GURU NANAK DEV ENGNINEERING COLLEGE, LUDHIANA
ELECTRICAL ENGINEERING DEPARTMENT
SYLLABUS SCHEME FOR M.TECH. (ELECTRICAL ENGG.) PART-TIME

2014 ONWARDS

Sr. No.	Description of Subject	No. of Subjects	Credits per Subject	Total Credits
1	Core	6	4	24
2	Program Elective (Department Elective)	4	3	12
3	Program Elective (Open Elective)	2	3	6
4	Laboratory	2	2	4
5	Pre Thesis Seminar	1	4	4
6	Pre Thesis Project	1	4	4
7	Thesis	1	14	14
G. Total				68

Sr. No.	Subject Code	Subject Name	Description of Subject	Credits
SEMESTER – I				
1	MTEE – 501	Power Sys. Analysis & Design	Core	4
2	MTEE – 504	Adv. Power Electronics	Core	4
3	MTEE – XXX	Department Elective - I	Program Elective	3
Total Credit				11
SEMESTER – II				
1	MTEE – 503	Adv. Electrical Machines	Core	4
2	MTEE – 507	Power System Software Lab-I	Core	2
3	MTEE – XXX	Department Elective - II	Program Elective	3
Total Credit				09
SEMESTER – III				
1	MTEE – 502	Digital Control Sys.	Core	4
2	MTEE – 506	Power Sys. Operation and Control	Core	4
3	MTXX – XXX	Open Elective - I	Program Elective	3
Total Credits				11
SEMESTER – IV				
1	MTEE – 505	Advanced Relaying and Protection	Core	4
2	MTEE – 508	Industrial Automation Lab	Core	2
3	MTEE – XXX	Department Elective - III	Program Elective	3
Total Credit				09
SEMESTER – V				
1	MTEE – XXX	Department Elective - IV	Program Elective	3
2	MTXX – XXX	Open Elective - II	Program Elective	3
3	MTEE – 509	Pre Thesis Seminar	Core	4
4	MTEE – 510	Pre Thesis Project	Core	4
Total Credit				14
SEMESTER – VI				
1	MTEE – 511	Thesis	Core	14

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

ELECTRICAL ENGINEERING DEPARTMENT

MASTER OF TECHNOLOGY (PART-TIME) ELECTRICAL ENGINEERING COURSE SUBJECTS (2014 ONWARDS)						
Sr. No.	**Subject code**	**Course title**	**Type**	**L**	**P**	**Credit**
1	MTEE – 501	Power System Analysis & Design	Core	4	-	4
2	MTEE – 502	Digital Control System	Core	4	-	4
3	MTEE – 503	Advanced Electrical Machines	Core	4	-	4
4	MTEE – 504	Advanced Power Electronics	Core	4	-	4
5	MTEE – 505	Advanced Relaying & Protection	Core	4	-	4
6	MTEE – 506	Power System Operation & Control	Core	4	-	4
7	MTEE – 507	Power System Software Lab - I	Core	-	2	2
8	MTEE – 508	Industrial Automation Lab - II	Core	-	2	2
9	MTEE – 509	Pre Thesis Seminar	Core	-	2	4
10	MTEE – 510	Pre Thesis Project	Core	-	2	4
11	MTEE – 511	Thesis	Core	-	-	14
12	MTEE – 601	Research Methodology	Program Elective	3	-	3
13	MTEE – 602	EHVAC & HVDC Transmission System	Program Elective	3	-	3
14	MTEE – 603	Energy Efficient Machines	Program Elective	3	-	3
15	MTEE – 604	Power System Planning	Program Elective	3	-	3
16	MTEE – 605	Special Electric Machines	Program Elective	3	-	3
17	MTEE – 606	Industrial Drives & Automation	Program Elective	3	-	3
18	MTEE – 607	Power System Reliability	Program Elective	3	-	3
19	MTEE – 608	High Voltage Engg. and Test Techniques	Program Elective	3	-	3
20	MTEE – 609	Microprocessor and Microcontroller	Program Elective	3	-	3
21	MTEE – 610	Power System Dynamics and Stability	Program Elective	3	-	3
22	MTEE – 611	Power System Transients	Program Elective	3	-	3
23	MTEE – 612	Real Time Instrumentation	Program Elective	3	-	3
24	MTEE - 613	Load and Energy Management	Program Elective	3	-	3
25	MTEE – 614	Modeling and Dynamics of Electrical Machines	Program Elective	3	-	3
26	MTEE – 615	Renewable Energy Resources	Program Elective	3	-	3
27	MTEE – 616	Reliability Engineering	Program Elective	3	-	3
28	MTEE – 617	Optimization Techniques	Program Elective	3	-	3
29	MTEE – 618	Neural Networks & Fuzzy Logic	Program Elective	3	-	3
30	MTEE – 619	Organization and Finance in Power Sector	Program Elective	3	-	3

MTEE – 501 POWER SYSTEM ANALYSIS AND DESIGN

L: 4	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. OVERVIEW

Review of modeling of power system components, formulation and modifications of the Impedance and Admittance matrices, storage techniques.

2. OPTIMAL POWER FLOW

Review of load flow with and without tap changing and phase shifting transformer, load flow for radial (distribution) systems, optimal power flow (OPF) problem formulation and solution techniques.

3. FAULT STUDIES

Three Phase Networks, Three Phase Network Elements, Balanced Network, Transformation Matrices, Three Phase Unbalanced network Elements, Algorithm formation of Three Phase Bus Impedance Matrix, Modification of Three Phase Bus Impedance Matrix for changes in the Network.

4. NETWORK FAULTS AND CEONTINGENCY ANALYSIS

Fault computation using Z – Bus, Short Circuit Calculation for Three Phase Network using z-bus, Contingency analysis for power system.

5. POWER SYSTEM SECURITY

Factors affecting security, Contingency analysis, Network sensitivity using load flow, correcting the generation dispatch by using sensitivity method and linear programming.

6. STATE ESTIMATION IN POWER SYSTEMS

Method of least-squares, State estimation of AC network, Detection and identification of bad measurements, Network observability and pseudo measurements, Application of power system state estimation.

BOOKS RECOMMENDED

1. Grainger J.D., *Power System Analysis*, McGraw-Hill, Inc, Singapore.
2. Wood A.J. and Wollenberg B.F., *Power Generation, Operation and Control*, John Wiley and Sons, New York, USA.
3. Glover J.D. and Sarma, *Power System Analysis and Design*, PWS Publishing Company, Boston, USA.
4. Stagg G. W. and Elabiad A. H., *Computer Methods in Power System Analysis*, McGraw Hill, New York.
5. Pai M. A., *Computer Techniques in Power System Analysis*, Tata McGraw Hill Publishing Co. Ltd.
6. Kusic G.L., *Computer Aided Power System Analysis*, Prentice Hall (India).
7. Arrillaga J., Arnold C.P. and Harker S.J., *Computer Modeling of Electrical Power Systems*, John Willey and Sons 1983.
8. Elgard O.I., *Electric Energy Systems an Introduction*, Tata McGraw Hill, 1971.

Note

1. Eight questions, well distributed out of the entire syllabus, are to be set.
2. Five questions are to be attempted.

MTEE – 502 DIGITAL CONTROL SYSTEMS

L: 4	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. SIGNAL PROCESSING IN DIGITAL CONTROL

Digital control, Configuration of the basic Digital control scheme, Principles of signal conversion, Basic Discrete-Time signals, Time-Domain Models for Discrete Time Systems, Transfer function Model, Stability in the Z-Plane and Jury stability criterion, Sampling as impulse modulation, Sampled spectra and Aliasing, Filtering, Practical aspects of the choice of sampling rate, Principles of Discretization, The Routh stability Criterion.

2. MODELS OF DIGITAL CONTROL DEVICES and SYSTEMS

Z-Domain, Description of Sampled continuous-Time Plants, Z-Domain Description of Systems with Dead Time, Implementation of Digital Controllers, Digital temperature Control System, Digital Position Control System, Stepper motors and their control.

3. DESIGN OF DIGITAL CONTROL ALGORITHMS

Z-Plane specifications of control system design, Digital Compensator Design using frequency response plots, Digital Compensator design using root locus plots, Z- Plane Synthesis.

4. CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS

State Variable representation, Conversion of state Variable models to Transfer functions, Conversion of Transfer functions to Canonical state Variable models, Eigen values and Eigen Vectors, Solution of state equations, Concepts of Controllability and Observability, Equivalence between transfer function and State Variable Representation, Multivariable systems. State descriptions of Digitals Processors, State description of Sampled continuous-Time Plants, State description of Systems with dead Time.

BOOKS RECOMMENDED

1. Raven, F.H., *Automatic Control Engg.* , McGraw Hill Book Company.
2. Shinners, S.M., *Modern Control System Theory and Design*, John Wiley and Sons.
3. Kuo, B.C., *Automatic Control System*, Prentice Hall.
4. Ogata, K., *Modern Control Engineering*, Prentice Hall.
5. Nagrath, I.J., and M. Gopal, Control Systems Engg. John Wiley and Sons.

Note

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MTEE – 503 ADVANCED ELECTRICAL MACHINES

L: 4	**Marks**	**Hrs.**
End Sem. Exam.	100	03
Internal Assessment	50	**

1. POLYPHASE SYNCHRONOUS MACHINES

Mathematical: Basic Synchronous machine parameters, Voltage, Flux linkage and inductance relations, Park's transformation – its physical concept, equations of performance.

2. BALANCED STEADY STATE ANALYSIS

Phasor equations and phasor diagrams, Power-angle characteristics, Cylindrical rotor and Salient pole machines, Short circuit ratio.

3. TRANSIENT ANALYSIS

Three phase short-circuits, Armature and field transients, Transient torque, Sudden reactive loading and Unloading. Transient Analysis-a qualitative approach, Reactance and Time - Constants from equivalent circuits, Measurement of reactance, Transient Power-angle characteristics.

4. SYNCHRONOUS–MACHINE DYNAMICS

The basic electromechanical equation, Linearized Analysis, Large Angular/oscillation, Non-linear analysis.

5. TRANSFORMERS

Multi-Circuit Transformers: General theory, Equivalent circuits, Three winding transformer as a multi-circuit transformers, Determination of parameters.

6. EXCITATION PHENOMENA IN TRANSFORMERS

Harmonics in Single – phase transformers, Harmonics in three-phase transformers, Disadvantages of harmonics, Suppression of harmonics.

7. TRANSFORMER TRANSIENTS

In-rush current phenomena, Qualitative approach, Analytical approach, In-rush current in 3-phase transformers.

8. UNBALANCED OPERATION OF THREE-PHASE TRANSFORMERS

Single-phase load on three-phase transformers, Single-Phasing in 3-phase transformers, Effect of using tertiary winding.

BOOKS RECOMMENDED

1. Edikins B. ,*Generalized theory of electrical Machines*,
2. Concordia, *Synchronous machines*.
3. E.W. Kim bark , *Power System Stability*, Vol. III., Wiley
4. Fitzgerald A.E., Kingsley C. and Umans S.D., *Electric Machinery*, 6th Edition, McGraw Hill
5. Bimbra, P.S.,*Generalized theory of electrical Machines*, Khanna Publications
6. Draper A, *Electrical Machines*, Longman London, 1972
7. MIT Staff, *Magnetic Circuits and Transformer.*
8. Daniels A. R., *Introduction to Electrical Machines*" MacMillan, London 1976.

Note

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MTEE – 504 ADVANCED POWER ELECTRONICS

L: 4	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Power Electronic Systems, Power Semiconductor switches, Basic electrical and magnetic circuit concepts.

2. POWER SUPPLY APPLICATIONS

Switching dc Power Supplies: Introduction, Comparison of Linear power supplies and switching power supplies, dc-dc converters with electrical isolation, Control of SMPS, Power supply protection Electrical isolation in the feedback loop, designing to meet power supply specifications.Power Conditioners and Uninterrupted Power Supplies: Introduction, Power line disturbances, Power Conditioners, Uninterrupted Power Supplies (UPS).

3. OTHER APPLICATIONS

Residential and Industrial Applications: Introduction, Residential Applications and Industrial Applications. Electric Utility Applications: Introduction, HVDC, Static Var Compensators, Interconnection of Renewable Energy Sources and Energy storage Systems to the Utility Grid.

4. PRACTICAL CONVERTER DESIGN CONSIDERATIONS

Snubber Circuits: Types of Snubber circuits, needs of Snubber circuit with diode, thyristor and transistors, Turn-off Snubber, over voltage snubber, turn on snubber, Snubber for bridge circuit configurations, GTO Snubber circuit. Gate and Basic Drive Circuits: Design Consideration, De-coupled drive circuits, electrically isolated drive circuits, cascade connected drive circuits, Power device protection in drive circuits, circuit layout considerations. Component Temperature Control and Heat Sinks: Control of semiconductor device temperatures, Heat transfer by conduction, Heat sinks, Heat transfer by radiation and convection.

BOOKS RECOMMENDED

1. Mohan, Undeland and Robbins, *Power electronics: converters, Applications and Design*, John Wiley and Sons.
2. Rashid M.H., *Power Electronics Handbook*, Elsevier Press (Academic Press Series).
3. Finney D., *the Power Thyristor and its Applications*, McGraw Hill, New York.
4. Lander C. W. *Power Electronics*, McGraw Hill Book Co., U.K.
5. Rashid M.H., *Power Electronics* - Circuits, Devices and Applications, PHI, India.

Note

1. Eight questions, well distributed out of the entire syllabus, are to be set.
2. Five questions are to be attempted.

MTEE – 505 ADVANCED RELAYING AND PROTECTION

L: 4	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. PROTECTIVE RELAYING

Relay terminology, Definitions, Classification, electromechanical, static and digital-numerical relays. Design-factors affecting performance of a protection scheme for various faults, Instrument transformers for protection.

2. RELAY SCHEMATICS AND ANALYSIS

Over Current Relay-Instantaneous/Inverse Time –IDMT Characteristics; Directional Relays; Differential Relays- Restraining Characteristics; Distance Relays: Types- Characteristics.

3. PROTECTION OF POWER SYSTEM EQUIPMENTS

Generator, Transformer, Transmission Systems, Bus bars, Motors; Pilot wire and Carrier Current Schemes.

4. SYSTEM GROUNDING

Ground faults and protection; Load shedding and frequency relaying; Out of step relaying; Re-closing and synchronizing.

5. BASIC ELEMENTS OF DIGITAL PROTECTION

Digital signal processing – Digital filtering in protection relay – digital data transmission – Numeric relay hardware – relay algorithm – distance relays – direction comparison relays – differential relays – software considerations – numeric relay testing –concept of modern coordinated control system.

6. INTEGRATED AND MULTIFUNCTION PROTECTION SCHEMES

SCADA based protection systems, Testing of Relays.

BOOKS RECOMMENDED

1. John A T and Salman A K, *Digital protection for power systems-IEE power series-15*, Peter Peregrines Ltd,UK,1997
2. Mason C.R., *The art and science of protective relaying*, John Wiley &sons, 2002
3. Reimert Donald, *Protective relaying for power generation systems*, Taylor & Francis-CRC press 2006
4. Gerhard Ziegler, *Numerical distance protection*, Siemens, 2nd edition, 2006
5. Warrington A.R., *Protective Relays*, Vol .1&2, Chapman and Hall, 1973
6. T S.Madhav Rao, *Power system protection static relays with microprocessor applications*, Tata McGraw Hill Publication, 1994
7. Badri Ram , D.N. Vishwakarma, *Power system protection and switch gear*, Tata McGraw Hill, 2001
8. Blackburn, J. Lewis, *Protective Relaying, Principles and Applications*, Marcel Dekker, Inc., 1986.
9. Anderson, P.M, Power System Protection, McGraw-Hill, 1999

Note

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2. Five questions are to be attempted.

MTEE – 506 POWER SYSTEM OPERATIONS AND CONTROL

	Marks	Hrs.
L: 4		
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Characteristics of power generation units(thermal, nuclear, hydro, pumped hydro), variation in thermal unit characteristics with multiple valves, Economic dispatch with and without line losses, lambda iteration method, gradient method, Economic dispatch without line losses, economic dispatch with line losses, lambda iteration method, gradient method, Newton's method, base point and participation factors

2. TRANSMISSION LOSSES

Coordination equations, incremental losses, penalty factors, B matrix loss formula (without derivation), methods of calculating penalty factors.

3. UNIT COMMITMENT

Constraints in unit commitment, priority list method, Dynamic programming method and Lagrange relaxation methods.

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 method and gradient method

5. GENERATION WITH LIMITED ENERGY SUPPLY

Take or pay fuel supply contract, composite generation production cost function, gradient search techniques.

6. OPTIMAL POWER FLOW FORMULATION

Gradient and Newton method, linear programming methods.

7. AUTOMATIC VOLTAGE REGULATOR

Load frequency control, single area system, multi-area system, tie line control.

BOOKS RECOMMENDED

1. Kothari D.P. and Dhillon J.S., *Power System Optimization*, Prentice-Hall of India Pvt. Ltd. New Delhi
2. G L.K .Kirchmayer, *Economic Operation of Power Systems*, John Willey and Sons, N.Y.
3. Wood A.J, Wollenberg B.F , *Power generation operation and control*
4. Kothari D.P. and Nagrath I.J., Modern Power System Analysis ,Tata McGraw-Hill Publishing Company Ltd., New Delhi

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MTEE – 507 POWER SYSTEM SOFTWARE LAB – I

P: 2	**Marks**
Viva-voce	50
Internal Assessment	50

Development of algorithms & flowcharts and digital simulation of the following using ETAP/MATLAB Software package:

1. Z-bus and Y-bus formulation
2. Load flow studies
3. Fault analysis
4. Transient stability studies

MTEE – 508 INDUSTRIAL AUTOMATION LAB – II

P: 2	**Marks**
Viva-voce	50
Internal Assessment	50

1. Programmable Logic Controller (PLC) –General introduction, basic concepts, different types of programming: ladder programming. Instruction List programming, High level programming, flow diagram programming.
2. Simple introductory programs.
3. Use of PLC for: Simple domestic or commercial lighting automation, water level control.
4. Industrial applications of PLC using Timer and Counter Function.
5. Study & use of SCADA Software for different process control systems.

BOOKS RECOMMENDED

1. Control Engg.-by Noel M. Morris.
2. Industrial Electronics-by Thomas E. Kissell, PHI, N. Delhi.

MTEE – 601 RESEARCH METHODOLOGY

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. METHODS OF RESEARCH

Nature and Objectives of research; historical, descriptive and experimental. Study and formulation of research problem. Scope of research and formulation of hypotheses; Feasibility, preparation and presentation of research proposal.

2. INTRODUCTION TO STATISTICAL ANALYSIS

Measures of central tendency and dispersion: Mean median, mode, range, mean deviation and standard deviation. Regression and correlation analysis. Probability and probability distributions; Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Normal and Log-normal distribution. Basic ideas of testing of hypotheses; Tests of significance based on normal, t and Chi-square distributions. Analysis of variance technique.

3. DESIGN OF EXPERIMENTS

Basic principles, study of completely randomized and randomized block design. Edition and tabulation of results, presentation of results using figures, tables and text, quoting of references and preparing bibliography. Use of common software like SPSS, Mini Tab and/or Mat Lab. For statistical analysis.

BOOKS RECOMMENDED

1. Borth Wayne C., *the Craft of Research*, Chicago Guides to Writing Edition and Publishing.
2. Johnson R.A., *Probability and Statistics*, PHI, New Delhi.
3. Meyer P.L., *Introduction to Probability and Statistical, Applications*, Oxford, IBH.
4. Hogg, R.V. and Craig A.T., *Introduction to Mathematical Statistics*, MacMillan.
5. Goon, A.M., Gupta, M.K. and Dasgupta, *Fundamentals of Statistics*, Vol. I: World Press.
6. Gupta, S.C. and Kapoor V.K., *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons.

Note

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2. Five questions are to be attempted.

MTEE – 602 EHVAC AND HVDC TRANSMISSION SYSTEM

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. OVERVIEW
Comparison of EHV AC and DC transmission, description of DC transmission systems, modern trends in AC and DC transmission.

2. EHV AC SYSTEMS
Limitations of extra-long AC transmission, Voltage profile and voltage gradient of conductor, Electrostatic field of transmission line, Reactive Power planning and control, traveling and standing waves, EHV cable transmission system.

3. STATIC VAR SYSTEM
Reactive VAR requirements, Static VAR systems, SVC in power systems, design concepts and analysis for system dynamic performance, voltage support, damping and reactive support.

4. HVDC SYSTEM
Converter configurations and their characteristics, DC link control, converter control characteristics; Monopolar operation, converter with and without overlap, smoothing reactors, transients in DC line, converter faults and protection, HVDC Breakers.

5. CORONA AND INTERFERENCE
Corona and corona loss due to EHV AC and HVDC, Radio and TV interference due to EHV AC and HVDC systems, methods to reduce noise, radio and TV interference.

6. HARMONIC FILTERS
Generation of harmonics, design of AC filters, DC filters.

7. POWER FLOW ANALYSIS IN AC/DC SYSTEMS
Component models, solution of DC load flow, per unit system for DC quantities, solution techniques of AC-DC power flow equations, Parallel operation of HVDC/AC systems, Multi terminal systems.

BOOKS RECOMMENDED

1. Padiyar K.R., *HVDC Power Transmission Systems*, Wiley Eastern Ltd., New Delhi
2. Kim bark E., *Direct Current Transmission*, Vol-I, John-Wiley and sons, NY
3. Arrillaga J., *HVDC Transmission*, IEE Press, London.
4. Begamudre R.D., *EHV AC Transmission Engineering*, Wiley Eastern Press.
5. Arrillaga J. and Smith B.C., *AC-DC Power System Analysis*, IEE Press, London

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2. Five questions are to be attempted.

MTEE – 603 ENERGY EFFICIENT MACHINES

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Energy efficient machines, energy cost and two part tariff, energy conservation in industries and agricultural sector -a necessity, introduction to energy management and energy audit system. Review of induction motor characteristics.

2. ENERGY EFFICIENT MOTORS

Standard motor efficiency, energy efficient motor, efficiency determination methods, Direct Measurement method, Loss segregation method, Comparison, motor efficiency labeling, energy efficient motor standards.

3. POWER FACTOR

The power factor in sinusoidal systems, power factor improvement, and power factor with nonlinear loads, Harmonics and the power factor

4. APPLICATION OF ELECTRIC MOTORS

Varying duty applications, Voltage variation, Voltage Unbalance, over motoring, Poly-phase induction motors supplied by adjustable frequency power supplies.

5. INDUCTION MOTORS AND ADJUSTABLE DRIVE SYSTEMS

Energy Conservation, adjustable speed systems, Application of adjustable speed systems to fans, pumps and constant torque loads.

6. ECONOMICS OF ENERGY EFFICIENT MOTORS AND SYSTEMS

Motor life cycle, Direct Savings and pay back analysis, efficiency evaluation factor, 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. Thuman Albert, *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. Belove Charles, *Handbook of Modem Electronics and Electrical Engineering*, John Wiley and Sons.

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2. Five questions are to be attempted.

MTEE – 604 POWER SYSTEM PLANNING

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Power System planning, objective, stages in planning and design, Key indices of power system reliability and their calculations, Linkage between reliability and capacity planning.

2. GENERATING SYSTEM CAPABILITY PLANNING

Probabilistic models of generating units, growth rate, Rate of generation capacity, Outage performance and system evaluation of loss of load and loss of energy indices, Power supply availability assessment.

3. INTERCONNECTED SYSTEMS

Multi area reliability analysis, Power pool operation and power exchange energy contracts, quantification of economic and reliability benefits of pool operation.

4. DEMAND/ENERGY FORECASTING

Electricity consumption pattern, Peak demand and energy forecasting by trend and economic projection methods.

5. POWER SYSTEM EXPANSION PLANNING

Formulation of least cost optimization problem involving capital, operation and maintenance costs of candidate units of different types.

6. INVESTMENT PLANNING MODELS

Traditional generation expansion planning models, integrated resource planning models, production cost simulation models.

BOOKS RECOMMENDED

1. Wallach Y., *Power System Planning*, McGraw Hill International.
2. Sullivan P., *Power System Planning*, McGraw Hill International
3. Dasari, S., *Electric Power System Planning*, IBT Publishers, New Delhi.
4. Billinton R., *Power System Reliability Calculation*, MIT Press, USA
5. Endreyni, *Reliability Modeling in Electric Power System*, John Wiley, New York
6. McDonald J.R., *Modern Power system Planning*, McGraw Hill International

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MTEE – 605 SPECIAL ELECTRIC MACHINES

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. SPECIAL AC MACHINES

Constructional aspects, design and analysis of reluctance, shaded pole, hysteresis, printed circuit, and claw motors, Servomotors and A.C. tacho-generators, Introduction of permanent magnet materials. Angled field and axial field devices; cross-field machines, special forms of rotating amplifiers. Electromagnetic clutches coupling and brakes, Eddy current devices.

2. LINEAR MACHINES

Linear devices and actuators, Linear electric machines: Classification, application, constructional aspects, design and method of analysis of various types, Goodness factor. Transverse-edge, entry-end, exit end, short primary, short secondary effects in linear electric motors, Force, energy and power LEM's for low speed medium speed and high speed applications. Electromagnetic levitation and guidance schemes-attraction, repulsion

3. ADVANCED MOTORS AND DRIVE SYSTEMS

Principle, construction, operation and drive application of Square wave Permanent Magnet (PM) brushless motor drives, sine wave PM brushless motor drives, PM and synchronous reluctance based motors, switched reluctance motors, Energy efficient motors.

BOOKS RECOMMENDED

1. Bose B.K., *Power Electronics and variable frequency drives*, Prentice Hall, New Jersey.
2. Miller T.J.E., *Brushless permanent magnet and reluctance motor drives*, Oxford University Press, UK
3. Nasar S.A., *Linear induction motor*, John Wiley, New York
4. Andreas J.C., *Energy Efficient Motors*, Marcel Dekker
5. Murphy J.M.P., *Power Electronics control of AC Drives*, Pergamon Press

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MTEE – 606 INDUSTRIAL DRIVES AND AUTOMATIONS

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Definition, Types of loads, steady state and transient stability of Drive, state of art of power electronics and drives, selection of motor rating.

2. D.C. DRIVES

Review of braking and speed control of D.C. motors, multi-quadrant operation, and loss minimization in adjustable speed drives. Mathematical modeling of dc drives, stability analysis, modern control techniques: variable structure, adaptive control.

3. INDUCTION MOTOR DRIVES

Review of braking and speed control of induction motors. Constant V/F, constant air gap flux, controlled voltage, controlled current and controlled slip operation, vector control, Mathematical modeling of induction motor drives, transient response and stability analysis Introduction to cycloconverter fed induction motor drive.

4. SYNCHRONOUS MOTOR DRIVES

Adjustable frequency operation, voltage fed drive, current fed self-controlled drive.

5. AUTOMATION USING DRIVES

Introduction, various components of automation, different sensors used in automation, PLC introduction and ladder programming, industrial application of automation, sensor less vector control and DTC drive, Recent trends in automation and case studies.

BOOKS RECOMMENDED

1. Dubey G.K., *Power Semiconductor Controlled Drive*, Prentice Hall, New Jersey
2. Sen. P.C., *Thyristor Controlled DC Drives*, Wiley, New York.
3. Murphy J.M.D. and Turnbull F.G., *Power Electronics Control of AC Motors*, Franklin Book Co.
4. Bose B.K., *Power Electronics and AC Drives*, Prentice Hall, New Jersey
5. Bose B.K., *Power Electronics and Variable Frequency Drives-Technology and applications*, IEEE Press.

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2. Five questions are to be attempted.

MTEE – 607 POWER SYSTEM RELIABILITY

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. PROBABILITY AND RELIABILITY

Review of probability concepts, probability distributions, applications of binomial distribution to engineering problems, probability distribution in reliability evaluation, reliability indices, network modeling and evaluation of simple and complex networks, system reliability evaluation using probability distributions, frequency and load duration techniques, key indices of power system reliability and their calculations.

2. GENERATION SYSTEM RELIABILITY EVALUATION

Concept of loss of load probability (LOLP), Energy demand, EDNS (Energy demand not served), Evaluation of these indices for isolated systems, generation system, reliability analysis using the frequency and duration techniques.

3. TRANSMISSION SYSTEM RELIABILITY EVALUATION

Evaluation of LOLP and EDNS, indices for an isolated transmission system, interconnected system reliability, bulk power system reliability.

4. DISTRIBUTION SYSTEM RELIABILITY EVALUATION

Reliability analysis of radial systems with switching.

BOOKS RECOMMENDED

1. Billinton R., *Power System Reliability Calculation*, MIT Press, USA
2. Endreyni, *Reliability Modeling in Electric Power System*, John Wiley, New York

Note

1. Eight questions, well distributed out of the entire syllabus, are to be set.
2. Five questions are to be attempted.

MTEE – 608 HIGH VOLTAGE ENGINEERING AND TEST TECHNIQUES

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Power Systems Development and High Voltage Engineering; Contents of High Voltage Engineering; Applications of High Voltage Technology.

2. TRAVELING WAVES

Transient and traveling waves; Effects of Line Terminations; Junction of several lines; Bewley Lattice Diagram; Traveling wave in transformer and generator.

3. LIGHTNING IN POWER SYSTEMS

Lightning formation; Lightning over voltages (strike and back flashover) in power systems; Lightning over voltages protection devices in power systems; Lightning protection system of high buildings.

4. SWITCHING OVER VOLTAGES

Types of internal over voltages; the importance of switching over voltages; Causes of various internal over voltages; Control of switching over voltages; EMTP and its applications.

5. ARRESTERS AND INSULATION COORDINATION

Surge arresters (MOA) and its performances; Voltage-Time Characteristics and coordination; Surge arresters selection and location in power systems; Principles of insulation coordination; Statistical and conventional insulation coordination.

6. HIGH VOLTAGE CABLES

Configuration and design features of high voltage cables; Testing of high voltage cables; Diagnostics of high voltage cables.

7. AIR AND SF6 BREAKDOWN

Fundamental aspects of air and SF6 breakdown, U-curve and gap factor; Spark over characteristics; SF6 gas insulation performance.

8. GAS INSULATED SUBSTATION

Gas Insulated Substation (GIS) and its importance; Configuration and design features of GIS; Prospects of GIS.

9. HIGH VOLTAGE TEST OF ELECTRICAL APPARATUS

Nondestructive insulation testing; Destructive insulation testing: AC, DC, and Impulse testing of apparatus; New high voltage measurement technology; Safety in high voltage lab. Applications of high voltages technology in other area.

BOOKS RECOMMENDED

1. Khalifa M., *High-Voltage Engineering*, Theory and Practice, Marcel Dekker, Inc.
2. Ryan H.M., *High Voltage Engineering and Testing*, IEE Press
3. Gonen T., *Electric Power Distribution System Engineering*: Analysis and Design, McGraw Hill Book Co.

Note

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MTEE – 609 MICROPROCESSOR AND MICROCONTROLLERS

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. MICROPROCESSOR

8086 Internal Architecture, Addressing modes, program development steps, 8086 instruction set, Assembler directives, Assembly language, program development tools.

2. PROGRAMMING OF 8086

Simple sequence programs, jumps, flags, conditional Jumps, IF-THEN, IF- THEN-ELSE, Multiple IF-THEN-ELSE, WHILE-DO, REPEAT-UNTIL, Instruction Timing and delay loops, strings, procedures, Macros.

3. PERIPHERAL INTERFACING

Parallel versus serial transmission, synchronous and asynchronous serial data transmission. Interfacing or hexadecimal keyboard and display unit, parallel, serial interface Standards.

4. MICROPROCESSOR APPLICATIONS TO POWER ENGINEERING

Protective Relaying: over- current, impedance, MHO, reactance, bi-directional relays.

5. MEASUREMENTS

Frequency, power angle and power factor, Voltage and Current, kVA, kW, and kVAR, maximum demand. Resistance, Reactance, Temperature Controls.

6. Microcontroller: PICi8 family

Microcontroller, architecture, Addressing Modes, Timers, Counters, Interrupts, Serial Communication, Instruction Set and Programming Concepts and applications to Electric Drive Systems

BOOKS RECOMMENDED

1. Rafiquzzaman, *M. Theory and Applications*, Prentice Hall (India) Publications 1993
2. Ram B, *Fundamentals of Microprocessors and Microcomputers*, Dhanpat Rai and Sons,
3. Hall, Douglas V. *Microprocessors and interfacing: Programming and Hardware*, Tata McGraw hill
4. Brey, Barry B., *The INTEL Microprocessors 8086/88, 80186, 286, 386, 486, Pentium Pro Processors, Architecture, Programming and Interfacing*, 4th Edition, Prentice Hall (India)
5. Ray A.K. and Bhurchandi K.M., *Advanced Microprocessors and Peripherals*, Tata McGraw Hill.
6. Mazidi M.A. et. al. *The PIC- Micro-controller and Embedded Systems*, Pearson Publication
7. Gaonkar R. S., *Fundamentals of Microcontrollers and Applications in Embedded Systems with PIC*, Thomson learning

Note

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MTEE – 610 POWER SYSTEM DYNAMICS AND STABILITY

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. OVERVIEW

Angular Stability, Transient stability, steady state stability, dynamic stability, Small Signal, Voltage Stability

2. MODELING OF POWER SYSTEM COMPONENTS

Generators (Non-linear and linear models using d-q transformation, power capability curve); Excitation System (IEEE standard models); Turbine and Speed governing System; Loads (Induction motors and composite loads)

3. TRANSIENT STABILITY ANALYSIS

Single Machine - Infinite Bus System; Equal Area Criterion; Multi-machine Stability; Network Reduction and Numerical Integration Methods; Methods of Improvement

4. SMALL SIGNAL STABILITY ANALYSIS

Eigen Value and Participation Factor Analysis; Single machine - Infinite Bus and Multi machine Simulation; Effect of Excitation System and AVR; Improvement of Damping - Power System Stabilizer and SVS supplementary controls

5. SUB SYNCHRONOUS OSCILLATIONS

Sub Synchronous Resonance (SSR) Phenomenon; Counter measures to SSR problems

6. VOLTAGE STABILITY

P-V and Q-V curves, Impact of Load and Tap-changer Dynamics; Static Analysis, Sensitivity and Continuation Methods; Dynamic Simulation, Introduction to Bifurcation Analysis; Proximity Indices, Methods to enhance Stability Margin.

BOOKS RECOMMENDED

1. Kundur P, *Power System Stability and Control*, McGraw Hill.
2. Taylor C.W., *Power System Voltage Stability*, McGraw Hill
3. Anderson P.M. and Foud A. A., *Power System Control and Stability*, IEEE Press
4. Kim bark E., *Power System Stability*, Vol. I, II and III, IEEE Press.

Note

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2. Five questions are to be attempted.

MTEE – 611 POWER SYSTEM TRANSIENTS

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. ORIGIN AND NATURE OF TRANSIENTS AND SURGES

Surge parameters of plant. Equivalent circuit representations. Lumped and distributed circuit transients.

2. LINE ENERGIZATION AND DE-ENERGIZATION TRANSIENTS

Earth and earth wire effects. Current chopping in circuit breakers. Short line fault condition and its relation to circuit breaker duty. Trapped charge effects. Effect of source and source representation in short line fault studies. Control of transients.

3. LIGHTNING PHENOMENON

Influence of tower footing resistance and earth resistance. Traveling waves in distributed parameter multi-conductor lines, parameters as a function of frequency. Simulation of surge diverters in transient analysis. Influence of pole opening and pole re-closing.

4. INSULATION CO-ORDINATION

Over voltage limiting devices, dielectric properties, breakdown of gaseous insulation, tracking and erosion of insulation, high current arcs, and metallic contacts.

5. COMMUNICATION LINKS

PLCC, Microwave, Telephone line, Satellite, Fiber optic. Requirements of' various communication equipment used in power systems. Computer networking in power systems.

BOOKS RECOMMENDED

1. Vanikov V.A., *Transients in Power System*, Mir Publications, Moscow
2. Bewley; L.V., *Traveling Waves on Transmission Lines*, Dover Publications Inc., New York
3. Arora Ravindera and Mosch Wolfgang, *High Voltage Insulation Engineering*, New Age International Publishers Limited.
4. Greenwood A., *Electrical Transients in Power Systems*, John Wiley & Sons,
5. Stallings William, *Data and Computer Communication*, PHI, 1994.
6. Gowar John,*Optical Communications Systems* , PHI, 1993
7. R.E. Collin ,Foundations of Microwave Engineering.
8. Theodore S. Rappaport, Wireless communication, Principles and Practice, IEEE Press; PTR 1996

Note

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MTEE – 612 REAL TIME INSTRUMENTATION

	Marks	Hrs.
L: 3		
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Static and Dynamic characteristics, Error analysis; transducers and sensors; their characteristics and parameters; role of instrumentation in monitoring, control and industrial automation.

2. SIGNAL CONDITIONING

Amplifiers, multiplexers and dividers, timer multiplexers, Signal converters, ADC and DAC, Signal conditioning, digital signal conditioning, transmission of digital signals, Telemetry methods and errors, PLCC, AM, FM, PAM, PWM, PCM Techniques.

3. DATA ACQUISITION SYSTEM

Role of dedicated computers, analog and digital control, computer systems for real time applications, distributed and supervisory control, SCADA and its organization and structure, centralized, hierarchical and decentralized control schemes, man machine interface, energy management system.

4. REAL TIME CONTROL APPLICATIONS

Instrumentation and conditioning of drive signals, data acquisition of drive system, energy management system for AGC, VAR Control, state estimation, security monitoring, economic dispatch, on line load management. Power system digital relaying, Power plant instrumentation.

BOOKS RECOMMENDED

1. Torsten Cegrell, *Power System Control Technology*, PHI, India.
2. Kusic C. L., *Computer Aided Power System Analysis*, TMH, New Delhi
3. Wood A. J. and Wollenberg B., *Power generation operation and control*, John Wiley.
4. Cerni R.H and Foster L.E., *Instrumentation for Engineering Management*, John Wiley and Sons

Note

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MTEE – 613 LOAD AND ENERGY MANAGEMENT

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. LOAD FORECASTING

Classification and characterization of loads, Approaches to load forecasting, Forecasting methodology, Energy forecasting, Peak demand forecasting, Non-weather sensitive forecast and Weather sensitive forecast, Total forecast, Annual and monthly peak demand forecasts. Applications of state estimation to load forecasting.

2. LOAD MANAGEMENT

Introduction to Load management. Electric energy production and delivery system structure (EEPDS). Design alternatives for EEPD systems. Communication/control techniques for load management. Tariff structure and load management, principles of macro and microeconomics and energy pricing strategies, Assessing the impacts of load management.

3. ENERGY DEMAND FORECASTING

Static and dynamic analysis of energy demand, elements of energy demand forecasting, methodologies and models for energy demand forecasting, techno-economic approach in energy demand forecasting.

4. TRENDS AND CASE STUDIES

Energy management strategy, symbiotic relation between information, energy models and decision making, case studies like industrial energy forecasting, transportation energy forecasting, residential, commercial and agricultural energy forecasting.

BOOKS RECOMMENDED

1. Martino J., *Technological Forecasting for Decision Making*, Elsevier Press, New York.
2. Gellings C.W. and Penn Well P.E., *Demand Forecasting in the Electric Utility Industry*, Fairmount Press.
3. Makridakis S., *Forecasting Methods and Applications*, Wiley

Note

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MTEE – 614 MODELING AND DYNAMICS OF ELECTRICAL MACHINES

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Challenges in computer simulations, Mechanics of simulation, solution techniques for time domain analysis, introduction of widely used circuit- oriented simulators like pSpice, MATLAB, PSIM, equation solvers, simulation of power electronics circuits and converters.

2. DYNAMIC CONDITIONS

Concept, constraints and considerations; modeling and performance simulation methods, concept of reference frame, generalized transformation, formulation of dynamic equations of a generalized machine in arbitrary reference frame.

3. D.C. MACHINES DYNAMICS

Ideal machine; dynamic equation; transfer function and block diagram; linear analysis of D.C. generators; effects of saturation; analysis and performance under disturbances. Switching and surge voltage transients in transformers.

4. INDUCTION MACHINES

Transients and dynamics; basic electro mechanical equations; linearized and non-linearized analysis; operation on harmonic supplies; unbalanced operation.

5. SYNCHRONOUS MACHINE TRANSIENTS

Coupled circuit viewpoint; approximate physical picture; equivalent circuit under transient conditions and its applications; synchronous motor operation with variable/fixed load torque and excitation; equal-area criterion for the study of transient stability.

BOOKS RECOMMENDED

1. Krause P.C., *Electric Machinery*, McGraw Hill
2. Kimbark E.W., *Power System Stability* Vol 3 Synchronous Machine, John Wiley and Sons
3. Concordia C., *Synchronous machines*, Theory and Performance, John Wiley and Sons.
4. Adkins B. and Harley R. G., *The General theory of Alternating Current Machines*, Chapman and Hall.
5. Ong Chee Mun, Dynamic Simulation of Electric Machinery using Mat Lab and Simulink, Pentice Hall (India), New Jersey

Note

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MTEE – 615 RENEWABLE ENERGY RESOURCES

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. ENERGY RESOURCES

Renewable energy sources, Energy and Global Climate Change energy parameters, atmospheric aspects of electric energy generation, Impact of renewable energy generation on environment, Electromagnetic Radiation from Extra High Voltage Overhead lines

2. SOLAR ENERGY

Solar Radiation and its Measurement, Solar Thermal Energy Collectors, Solar Thermal Energy Conversion Systems, Solar Photovoltaic System.

3. WIND ENERGY

Wind turbines and rotors, Modes of Wind Power Generation, Estimation of Wind Energy Potential, Selection of Optimum Wind Energy Generator (WEG), Economics of Wind Farms

4. GEOTHERMAL ENERGY

Structure of the Earth's Interior, Geothermal Sites, Geothermal Field, Geothermal Resources, Geothermal Electric Power Plant.

5. OCEAN ENERGY

Development of a Tidal Power Scheme, Grid Interfacing of Tidal Power, Principle of Wave Energy plant, Wave Energy Conversion Machines

6. FUEL CELLS

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

7. HYDROGEN ENERGY SYSTEM

Hydrogen Production, Hydrogen Storage, Development of Hydrogen Cartridge, Gas Hydrate

8. HYBRID ENERGY SYSTEMS

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

BOOKS RECOMMENDED

1. Kothari DP, Singal KC and Ranjan Rakesh, *Renewable energy sources and emerging technologies*, 2nd edition, Prentice Hall (India)
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 1990.
4. Abbasi SA, Abbasi N, *Renewable energy sources andtheir environmental impact*, PHI, 2001
5. Mittal KM, *Renewable energy Systems*, Wheelar Publishing, New Delhi, 1997
6. Mukherjee D, *Renewable energy Systems*, New Age International, New Delhi, 2004

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MTEE – 616 RELIABILITY ENGINEERING

L: 3	**Marks**	**Hrs.**
End Sem. Exam.	100	03
Internal Assessment	50	**

1. RELIABILITY MATHEMATICS

Random experiments, probability, random variables, distribution functions, discrete distributions, Continuous distributions.

2. NETWORK MODELLING AND RELIABILITY EVALUATION OF SIMPLE SYSTEMS

Series systems, parallel system, series-parallel systems, partially redundant systems, standby redundant systems.

3. NETWORKS AND RELIABILITY EVALUATION OF COMPLEX SYSTEMS

Cut set method, Tie-set method, Connection matrix techniques, Event trees, Fault trees.

4. PROBABILITY DISTRIBUTIONS IN RELIABILITY EVALUATION

General reliability function, Poisson distribution, normal distribution, exponential distribution.

5. DISCRETE MARKOV CHAINS

General modelling Concept, Stochastic transitional prob. matrix, Time dependent prob. evaluation, Limiting state Prob. evaluation, Absorbing States.

6. CONTINUOUS MARKOV PROCESSES

General modelling concepts, state space diagrams, Stochastic transitional probability matrix, Evaluating limiting state probabilities.

BOOKS RECOMMENDED

1. L.S. Srinath, Reliability Engineering, Affiliated East –West Press Pvt. Ltd., New Delhi.
2. E. Balagurusamy, Reliability Engineering, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. R. Billinton & Ronald N. Allan ,Reliability Evaluation of Engg. Systems: Concepts & Techniques, Plenum Press, N.Y. and London.

Note

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MTEE – 617 OPTIMIZATION TECHNIQUES

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION TO OPTIMIZATION

Statement of an optimization problem, Classification of optimization problems, Optimization techniques, Engg. applications of optimization.

2. CLASSICAL OPTIMIZATION TECHNIQUES

Single variable optimization, Multivariable optimization with no constraints, Multivariable optimization with equality constraints, Multivariable optimization with in equality constraints.

3. LINEAR PROGRAMMING

Standard form of linear programming ,Graphical solution, Simplex method, Two phase simplex method, Computer implementation of the simplex method, Duality theory.

4. TRANSPORTATION PROBLEM

North-West Corner rule, Least cost method, Vogel approximation method, testing for optimality.

5. NON-LINEAR PROGRAMMING: ONE–DIMENSIONAL MINIMIZATION METHODS

Unimodal function, Dichotomous search, Fibonacci search, Quadratic interpolation method, Cubic interpolation method.

6. NON-LINEAR PROGRAMMING-UNCONSTRAINED OPTIMIZATION TECHNIQUES

Random search method, Steepest descent method, Conjugate gradient method, Variable metric method.

7. NON-LINEAR PROGRAMMING-CONSTRAINED OPTIMIZATION TECHNIQUES

Interior Penalty function method, Exterior penalty function method.

BOOKS RECOMMENDED

1. S.S. Rao,Optimization : Theory and applications, Wiley Eastern Ltd.
2. G.V. Reklaitis, Engg. optimization Methods & applications, Wiley.

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MTEE – 618 NEURAL NETWORKS & FUZZY LOGICS

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. INTRODUCTION

Neural networks characteristics, History of development in neural networks principles, artificial neural net terminology , Model of a neuron, Topology, Learning, types of learning, Supervised, Unsupervised, Re-enforcement learning. Knowledge representation and acquisition.

2. ALGORITHMS & MODELS

Basic Hop filed model, Basic learning laws, Unsupervised learning, Competitive learning, K-means clustering algorithm ,Kohonen's feature maps.

3. NEURAL NETWORKS

Radial basis function neural networks, Basic learning laws in RBF nets, Recurrent back propagation, Introduction to counter propagation networks, CMAC network and ART networks.

4. APPLICATIONS

Application of neural nets such as pattern recognition, Optimization, Associative memories, speech and decision-making. VLSI implementation of neural networks.

5. FUZZY LOGICS

Basic concepts of fuzzy logic, Fuzzy vs. Crisp set, Linguistic variable, Membership functions, Operations of fuzzy sets, Fuzzy IF-THEN rules, Variable inference techniques, De-Fuzzification ,Basic fuzzy inference algorithm, Fuzzy system design, FKBC & PID control , Antilock Breaking system(ABS), Industrial applications.

BOOKS RECOMMENDED

1. Neural Networks-by Simon Haykin.
2. Fuzzy logic with engineering application-by ROSS J.T.
3. Neural Networks & Fuzzy Logic –by Bart Kosko.
4. Neural computing theory & practice-by P.D. wasserman (ANZA PUB).
5. Introduction to applied Fuzzy Electronics-Ahmed M. Ibrahim (PHI).
6. Introduction to artificial neural systems-by J.M. Zurada.(Jaico Pub).
7. An Introduction to Fuzzy control-by D. Driankor ,H. Hellendorn, M. Reinfrank (Narosa Pub).
8. Fuzzy Neural Control-by Junhong NIE& DEREK LINKERS(PHI).
9. Related IEEE/IEE Publications.
10. Fuzzy System Design Principles, Buildidng Fuzzy IF-THEN Rule Bases-by Riza C. Berkiu & Trubatch, IEEE Press.

Note

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MTEE – 619 ORGANIZATION AND FINANCE IN POWER SECTOR

L: 3	Marks	Hrs.
End Sem. Exam.	100	03
Internal Assessment	50	**

1. MANAGEMENT AND ITS GOALS

Organization and Management; The management process; Managerial skills and Managerial performance; Policy and Objectives of a Power Utility; The Goal of a Firm.

2. UTILITY FINANCIAL ACCOUNTING

Balance Sheet, Income Statements and Cash Report; Depreciation; Interest charges during construction; Financial Statement Analysis.

3. INVESTMENT PROPOSAL

Interest and compounding; Measure of price - public versus private perspective; Economic evaluation of investment proposal; Internal Rate of return, Pay-Back Period

4. LEVELIZED COSTS OF GENERATION

Generating system costs; Basic concept of cost levelization; Levelized bus bar cost.

5. UTILITY ORGANIZATION

Functional structure; Divisional Structure; Matrix structure; Hybrid structure.

6. INDUSTRY STATUS AND TRENDS

Main concerns of electric utilities; Performance of electric utilities; Power Sector changes; Dynamic, spot and real time pricing; Regulatory aspects - towards deregulation; System Planning under Evolving Utility Structures Computerized Management Game.

BOOKS RECOMMENDED

1. Bartol K. M. and David C., *Management*, Martin McGraw-Hill, INC.
2. Weston J.F., *Brigham Essential of Managerial* Finance, Dryden Press
3. Stoll, *Least-Cost Electric Utility Planning*, John Wiley.
4. Stickney C.P. and Weil R.L., *Financial Accounting*, Dryden Press
5. Berrie T.W., *Electricity Economics and Planning*, IEE Power Series.
6. Levy H. and Sarnat M., *Capital Investment and Financial Decisions*, Prentice Hall

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2. Five questions are to be attempted.