 Software Lab –IV (Data Structures)

Internal Assessment: 60

External Assessment: 40

Note:

Programs are to be implemented in C++

Suggested Operations:

1. Creation of a data-structure
2. Deletion of a data-structure
3. Searching with a data-structure
4. Sorting of a data-structure
5. Inserting element in a data-structure
6. Removing element from a data-structure
7. Searing element in a data-structure
8. Traversing through a data-structure

Suggested Applications:

1. Reversing Data/Lists/Strings using stack
2. Convert Decimal to Binary using stack
3. Infix to Postfix Transformation using stack
4. Quick sort using stack
5. Round Ribbon algorithm implementation using queue
6. Evaluation of Postfix Expression using stack Implementing selection algorithm using heap
Implementing priority queues using heap
7. Implementing sorting using heap
8. Shortest path algorithm using graphs

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MCA-15208 Software Lab-V (LINUX OPERATING SYSTEM)

Internal Assessment: 60
External Assessment: 40

Learning Objectives:

1. How to install different distributions of Linux (Fedora, red Hat, Open Suse etc.).
2. Booting and Shutting down the system.
3. Learning the use of VI Editor for Shell programming, Searching & Sorting Processes.
- 4 User Management
5. Package management.
6. File/Directory Management.
- 7 Installing Printer and using Printer services.
8. Process Management.
9. Security and Protection of system.
10. Privilege management.
11. Managing various services (Cron & Quota etc) in Linux.
12. Running a project to learn overall Linux System Usage.

References:

1. Linux Administration : A Beginner's Guide by Steve Shah , Wale Soyinka, ISBN 0072262591 (0-07-226259-1), McGraw-Hill Education
2. Unix Shell Programming, Yashavant P. Kanetkar
3. UNIX Concepts and Applications by Sumitabha Das

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Third Semester

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MCA-15301 Database Administration

Internal Assessment: 40

External Assessment: 60

Section-A

(Introduction)

Understanding role and responsibilities of DBA, Database Environment management (network, CPU, disk and RAM), Installing and upgrading various database packages (MS SQL Server, Oracle, MySQL), Comparing various database packages, Configuring various services and components, Understanding the client/server model, Communication protocols, Database instance management, Creating and managing various database objects (tables, views, indexes)

Section-B (Managing Database Servers)

Understanding client tools for administrative tasks, Task Automation, Implementing migration, consolidation, and upgrade strategy, Hardware resource allocation, Business policy implementation, Monitoring and trouble-shooting, Implementing database compression, Database Replication and multiple servers, Exporting and Importing data, Managing Data integrity

Section-C (Security and Availability)

Understanding User Access and Security, Creating and modifying user accounts, Creating, Modifying and Using roles, Granting and Revoking Privileges, Querying role information, Auditing User activity, Implementing database encryption, Database backup, restoration and recovery, Types of failure, Defining a backup and recovery strategy, Testing the backup and recovery plan, RAID implementation, High-availability and disaster recovery

Section-D (Performance Tuning)

Introduction to performance tuning and its requirement, performance tuning methodology and concepts, Monitoring status variables that affect performance, General Table Optimizations, Using indexes to improve performance, Monitoring and optimizing the performance of the database, Identifying full-table scans, Re-writing SQL queries, Tuning sub-queries, Database mirroring, clustering

Note: Subject Coverage will be preferably based on MySQL.

Reference Books

1. Pro SQL Server 2012 Administration, 2nd Ed by Ken Simmons, Sylvester Carstarphen (Dreamtech Press)
2. MySQL Administrator's Bible By Sheeri K Cabral, Keith Murphy (John Wiley & Sons)
3. SQL Server 2012 Bible by Adam Jorgensen, Jorge Segarra, Patrick Leblanc, Jose Chinchilla, Aaron Nelson (Wiley India Pvt Ltd)

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MCA-15302 Computer Based Optimization Techniques

Internal Assessment: 40

External Assessment: 60

SECTION-A

Introduction to Optimization Techniques, Origin & development of O.R., Nature & Characteristic features of O.R., Models & Modeling in Operation Research. Methodology of O.R. Linear Programming - Mathematical Model, Assumptions of Linear Programming, Graphical Method, Principles of Simplex method and its Applications, Duality, Dual simplex method- Primal Dual Relationship and sensitivity analysis.

SECTION-B

Special types of linear programming problems -Transportation and assignment problems, Unbalanced Assignment problems, Crew based assignment problems, Test for Optimality, Degeneracy in Transportation Problems, Unbalanced Transportation Problems.

SECTION-C

Definition of Probability, Sample Space, Algebra of Events, Addition and multiplication law of probability, Conditional Probability. Dynamic Programming-Features and applications of dynamic programming.

SECTION-D

Decision Theory, Integer Programming-Gomory Method and Branch & Bound Method.

Suggested Books:

1. Hiller, F.S. & Liberman, G.J., 1974: Introduction to Operations Research, 2nd Edn. Holden Day Inc. London.
2. Tara, H.A., 1982: Operations Research, 3rd Edn., McMillan Publishing Company.
3. Beightler, C.S. & Phillips, D.T., 1979: Foundations of Optimisation, 2nd. Edn. Prentice-Hall.
4. Rao, S. S., 1978: Introduction to Optimization: Theory & Applications, Wiley Eastern.
5. Srinath, L.S.: Linear Programming, East-West, New Delhi.

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MCA-15303 Software Engineering

Internal Assessment: 40

External Assessment: 60

Section-A

Software Engineering: The software problem, Evolution of Software Engineering, Principles of software engineering, Software Development vs. Software Engineering.

Software Process: Software Process, Selection of appropriate process model, Software Process Models- Waterfall, Spiral, Prototyping, Agile Methodology- Scrum and XP.

Section-B

Advanced Requirement Analysis & Design: Analysis Principles, SRS, Requirement Elicitation Techniques- FAST and QFD, Design Principles, Design Concepts, Data Design, Architectural Design-Architectural Styles, Procedural Design.

Section-C

Software Project Management: The Management Spectrum, Software Project Planning and its characteristics, Types of metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models- Activity Networks- PERT/CPM, COCOMO-I, COCOMO-II, Risk Assessment- Probability Matrix, Risk Management.

Software Testing: Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases, Testing Techniques-White Box & Black Box, Unit Testing, Integration Testing, System Testing, Verification and Validation Testing, Acceptance Testing.

Section-D

Software Quality Management: S/W Quality, Importance of S/W Quality, Quality Metrics, Quality Standards- ISO 9126, Change Control, Change Control Process.

Advanced S/W Engineering: CASE Tools, Reverse Engineering, Re-engineering, Web Engineering.

References:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (6th ed.), McGraw- Hill, 2006
2. P. Jalote, An Integrated Approach to Software Engineering(3rd ed.), Narosa Publishing House, 2005
3. K.K. Aggarwal and Y. Singh, Software Engineering(revised 2nd ed.), New Age International Publishers, 2006 .
4. Sommerville, Ian, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.
5. Bob Hughes and Mike Cotterell, Software Project Management, Tata McGraw Hill Publishing Company Ltd., New Delhi (2006) 3rd ed.

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MCA-15304 Java Programming

Internal Assessment: 40

External Assessment: 60

Section A

Introduction: Object Oriented Concept overview, features and applications of Java, Differences between Java and C++, structure of Java Program, understanding class path. Building Blocks: Literals, Tokens, Keywords, constants, variables & Data types, scope of variables, Operators, Expressions, Flow Control statements.

Arrays, Vectors, Type Conversion, Command Line Arguments, Review of classes and methods, Access specifiers, constructors, Inheritance, static Classes, Abstract Classes, Final Classes, Wrapper Classes: Autoboxing and Unboxing, Garbage Collection & Finalize method, Enumerated types and annotations, Handling String and String Buffer classes, Method Overloading and Overriding, Nesting of methods and methods with varargs.

Section B

Interfaces & Packages: Interfaces and implementing multiple inheritance through interfaces, Packages, Multithreaded Programming, Synchronization.

Exception Handling: Introduction, Handling System defined Exceptions, Creating and handling user defined exception.

Managing I/O: Introduction to streams, Handling and using various Stream Classes, Random, String Tokenizer, Scanner classes .

Section C

Applet and Graphic Programming: Introduction to applets, Types of applets, Using Applet Applications, Passing Parameters to applets,

Introduction to Graphic Programming: Applying 2-D transformations on Objects, Event Handling , Layouts, Frames, Panels, Menu's, Pop up Menus, Swings, JDBC.

Section D

Advanced Programming: Servlet Programming(Servlet Life Cycle, Generic Servlet, HttpServlet, HttpServletRequest, HttpServletResponse, service method, doGet method, doPost method, Servlet Exception), Introduction to JSP, Syntax, Semantics, Declaration and Expressions

Socket Programming: Overview, Difference between TCP and UDP Sockets, Various methods associated with TCP and UDP.

REFERENCES: -

1. Introduction to Java Programming, Comprehensive Version, Y. Daniel Liang, Pearson, 9/E
2. Java 2 The Complete Reference by Petric Noughton And Herbet Schildt, McGraw Hill Professional, 1999
3. Head First java by Kethy Seirra and Bert Bates, Oxford Publications.
4. Head First Sevlets and JSP, 2nd Edition by Bryan Basham, Kathy Sierra, Bert Bates, O'Rielly Media.

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Elective-I

DEMCA-15307 System Programming

Internal Assessment: 40

External Assessment: 60

Section-A

Assemblers and Macro Processors: Language processors, data structures for language processing, General Design Procedure, Single pass and two pass assembler and their algorithms, assembly language specifications (example MASM). Macro Instructions, Features of Macro Facility: Macro instruction arguments, Conditional macro expansion, Macro calls within macro.

Section-B

Loaders and Linkers & Editors: Loader Schemes: Compile and go loader, general loader scheme, absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Relocation, Design of Absolute Loader, Bootstrap Loaders, Dynamic Linking, MS-DOS Linker, Text Editors, Line Editor, Steam Editors, Screen editor, Word processors, Structure editors.

Section-C

Compiler Design: Introduction to various translators, interpreters, debuggers, various phases of compiler, Introduction to Grammars and finite automata, Bootstrapping for compilers, Lexical Analysis and syntax analysis, Intermediate Code Generation, Code optimization techniques, Code generation, Introduction to YACC, Just-in-time compilers, Platform Independent systems.

Section-D

Operating System: Operating Systems and its functions, Types of operating systems: Real-time OS, Distributed OS, Mobile OS, Network OS, Booting techniques and subroutines, I/O programming, Introduction to Device Drivers, USB and Plug and Play systems, Systems Programming (API's).

TEXT BOOKS:

- Donovan J.J., Systems Programming , New York, Mc-Graw Hill, 1972.
- Leland L. Beck, System Software, San Diego State University, Pearson Education, 1997.
- Dhamdhare, D.M., System Programming and Operating Systems, Tata Mc-Graw Hill 1996.

REFERENCES:

1. Aho A.V. and J.D. Ullman Principles of compiler Design Addison Wesley/ Narosa 1985.

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Elective-I

DEMCA-15308 Theory of Computation

Internal Assessment: 40

External Assessment: 60

Section-A

1. Introduction, Sets , Logic , Functions , Relations , Languages , Proofs Mathematical Induction , Strong Principle of Mathematical Induction , Recursive Definitions ,Structural Induction
2. Regular Languages & Regular Expressions, Finite Automata (FA), Distinguishing Strings w.r.t. Language , Union, Intersection, & Compliment of Languages

Section-B

3. Non-deterministic Finite Automata (NFA), NFA with Null-Transitions, Kleene's Theorem
4. A Criterion for Regularity, Minimal Finite Automata, Pumping Lemma for Regular Languages
5. Introduction to Context-Free Grammar (CFG) , Regular Grammars , Derivation (Parse) Trees & Ambiguities , An Unambiguous CFG for Algebraic Expressions , Simplified Forms & Chomsky Normal Forms

Section-C

6. Introduction to Push Down Automata (PDA), Deterministic PDA (DPDA), PDA corresponding to a Given CFG , CFG Corresponding to a Given PDA , Parsing
7. The Pumping Lemma for CFG , Intersection & Complement of CFGs , Decision Problems Involving CFGs

Section-D

8. Turing Machine (TM) Definition & Examples, Computing a Partial Function with a TM
9. Recursive Enumerable & Recursive Languages, Enumerating a Language, Context-Sensitive Languages & Chomsky Hierarchy

Reference Book:

"Introduction to Languages and the Theory of Computation", John C. Martin, Tata McGraw-Hill, (2003), 3rd Edition, ISBN: 007049939X

Suggested Additional Reading:

1. "Elements of the Theory of Computation", Harry Lewis & Christos H. Papadimitriou,IEEE (PHI), 2nd Edition ,ISBN-978-81-203-2233-2.
2. " Theory of Computation", Michael Sipser, ", Cengage Learning(2007), ISBN-13: 978-81-315-0513-7
3. Introduction to Automata Theory, Languages, and Computation , Hopcroft, Motwani & Ullman, Pearson Education, 3rd Edition, (2008), ISBN: 978-81-317-2047-9

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Elective-I

DEMCA-15309 Embedded Systems

Internal Assessment: 40

External Assessment: 60

Section A

Introduction to Embedded Systems: Overview of embedded systems, features, requirements and applications of embedded systems, recent trends in the embedded system design, common architectures for the ES design, embedded software design issues, communication software, introduction to development and testing tools.

Section B

Embedded System Architecture: Basics of 8-bit 40 Pin PIC microcontroller 16F877A, memory organization, Special Function Registers, GPIO, Timer Comparator and A/D Converter, Bus Architecture, data operations, addressing modes, timers and counters

Section C

Assembly language programming: Memory-Mapped I/O, Interrupt handling, PIC 16F877A Instruction Set, Assembler Directives, Programming of PIC Microcontrollers

Section D

Applications of Embedded Systems: Industrial and control applications, networking and telecom applications, Digital Signal Processing and multimedia applications, Applications in the area of consumer appliances.

Note: Practical Training will be given for the clarity of contents wherever required in each section

References:

1. Embedded Systems Design by Steve Heath
2. "Real-Time Systems" by Jane W S Liu, Prentice Hall
3. Design with PIC Microcontrollers by John B. Peatman Pearson Education, 1997
4. PIC 16F877A Data Sheet

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MCA-15305 (Software Lab VI – Database Administration)

Internal Assessment: 60

External Assessment: 40

Implementation of various DBA roles/techniques studied in MCA-15301, like:

1. Practical implementation of various industry leading database packages.
2. Import/Export data between various databases and flat files.
3. Implementation Database replication
4. Backup/Restore strategies implementation
5. User and Roles creation and management

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MCA-15306 S/W Lab-VII [JAVA Programming]

Internal Marks: 60

External Marks: 40

Learning Objectives:

1. To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.
2. Dealing with Array and String Programming.
3. Exception Handling.
4. Multithreading.
5. Interfaces and Package handling.
6. File Handling.
7. Applet and Swings Programming.
8. Event Handling and Graphics Programming.
9. Database Connectivity.
10. Java Server Pages.
11. Servlet and Socket (TCP & UDP) Programming.

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Fourth Semester

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MCA-15401 Programming Languages

Internal Assessment: 40

External Assessment: 60

Section-A

Introduction: Brief history of Programming Language, Characteristics of programming language. Programming Language Processors: structure and operation of a computer, Hardware and firmware computers, Translator and simulator computers, Syntax, semantics and virtual computers, hierarchies of computers, binding and binding time

Section-B

Elementary Data Types: variable and constants, various data types, declarations, type checking and type conversion, assignment and initialization, enumerations, Structured Data Types, vector and arrays, record, character strings, variable sized data structures, pointers and programmer-constructed data objects, sets, file and input/output

Subprogram and Programmer-Defined Data Types: Abstraction, encapsulation, information hiding, subprogram, type definitions, abstract data types

Section-C

Sequence Control: Implicit and explicit sequence control, sequence control within expression, sequence control between statements, subprogram sequence control, recursive subprogram, exceptions and exception handlers, Co-routines, scheduled subprograms, tasks and concurrent execution, data structures and sequence control. Data Control: names and referencing environments, static and dynamic scope, block structure, local data and local referencing environments, shared data, task and shared data.

Section-D

Evolution of .NET, Comparison of Java and .NET, Architecture of .NET framework, Common Language Runtime, CTS, CLS, Just-in-Time compilation, Class Libraries, Metadata, Assemblies, Garbage Collection, Application Domains, Introduction to Windows Presentation Foundation (WPF) and Windows Communication Foundation (WCF) , Silver light, Creating applications using .NET programming languages, Data base connectivity

References:

1. "Programming Languages design and implementation", Second edition by Terrence W. Pratt Prentice Hall of India pvt.ltd. New Delhi
2. ".Net Framework Essentials", by [Hoang Lam, Thuan L. Thai](#), Published by O'Reilly Media

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Batch 2015 Onwards

MCA-15402 E-Commerce & Web Application Development

Internal Assessment: 40

External Assessment: 60

Section–A

Introduction to Electronic Commerce, Potential benefits & limitations of E-Commerce, Traditional Commerce vs. E-Commerce vs M-Commerce, Different E-Commerce Models (B2B, B2C, C2C, P2P), E-Commerce applications, Social Networks, Auctions & Portals, Legal and Ethical issues in E-Commerce.

Section–B

Introduction to Electronic Data Interchange, Types of EDI, Benefits of EDI

Overview of Electronic Payment system, Types of Electronic payment schemes (Credit cards, Debit cards, Smart cards, Internet banking), Issues in Electronic payment systems

Web Based Marketing and Communications: Online Advertising, E-Mail Marketing, Online Catalogs, Social Marketing and Targeted Marketing, Techniques and Strategies

Section–C

WWW concepts, Client/Server Computing, Web Servers and Clients, Web Browsers, Protocols and Ports, IP Address, Domains & DNS, URL, A Systematic approach to Website creation, Creating interactive and dynamic web pages, Factors in E-Commerce Website design, Web and Database integration, Website Optimization strategies

E-Commerce security, threats, managing security issues through internet security protocols and standards, and Firewall.

Section–D

Review of HTML, HTML tags; text formatting; text styles; lists: ordered, unordered and definition lists; layouts; adding graphics; tables; linking documents; images as hyperlinks; frames and layers; data collection using forms.

CSS: Introduction, consistent web designing using CSS

Java Script: Introduction, DOM, documents, forms, statements, functions, objects, client side interactive web page design, input validation, event handling

PHP: Introduction, server side dynamic programming, MYSQL database access

REFERENCES:-

1. E-Commerce Essentials by Kenneth Laudon and Carol Traver – Pearson Publication
2. Frontiers of Electronic Commerce by Ravi Kalakota, Andrew B. Whinston - Addison Wesley Publication
3. E-Commerce, Fundamentals and Applications by Henry Chan, Raymond Lee, Tharam Dillon and Elizabeth Chang - Wiley India Publication
4. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP by Ivan Bayross BPB Publication

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Elective-II

DEMCA-15407 Data Warehousing and Data Mining

Internal Assessment: 40

External Assessment: 60

Section A

Review of Data Warehouse: Need for data warehouse, Big data, Data Pre-Processing, Three tier architecture; MDDM and its schemas, Introduction to Spatial Data warehouse, Architecture of Spatial Systems, Spatial: Objects, data types, reference systems; Topological Relationships, Conceptual Models for Spatial Data, Implementation Models for Spatial Data, Spatial Levels, Hierarchies and Measures Spatial Fact Relationships.

Section B

Introduction to temporal Data warehouse: General Concepts, Temporality Data Types, Synchronization and Relationships, Temporal Extension of the Multi Dimensional Model, Temporal Support for Levels, Temporal Hierarchies, Fact Relationships, Measures, Conceptual Models for Temporal Data Warehouses : Logical Representation and Temporal Granularity

Section C

Introduction to Data Mining functionalities, Mining different kind of data, Pattern/Context based Data Mining, Bayesian Classification: Bayes theorem, Bayesian belief networks Naive Bayesian classification, Introduction to classification by Back propagation and its algorithm, Other classification methods: k-Nearest Neighbor, case based reasoning, Genetic algorithms, rough set approach, Fuzzy set approach

Section D

Introduction to prediction: linear and multiple regression, Clustering: types of data in cluster analysis: interval scaled variables, Binary variables, Nominal, ordinal, and Ratio-scaled variables; Major Clustering Methods: Partitioning Methods: K-Mean and K-Medoids, Hierarchical methods: Agglomerative, Density based methods: DBSCAN

References:

1. Data Mining: Concepts and Techniques By J.Han and M. Kamber

Publisher Morgan Kaufmann Publishers

2. Advanced Data warehouse Design (from conventional to spatial and temporal applications) by Elzbieta Malinowski and Esteban Zimányi

Publisher Springer

3. Modern Data Warehousing, Mining and Visualization By George M Marakas,

Publisher Pearson

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Elective-II

DEMCA-15408 ERP Systems

Internal Assessment: 40

External Assessment: 60

Section-A

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

Section-B

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules.

Section-C

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective. Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators.

Section-D

Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations. Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

References:

1. A. Lexis Leon, "Enterprise Resource Planning", TMH
2. Brady, Manu, Wegner, "Enterprise Resource Planning", TMH

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Elective-II

DEMCA-15409 Big Data Analytics

Internal Assessment: 40

External Assessment: 60

Section-A

Introduction to Data Analytics: Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification, Clustering.

Big Data Technology Landscape: Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.

Section-B

Introduction to Business Intelligence: Business View of IT Applications, Digital Data, OLTP vs. OLAP, Why, What and How BI? , BI Framework and components, BI Project Life Cycle, Business Intelligence vs. Business Analytics.

Big Data Analytics: Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Map-Reduce Programming, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst.

Section-C

Business implementation of Big Data: Big Data Implementation, Big Data workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a business scenario, Security and Governance for Big Data,

Section-D

Big Data on Cloud, Best practices in Big Data implementation, Latest trends in Big Data, Latest trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations.

Introduction to most recent advancements in Big Data technology along with their usage and implementation with relevant tools and technologies.

Recommended books:

1. Michael Minelli, Michele Chambers, AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley CIO Series (2013), 1st ed.
2. T. white, Hadoop: The Definitive Guide, O' Reilly Media (2012), 3rd ed.

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MCA-15403 Advanced Operating Systems

Internal Assessment: 40

External Assessment: 60

Section A

Multi-Processor and Distributed Operating System: Introduction, Architecture, Organization, Resource sharing, Load Balancing, Availability and Fault Tolerance, Design and Development Challenges, Inter-process Communication, Distributed Applications – Logical Clock, Mutual Exclusion, Distributed File System.

Section B

Real Time and Embedded Operating Systems: Introduction, Hardware Elements, Structure - Interrupt Driven, Nanokernel, Microkernel and Monolithic kernel based models. Scheduling - Periodic, Aperiodic and Sporadic Tasks, Introduction to Energy Aware CPU Scheduling

Section C

Cluster and Grid Computing: Introduction to Cluster Computing and MOSIX OS, Introduction to the Grid, Grid Architecture, Computing Platforms: Operating Systems and Network Interfaces, Grid Monitoring and Scheduling, Performance Analysis, Case Studies

Section D

Cloud Computing: Introduction to Cloud, Cloud Building Blocks, Cloud as IaaS, PaaS and SaaS, Hardware & Software Virtualization, Virtualization of OS – Hypervisor KVM, SAN & NAS back-end concepts.

Mobile Computing: Introduction, Design Principals, Structure, Platform and Features of Mobile Operating Systems (Android, IOS, Windows Mobile OS)

References:

1. Sibsankar Haldar, Alex A. Arvind, —Operating Systems‡, Pearson Education Inc.
2. Tanenbaum and Van Steen, —Distributed Systems: Principles and Paradigms‡, Pearson, 2007.
3. M. L. Liu, —Distributed Computing: Principles and Applications‡, Addison-Wesley, Pearson
4. Maozhen Li, Mark Baker, —The Grid - Core Technologies‡, John Wiley & Sons, 2005

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MCA-15404 SOFTWARE LAB-VIII (E-Commerce and Web Application Development)

Internal Assessment: 60

External Assessment: 40

Learning Objectives:-

1. Creating Advanced HTML pages with the help of frames, scripting languages & evolving technologies & scripting like DHTML, JQuery, AJAX and XML.
2. Creating SQL Server database.
3. Creation of ODBC connectivity.
4. Development of Website which must contain the following features:
 - a. How businesses sell products & services on the web.
 - b. How to reach the Consumers on the web.
 - c. Online payment process.
 - d. Managing & Implementing security threats in E-Commerce application.
5. Implement backup and recovery plan of E-Commerce applications.
6. Understand the client/server infrastructure that supports E-Commerce
7. Development of Online Banking / Net Banking website which must provide following features
 - a. View bank account details, balance, download account statement etc.
 - b. Electronic Fund Transfer from one account to another within a single financial institution or across multiple financial institutions.
 - c. Request for cheque book, demand draft etc.
 - d. Manage fixed deposits.
 - e. Online Payment of Utility bills & online shopping.
8. Understanding legal aspects and issues in E-Commerce applications

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MCA-15405 Major Project and Seminar

Internal Assessment: 100

External Assessment: 00

To provide the hands on experience in analyzing, designing and implementing various projects, students are assigned major projects based on the languages they have learned so far. Based on the project work a project report should be prepared under the guidance of faculty and submitted to department for evaluation.

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MCA - 15406 Software Lab IX (Advanced Operating Systems)

Internal Assessment: 60
External Assessment: 40

The Software Lab will be based upon MOSIX OS

Fifth/Sixth Semester

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MCA-15501 Interactive Computer Graphics

Internal Assessment: 40

External Assessment: 60

SECTION A

Review of Computer Graphics, Applications of computer graphics. Introduction to Graphic devices like light pens, Graphic tablets, Graphic Cards, Data Glove, Digitizers, Graphs and types of Graphs. Cathode -Ray tube, Raster Scan displays, Random Scan displays, Architecture of a Raster and Random Graphics System with display processor, Color generating techniques (shadow mask, beam penetration) , 3-D viewing devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Workstations, Color Models (RGB and CMY), color lookup Table.

SECTION B

Input and Output primitives, Process and need of Scan Conversion, Scan conversion algorithms for line, circle and ellipse, effect of scan conversion, Bresenham's algorithms for line and circle along with their derivations, midpoint circle algorithm with derivation , area filling techniques, flood fill techniques, character generation techniques (like typography, vector and bitmap).

2-Dimensional Graphics: Cartesian and Homogeneous Co-ordinate System, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, affine transformation, Two dimensional viewing transformation and windowing and clipping (line, polygon and text). Concave and Convex Polygon, Cohen Sutherland line clipping and its algorithm, Sutherland Hodgeman polygon clipping.

SECTION C

3-dimensional Graphics: Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, Parallel and Perspective Projections. Bezier curves and its properties, B-Spline curves. Fractals, Classification of fractals.

SECTION D

Hidden line and surface elimination algorithms: Z-buffer, Painters algorithm, scan-line, sub-division, Shading and Reflection: Diffuse reflection, Specular reflection, refracted light, Halftoning, Dithering techniques. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading (Mash Band effect). Morphing of objects

Note: Graphics Programming using C/C++ with introduction to Open GL.

References:

1. D. Hearn and M.P. Baker, —Computer Graphics], PHI New Delhi; Third Edition.
2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes,. R.L Phillips, [Computer Graphics Principles & Practices, Second Edition], Pearson Education, 2007.
3. R.A. Plastock and G. Kalley, —Computer Graphics], McGraw Hill, 1986.
4. F.S. Hill: Computer Graphics using Open GL- Second Edition, Pearson Education-2003.

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Elective-III

DEMCA-15507 Network Security & Administration

Internal Assessment: 40

External Assessment: 60

Section-A

Security Attacks –Passive & Active Attacks, Security Services, Security Mechanisms, Model for Internetwork Security, Man –In – the middle attack, Meet – in – the middle attack

Conventional Encryption Principles, Monoalphabetic ciphers, Playfair Ciphers, Transposition Ciphers, Cipher block chaining mode, approaches of message authentication.

Section-B

Public Key cryptography Principles, RSA algorithm, Digital Signatures , Digital Certificates, Certificate Authority and Key management Kerberos, X.509 Directory Authentication Service.

Section-C

IP Security: Security Problems of IP, Security Objectives, IP Security Protocol Modes, Authentication Header, Security Payload.

Firewall Characteristics, Types of Firewalls and their practical use, NAT

Section-D

Email Security: PGP, S/MIME

Web Security: Security Socket Layer, Transport Layer Security, Secure Electronic Transaction.

Text Books:

1. Handbook of Applied Cryptography - Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone
2. Network Security and Cryptography – Bernard Menezes
3. Network Security Essentials – William Stallings
4. Data Communication and Networking-Behrouz A. Forouzan

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Elective-III

DEMCA-15508 Cloud Computing

Internal Assessment: 40

External Assessment: 60

Section-A

Cloud Computing: Basics of emerging cloud computing paradigm, Deployment models, Reference models, Cloud cube model, Cloud software and service providers, Cloud migration, Benefits and challenges to cloud computing, Characteristics of Clouds .Virtualization: Concept and types, Advantages of Virtualization, Taxonomy of virtualization, Physical and logical partitioning, Migration and deployment of virtual machines, XEN, QEMU, VMware, Hyper-V etc., Uses of virtual server consolidation.

Section-B

Cloud Storage: Architecture of storage (S3), Different storage models, Blobs, Buckets, Tables, ACL, Storage network design considerations, NAS and Fibre channel SANs, Global storage management locations, scalability, operational efficiency.

Section-C

Cloud Security: Trust models for clouds, Security and disaster recovery, Security base line, Fear Uncertainty Doubt and Disinformation factor, Challenges, Data center security recommendations, Statement of audit standards, Cloud security alliance, Recovery time objectives and vendor security process.

Section-D

Cloud Monitoring: Architecture for federated Cloud Computing, Service Oriented Architecture, Foundation for SLA, Components of the SLA, Selected business use cases. Demystifying the Cloud: Using case studies like Hadoop, Google App Engine, Amazon EC2, Eucalyptus, Open Nebula etc.

Recommended Books:

1. *Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing: Principles and Paradigms, John Wiley and Sons (2011).*
2. *David E.Y. Sarna, Implementing and Developing Cloud Computing Applications, CRC (2011).*
3. *William von Hagen, Professional Xen Virtualization, Wrox Publications, (2008).*
4. *Chris Wolf , Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress (2005).*
5. *George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publishers (2009).*

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

Elective-III

DEMCA-15509 Advanced Computer Networks

Internal Assessment: 40

External Assessment: 60

Section-A

Internetworking: Half and Full Duplex Ethernet, Ethernet at the Data Link Layer, Ethernet at the Physical Link Layer, Ethernet Cabling: Straight-through, Crossover and Rolled Cable, Data Encapsulation, Three-Layer Hierarchical Network Model.

TCP Protocols: Internet Layer Protocols: IP, ICMP, ARP, RARP; Host to Host Layer Protocols: TCP, UDP; Application Layer Protocols: Telnet, FTP, TFTP, NFS, SMTP, LPD, X Window, SNMP, DNS, and DHCP.

Section-B

Switching: Overview of Switch, Unmanaged and Managed Switches, Switch Administrative Configurations, Viewing, Saving and Erasing Configurations, Spanning Tree Protocol, VLAN Basics, Static VLAN, Dynamic VLAN, Frame Tagging, Trunking Protocol, Routing between VLANs, Configuring VLANs, Configuring VLAN Trunk Ports, Configuring Inter-VLAN Routing.

Section-C

Network Routing: Overview of Router, Static and Dynamic Routing, Introduction to Classless Routing, Distance Vector Routing Protocols, Router Administrative Configurations, Router Interfaces, Viewing, Saving and Erasing Configurations, Routing Information Protocol, Configuration of EIGRP (Enhanced IGRP) and OSPF (Open Shortest Path First).

Section-D

Adhoc Networks: Features, Advantages and Applications, Adhoc versus Cellular networks, Network Architecture, Protocols: MAC protocols, Routing Protocols, Technologies, Applications of Mobile Adhoc Networks

Text Books:

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri “Wireless and Mobile Networks: Concepts and Protocols”, Wiley India Pvt. Ltd., 2013

Reference Books:

1. Andrew S. Tanenbaum, “Computer Networks”, 5th Edition, Pearson Education, 2011.

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

MCA-15502 Web Technologies

Internal Assessment: 40

External Assessment: 60

SECTION- A

Introduction to XML, XML Basics, XML Syntax and Editors, Elements, Attributes, Document Type Definitions (DTD), XML Schemas (XSD), XML Namespaces, XML Document Object Model, XSLT, Use of XSLT with XML.

SECTION- B

Introduction to Ajax, Use of Ajax in Website. Introduction to jQuery, Overview, retrieving page content, manipulating page content, working with events.

SECTION- C

Introduction to Web Services, Use of Web Services, Types of Web Services, Introduction to SOAP, Syntax of SOAP, Envelope, Header and Body, Introduction to JSON, Syntax and Use,

SECTION- D

Introduction to Content Management System CMS (Types, Usages, Benefits), Introduction to Wordpress- Use, Building a simple website using Wordpress, Study of Wordpress dashboard, Customization of Wordpress website, Creation of Network Websites.

TEXT BOOKS:

1. Professional XML, Wrox Publications.
2. Web Services Essentials: Distributed Applications with XML-RPC, SOAP,
3. Web Services Essentials: Distributed Applications with XML-RPC, SOAP, UDDI & WSDL
By Ethan Cerami, O'Reilly

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

MCA-15503 Object Oriented Analysis and Design using UML

Internal Assessment: 40

External Assessment: 60

Section A

Object orientation and Development, OO Benefits, Abstraction, OO Modeling, The Three Models: Class Modeling (Objects and Classes, Relationships, Generalization and Inheritance, Association, Aggregation, Constraints, Packages), State Modeling (Events, States, Transitions and Conditions, State and Behavior, Concurrency) and Interaction Modeling (Use case models, Sequence and Activity)

Section B

System and Process, SDLC, Creation of SRS document: Requirement Specification, Documentation and SDLC Models. Domain and Application Analysis (Class, State and Interaction Models), System Design (Subsystems, Global Resources, Conditions, Priorities) Using design patterns (Abstraction-Occurrence, General Hierarchy, Player-Role, Singleton, Observer, Delegation, Adapter and Proxy Patterns), Class Design (Use cases, algorithms, refactoring, design optimization, inheritance adjustment)

Section C

UML Diagram: Use case diagram, Class diagram, Object diagrams, Aggregation activities on real objects (Aggregation, Generalization relations, Association and multiplicity), Activity diagram (Activity and state diagram), Interaction Diagram (Sequence diagram, Collaboration diagram, Component diagram.)

Section D

OO Methodologies (Structured Analysis, Structured Design (SA/SD), Jackson Structured Development (JSD), Information Modeling Notations), OMT as SE Methodology, OO Impact, OO Style (Reusability, Extensibility, Robustness, Programming-in-the-large), User centric design and usability principles, Reverse Engineering, Difficulties and risks in use-case modeling and UI design, System testing and maintenance. Use of open source tools for UML Design such as Plant UML, Argo UML.

TEXT BOOKS:

1. Frederick Eddy, James Rumbaugh, Michael Blaha, William Premerlani, William Lorensen: Object-Oriented Modeling and Design, Pearson Education.
2. James Rumbaugh, Michael R. Blaha: Object-Oriented Modeling and Design with UML, Pearson Education.
3. Timothy C. Lethbridge, Robert Laganieri: Object Oriented Software Engineering, Practical Software Development using UML and Java, Tata McGraw-Hill edition.
4. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

REFERENCE BOOKS:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGraw Hill.
5. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and
6. Unified Process, Craig Larman, Pearson Education.

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

MCA-15504 Software Lab-X (Interactive Computer Graphics)

Internal Assessment: 60

External Assessment: 40

The various algorithms will be implemented using C/C++ or Open GL

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

MCA-15505 Software Lab-XI (Web Technologies)

Internal Assessment: 60

External Assessment: 40

The software lab will be based upon the course Web Technologies (MCA-15502).

Guru Nanak Dev Engineering College, Ludhiana
Scheme and syllabus of MCA
Batch 2015 Onwards

MCA-15506 Software Lab-XII (Object Oriented Analysis & Design with UML)

Internal Assessment: 60
External Assessment: 40

The software lab will be based on UML.

Fifth/Sixth Semester

Guru Nanak Dev Engineering College, Ludhiana

Scheme and syllabus of MCA

Batch 2015 Onwards

MCA-15601 Industrial Training

Internal Assessment: 300

External Assessment: 300

This semester is based on Industrial training of minimum duration of four months and one week orientation training in department of computer applications.

During Industry Oriented Training in department, students will finalize their project work and report based on the industry training as per T&P Cell guidelines. The projects of students would be evaluated by their internal guides during orientation week in college.

Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department

Minutes of Meeting

No. CE-18/2644

Dated: 14/07/2018

The 9th meeting of Board of Studies (Civil Engineering) was held on 14 July, 2018 in the office of Head of Department, Civil department and chaired by Dr. K S Gill (Professor & Head).

Following members were present in the meeting:

Dr. K S Gill- Chairman - Guru Nanak Dev Engineering College, Ludhiana

Dr. Harpal Singh - Member - Guru Nanak Dev Engineering College, Ludhiana,

Dr. H S Rai -Member- Guru Nanak Dev Engineering College, Ludhiana

Dr. B S Walia -Member- Guru Nanak Dev Engineering College, Ludhiana

Dr. Harvinder Singh - Member - Guru Nanak Dev Engineering College, Ludhiana

Dr. Gurdeepak Singh - Member- Guru Nanak Dev Engineering College, Ludhiana

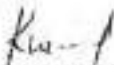
Dr. Puneetpal Singh Cheema - Member- Guru Nanak Dev Engineering College, Ludhiana

Er. Prashant Garg - Member - Guru Nanak Dev Engineering College, Ludhiana

The Following decisions were taken against the Agenda items:

1. Department proposed the syllabus of program elective subjects 'Disaster Reduction & Management (MTGT-16615)' and 'Earthen Embankment (MTGT-16618)' for M.Tech (Geotechnical Engineering) program and the same has been approved
2. Department proposed the syllabus of 'Advanced structural analysis (PhDCE-17001)' and 'Presentation (PhDCE-17003)' for PhD (Civil Engineering) program and the same has been approved.

The meeting ended with vote of thanks.


Dr. K S Gill
(Chairman)

**Guru Nanak Dev Engineering College Ludhiana
Civil Engineering Department**

December 13, 2019

Minutes of Meeting

The 12th BOS meeting was held in the HoD office (Civil) on 13th December, 2019 under the chairmanship of Dr. H. S. Rai (Professor and Head), wherein following members were present:

- Dr. H. S. Rai – Chairman - GNDEC, Ludhiana
- Dr. K. S. Gill – Member - GNDEC, Ludhiana
- Dr. Harpal Singh – Member- GNDEC, Ludhiana
- Dr. Harvinder Singh – Member - GNDEC, Ludhiana
- Dr. Jagbir Singh – Member- GNDEC, Ludhiana
- Dr. Gurdeepak Singh – Member- GNDEC, Ludhiana
- Dr. Prashant Garg – Member- GNDEC, Ludhiana
- Dr. Puneet Pal Singh Cheema – Member- GNDEC, Ludhiana
- Dr. Naveen Kwatra – Member – Thapar University Patiala
- Er. Jitender K. Sharma – Member (From Industry)
- Dr. Randhir Singh – Nominated Member (COE) - GNDEC, Ludhiana
- Dr. N. S. Bhangu – Nominated Member (Academic Branch) - GNDEC, Ludhiana
- Er. G S Sodhi – TPO GNDEC Ludhiana

Following decisions were taken against the agenda items:

1. Department presented syllabus of various subjects for M. Tech. Programs (Structural Engineering-Full Time, Geotechnical Engineering-Full Time, Environmental Science and Engineering-Full Time, Soil Mechanics & Foundation Engineering-Part Time) (applicable for Batch 2019 and onward), the study scheme of which and subjects of 1st semester were approved in 11th meeting. The present syllabus was discussed and approved in principle. Some observations were made for incorporation in the syllabus. The edited copy of the syllabus (for 2nd semester) will be sent through e-mail to all members for their review and final approval and for rest of semester, it to be put up in next meeting.

2. Department presented syllabus of Research Methodology (PHRM-101), Advance Structure Analysis (PHSE-19001) and Physico-Chemical Treatment Methods (PHENV-19001) subjects for PhD Programs applicable for batch 2019 and onward, were discussed & approved.
3. The updated syllabus of Hydrology and Water Resources Engineering [B. Tech 4th semester] was presented and it was approved by the BOS.
4. BoS recommended to rename course title of "Mathematics – III (Transform & Discrete Mathematics)" as "Mathematics – III" of UG program (Batch 2018 and onward) and replace the word "Lab" with "Laboratory" in course titles for all schemes. Same was approved and incorporated.
5. A list of MOOC courses for the session January – June, 2020 was finalised for B. Tech. (Batch 2018 and onward) students to qualify for "Civil Engineering" as Minor Engineering Branch.
6. A list of MOOC courses for the session January – June, 2020 was finalised for B. Tech. (Batch 2018 and onward) students to qualify for B. Tech. Civil Engineering (Honor) degree.
7. A list of examiners was presented and it was approved by the BOS.

The meeting ended with vote of thanks to all present.



Dr. H. S. Rai

Prof. & Head of Civil Engg. Deptt.
G. N. D. E. College,
LUDHIANA

Encl: Copy of Study Schemes, syllabus & other items

Guru Nanak Dev Engineering College, Ludhiana
Civil Engineering Department

Minutes of Meeting

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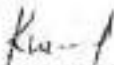
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**Guru Nanak Dev Engineering College Ludhiana
Civil Engineering Department**

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Dr. H. S. Rai

Prof. & Head of Civil Engg. Deptt.
G. N. D. E. College,
LUDHIANA

Encl: Copy of Study Schemes, syllabus & other items



Guru Nanak Dev Engineering College, Ludhiana
An Autonomous College as 2(a) and 2(b) of UGC Act 1956
Punjab Government Aided Status
Institute Accredited "A" Grade NAAC, Jeta Consultancy Services
AICTE approved, Affiliated to IKG Punjab Technical University, ISO 9001:2015 Certified

Ref No. 2/109

Date 3/1/17

To: The Principal,
GEC (RICO)
The Punjab Technical University,
Munimbar-Kapurthala Road, Near Science City,
Ludhiana

From: Sir,

With reference to telephone conversation with your goodself regarding joining of Ms. Kirti Kaur, QIP Application No. 50356 admitted in QIP Centre, GNDIA, Ludhiana in Electrical Engineering. She has reported on 1.8.2017 for pursuing her P.D in GNDIA Ludhiana. As per IKGPTU guidelines, she has filled online form and deposited the requisite fee. As per the IKGPTU letter No. IKGPTU Reg N4244-4251, Dated 22-08-16 and in light of AICTE guidelines she will be offered following subjects:

Name of the Student	Course/Subject	Code of the course/subject	Remarks	Grade
Computer	Compulsory	PHDCO-17001	As per IKGPTU guidelines	70
Computer Graphics	Compulsory	PHDCO-17002	As per AICTE guidelines	70
Advanced Power System Analysis	Core Subject	PHDEE-17001	As per IKGPTU guidelines	71
Power System Operation	Elective Subject	PHDEE-17002	As per IKGPTU guidelines	72
Prescription	Dept. Spec. Elect	PHDEE-17003	As per IKGPTU guidelines	73

PHDCO-17001: Control course PHDEE-17002: Core course (Electrical Engg. PHDCO-17003: Elective course (Interdisciplinary)
The classes for above course work will be conducted separately from regular M.Tech (other PG programmes). This is for your kind information and ratification, please

Thanking you,

Yours sincerely,

Dr. P. Choudhary

Gill Park, Gill Road, Ludhiana-141006 (INDIA),

Ph: 0161-2604595 (O), Fax: 2602240, Mobile: 9872257575

Email: gnanapud@rediffmail.com, gnanapud@rediffmail.com, website: www.gnanapud.com

PHDCC – 17001 RESEARCH METHODOLOGY

Internal Marks : 50	L	C
External Marks : 100	4	4
Total Marks : 150		

COURSE OUTCOMES

The students will be able to

- Identifying and defining research problems.
- Classification of the methods of data collection.
- Work with the samples to carry out research.
- Process and analyze the data and validate the results obtained

CONTENTS

1. Overview of Research

Nature and objectives of research. Methods of Research and its types: identifying and defining research problem and introduction to different research designs. Essential constituents of Literature Review. Basic principles of experimental design: completely randomized, randomized block, Latin Square, Factorial, response surfaces.

2. Methods of Data Collection

Primary data and Secondary Data, methods of primary data collection, classification of secondary data, designing questionnaires and schedules.

3. Sampling Methods

Probability sampling: simple random sampling, systematic sampling, stratified sampling, cluster sampling and multi-stage sampling. Non-probability sampling: convenience sampling, judgement sampling, quota sampling. Sampling distributions.

4. Processing and analysis of Data

Statistical measures and their significance: Central tendencies, variation, skewness, Kurtosis, time series analysis, correlation and regression. Testing of Hypotheses: Parametric (t, z and F) Chi Square, ANOVA, and non-parametric tests.

5. Reliability and Validity

Test-retest reliability, alternate-form reliability, internal-comparison reliability, and scorer reliability. Content validity, Essential of Report writing

Note: Use of software for statistical analysis like SPSS, Mini Tab or MATLAB. Report writing, preparation of thesis, use of software like MS Office.

Recommended Books

- C.R. Kothari, Research Methodology, Wishwa Prakashan
- P.G. Tripathi, Research Methodology, Sultan Chand & Sons, N.Delhi
- Fisher, Design of Experiments, Halper
- Sadhu, Singh, Research Methodology in Social Sciences, Himaya Publishers
- Stouffer et al, Measurement & Prediction, Wiley, N.York
- J.W. Barnes, Statistical Analysis for Engineers & Scientists, McGraw Hill, N.York
- Donald Cooper, Business Research Methods, Tata McGraw Hill, N.Delhi

PHDCC – 17002 ENGLISH FOR TECHNICAL WRITING

Internal Marks : 50

P

C

External Marks : --

2

0

Total Marks : 50

COURSE OUTCOMES

The students will be able to

- a) Understand the requirements and ethics of technical writing.
- b) Critically compare and evaluate technical literature.
- c) Work individually and in a team to produce effective technical documents.
- d) Communicate effectively for technical presentations

CONTENTS

1. To practice in preparing power point presentation
2. To enhance communicative skills by Seminar presentation
3. To gain experience in Report writing
4. Learn to write Bibliography/ referencing
5. Learn to develop skill of Paraphrasing
6. To learn Summarizing précis writing
7. To understand and practice Paragraph writing
8. To analyze and understand the book/article reviews
9. To gain expertise in technical writing (journal article, conference papers, review and research articles).

PHDEE – 17001 ADVANCED POWER SYSTEM ANALYSIS

Internal Marks : 50	A	C
External Marks : 100	B	D
Total Marks : 150		

COURSE OUTCOMES

After studying this course, the students will

- Construct network matrices by singular and non-singular transformation and bus impedance matrices by algorithmic approach
- Develop mathematical model and find solution of optimal power flow problems.
- Investigate state of a power system by power flow analysis as well as state estimation.
- Investigate security of Power System using Short Circuit and Contingency Analysis.

CONTENTS

1. FORMATION OF NETWORK MATRICES

Incidence and network matrices, Formation of network matrices by singular and non-singular transformation, Formation of single phase bus impedance matrix using algorithmic approach including the effect of mutually coupled elements.

2. POWER FLOW & OPTIMAL POWER FLOW ANALYSIS

Review of power flow without and with tap changing and phase shifting transformers, Power Flow analysis with series and shunt compensating devices, Power flow for radial distribution network, Optimal power flow problem formulation and solution techniques

3. POWER SYSTEM SECURITY

Factors effecting power system security, Short circuit and contingency analysis, Network sensitivity using load flow, Correcting the generation dispatch by using sensitivity method and linear programming.

4. STATE ESTIMATION

State estimation from on line measurements, Method of least squares, the line power flow state estimation.

BOOKS RECOMMENDED

1. G.N. Stagg and A. H.Eb-Abiad, *Computer Methods in Power System Analysis*, Mc Graw - Hill, International Edition.
2. George L. Kusin, *Computer Aided Power Systems Analysis*, Prentice Hall
3. Arrillaga, C.P. Arnold and S.J. Harker, *Computer Modelling of Electrical Power Systems*.
4. O.L. Elgerd, *Electric Energy Systems-An Introduction*, Tata Mc Graw Hill.
5. M.A. Pai, *Computer Techniques in Power Systems Analysis*, Tata McGraw Hill.
6. P.M. Anderson, *Analysis of Faulted Power System*, IEEE Press Book.
7. Referred IEEE IEE Publication

PhDOE- 17001 POWER SYSTEM OPERATION

Internal Marks	: 50	1	1
External Marks	: 100	4	2
Total Marks	: 150		

COURSE OUTCOMES

After studying this course, the students will

- Analyze the difference in characteristic curves for different types of generation.
- Understand economic dispatch problem, unit commitment problem and apply various solution methods to these problems.
- Understand hydro-thermal co-ordination, concept of energy banking and power trading.
- Apply techniques for optimized operation of power system.

CONTENTS

1. CHARACTERISTICS OF POWER GENERATION UNITS

Characteristics of steam units, variations in steam unit characteristics, cogeneration plants, hydro-electric units.

2. OPTIMIZATION TECHNIQUES

Lagrange's multiplier, random search, steepest-descent, conjugate-gradient, interior and exterior penalty function methods for Unconstrained and constrained optimization.

3. OPTIMAL OPERATION OF THERMAL UNITS

Economic load dispatch problem without and with transmission losses, Lambda iteration method, Gradient method, Newton's method, Base point and participation factors, Unit commitment, Priority method, Dynamic programming, Analytical method, Introduction to optimal power dispatch considering unit commitment.

4. HYDRO-THERMAL CO-ORDINATION

Introduction to long range and short range hydro scheduling, Types of short range scheduling problem, Scheduling energy, the short term hydro-thermal scheduling problems and its solution by Lambda-Gamma iteration and gradient methods.

BOOKS RECOMMENDED

- Allen J. Wood and Bruce F. Wollenberg, *Power Generation Operation and Control*, John Wiley & Sons 2nd Edition.
- D.P. Kothari and J.S. Dhillon, *Power System Optimization*, Prentice-Hall of India, Pvt. Ltd., New Delhi.
- L.A. Kirchner, *Economic Operation of Power Systems*, John Wiley & Sons, N.Y.
- D.P. Kothari and J. Nagari, *Modern Power System Analysis*, Tata Mc Graw- Hill Publishing Company Ltd. New Delhi.

PHDEE – 17003 PRESENTATION

Internal Marks : 100

P C

External Marks : --

3 3

Total Marks : 100

COURSE OUTCOMES

After studying this course, the students will

- Evaluate various latest topics in Electrical Engineering and formulate research problem.
- Survey extensive literature and understand others point of view, thereby encouraging team work.
- Evaluate generalized research results and impact of various technologies on environment.
- Analyze and develop a thought process for presentation

CONTENTS

1. LITERATURE SURVEY

Publication database, search engine and patent database, Online tools – google, citeseer, digital library, IEEE survey papers.

2. RESEARCH PROBLEM FORMULATION

Developing the objectives, Research design, Defining key area of research, Creative thinking technique

3. PRESENTATION

Analyze and prepare 1-1.30 hours presentation related to area of concern and future scenario in Electrical Engineering.