Civil Engineering

Program Outcomes (PO)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

1. **Understanding**
   Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.
2. **Broadness and Diversity**
   Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage
3. **Self-Learning and Service**
   Graduates will be motivated for continuous self-learning in engineering practice and/or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.

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Course Outcome

After completing this course the student must demonstrate the knowledge and ability to:

S No	Course Code	Course Name	Course Outcomes
1	CE-14301	Engineering Mathematics-III	1. Decompose periodic functions or periodic signals into the sum of a (possibly infinite) set of simple oscillating functions namely sines and cosines (or complex exponentials). 2. Apply De-Moivre's theorem to basic functions of complex variables 3. Use power series method to solve differential equation and its application to Bessel's and Legendre's equations. 4. Analyze Partial differential equations and learn simplest means to solve them. 5. Apply method of separation of variables to solve wave and heat equation. 6. Use the concepts of limit, continuity and derivative of complex variables and use analytic functions which are widely applicable to two dimensional problems in engineering.
2	CE-14302	Fluid Mechanics-I	1. Understand the basic properties of Fluid. 2. Compute hydrostatic forces on submerged bodies. 3. Analyze flow rates, velocity, energy losses and

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			momentum flux for fluid system. 4. Explain fluid flow phenomena. 5. Evaluate relationship among various parameters based on dimension analysis and model study. 6. Predict the resisting forces on moving submerged body.
3	CE-14303	Rock Mechanics & Engineering Geology	1. Understand the geological considerations in civil engineering projects. 2. Predict the different properties of rocks. 3. Identify the geological problems associated with civil engineering structures and suggest remedies. 4. Analyze geological data for civil engineering projects. 5. Inter predict the engineering properties of rocks in laboratory and field. 6. Plan appropriate techniques for improvement the engineering properties of rocks.
4	CE - 14304	Strength of Material	1. Identify the concepts solid mechanics including static equilibrium, geometry of deformation, and material constitutive behavior. 2. Execute the fundamental concepts of stress, strain and elastic behaviour of materials to analyze structural members subjected to tension, compression, torsion 3. Analyse the bending stress on different types of sections. 4. Formulate appropriate theoretical basis for the analysis of combined axial and bending stresses. 5. Understand the behavior of columns and struts under axial loading. 6. Demonstrate the use of critical thinking and problem solving techniques as applied to structural systems.
5	CE-14305	Surveying	1. Understand various methods and techniques of surveying and its applications (chain survey, compass survey, leveling and contouring). 2. Compute angles, distances and levels. 3. Apply the concept of tachometry survey in difficult and hilly terrain. 4. Discuss the working principle of ordinary and electronic survey instruments. 5. Select different instruments for data collection and apply corrections on collected data. 6. Analyze the survey data for different applications.
6	CE-14306	Building Material & Construction	1. Identify and characterize building materials 2. Understand the manufacturing process of bricks, cement and concrete. 3. Select the appropriate methods for preservation of

S No	Course Code	Course Name	Course Outcomes
			timber and metals 4. Evaluate the quality of building material through visual inspection or by laboratory testing. 5. Apply the knowledge to select suitable construction techniques for different building components. 6. Use the suitable techniques of damp proofing and fire resistance.
7	CE-14307	Fluid Mechanics Lab-I	1. Predict the metacentric height of floating vessel and appreciate its utility in vessel design. 2. Calibrate various flow measuring devices (venturimeter, orifice meter and notches). 3. Authenticate the Bernoulli's theorem experimentally. 4. Assess the discharge of fluid over broad crested weir 5. Compute various losses and velocity in pipe flow in field 6. Compare good understanding of concepts and their applications in the laboratory.
8	CE-14308	Strength of Material Lab	1. Understand the importance of physical properties of steel. 2. Identify and comprehend code provisions for testing different properties of steel. 3. Develop stress –strain curve for axial compression, axial tension and shear. 4. Evaluate fatigue and impact strength of steel using suitable equipment. 5. Assess hardness of steel using Rockwell and Brinell apparatus. 6. Compute load carrying capacity of a leaf spring.
9	CE-14309	Surveying Lab	1. Assess horizontal & vertical angles by Theodolite and various distances by Chaining along with ranging. 2. Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically. 3. Compute the reduce levels using various methods of leveling. 4. Predict the location of any point horizontally and vertically using Tachometry. 5. Setting out curves in the field. 6. Analyze different types of survey data
10	CE-14401	Geomatics Engineering	1. Demonstrate the use of remote sensing in resolving the location related problems. 2. Explain and apply the concept of photogrammetry in the survey. 3. Retrieve the information from remotely sensed data and interpret the data for survey. 4. Analyze and representation of the geographical data.

S No	Course Code	Course Name	Course Outcomes
			5. Understand the basic concepts related to GIS and GPS. 6. Apply the electronic technology for surveying works.
11	CE-14402	Construction Machinery & Works Management	1. Understand the concept, and need of project planning and the related concepts. 2. Utilize various management tools and techniques, such as PERT, CPM, etc. in the project planning. 3. Develop a network and perform time estimates to find the critical path. 4. Assess the minimum total cost and do the project scheduling. 5. Perform cost analysis for a given activity and formulate a project contract. 6. Select appropriate construction equipment and machinery for a given construction activity.
12	CE-14403	Design of Concrete Structures-I	1. Identify the quality control tests on concrete making materials. 2. Understand the behavior and the durability aspects of the concrete under different loading and exposure conditions. 3. Design the concrete mixes as per various mix techniques. 4. Apply the stress-strain response of steel and concrete in the design of various RC elements. 5. Compare the fundamental concepts of different design philosophies available for RC elements. 6. Execute the solution using a logic and structured approach based on Limit State Method and IS code provisions for various RC elements, such as beams, slabs and stairs.
13	CE-14404	Fluid Mechanics-II	1. Distinguish and identify different types of fluid flow. 2. Formulate equation of flow through different media/obstructions for a laminar and turbulent flow. 3. Apply the principles of conservation of energy and momentum in the flow studies in open channels and simple pipe network. 4. Design pipe network and open channels for passing a given discharge. 5. Evaluate the effect of channel shapes on the discharge parameters. 6. Understand and apply the theory of hydraulic jumps and surges.
14	CE-14405	Irrigation Engineering –I	1. Identify the basic understanding of soil water plant relationship.

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			2. Understand different irrigation techniques and the related theories. 3. Apply different theories/methods to design lined and unlined canals. 4. Estimate the yield of tube-well using different formulae. 5. Design different hydraulic structures required for effective river training works. 6. Demonstrate the knowledge related to the water logging, losses, economics of lining, etc.
15	CE-14406	Structural Analysis- I	1. Understand the concept of structural systems, loads, supports and displacements 2. Analyze different types of statically determinate structures including cables, beams, arches, frames and trusses. 3. Identify and apply a suitable analysis technique for statically determinate structures. 4. Assess the effect of rolling loads, support displacements and temperatures on response of statically determinate structures. 5. Develop and use the concept of influence line diagram for calculating maximum values of different structural quantities in a statically determinate structure, like BM, SF and displacement. 6. Evaluate the forces acting over dams, chimneys and retaining walls.
16	CE-14407	Concrete Technology Lab	1. Evaluate properties of various building materials, such as cement, aggregates, bricks and tiles. 2. Conduct experiments and check the acceptance criteria (if any). 3. Design concrete mixes by relevant code provisions. 4. Analyze the properties of concrete in fresh and hardened state. 5. Create a well organized document and present the results appropriately. 6. Understand and apply non destructive testing (NDT) for evaluating concrete quality.
17	CE-14408	Structural Analysis Lab	1. Verify theoretical formulas by conducting experiments. 2. Predict the behavior of statically determinate beams and trusses. 3. Understand two hinged arch and three hinged arch structures.

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			4. Demonstrate the influence lines for statically determinate and indeterminate beams. 5. Observe and compute deflections of simply supported beams, curved beams and frames using classical methods. 6. Outline the deflected shapes of columns and struts with different end conditions.
18	CE-14501	Design of Steel Structures – I	1. Understand different types of steel sections; their specifications and properties and its use as a structural material. 2. Analyze and design various types of steel connections using bolts and weld. 3. Understand the design of built up sections and column bases. 4. Determine the design loads for roof truss. 5. Design various components like purlins, web members, top chord members etc. 6. Prepare detailed working structural drawings of steel.
19	CE-14502	Geotechnical Engineering	1. Understand the origin and identification of different soils. 2. Determination of different physical and engineering characteristics of soils. 3. Analyze the slopes for their stability by different methods. 4. Evaluate shear strength and permeability parameters of different soils. 5. Compute consolidation settlements. 6. Apply the principles of compaction to field problems.
20	CE-14503	Structural Analysis-II	1. Distinguish statically determinate and indeterminate structural systems. 2. Analyze the beams and trusses using the Classical Methods of analysis. 3. Compute reactive forces in the beams, pin-jointed and rigid jointed frames using Conventional Methods of analysis. 4. Develop and apply the approximate methods of analysis for framed structures. 5. Predict the structural response under different types of loading, support displacements and temperature changes. 6. Apply the concept of influence lines for deciding the critical forces and sections while designing.
21	CE-14504	Transportation Engineering – I	1. Appreciate the importance of different modes of transportation and characterize the road transportation. 2. Align and design the geometry of pavement as per

S No	Course Code	Course Name	Course Outcomes
			Indian Standards according to topography. 3. Assess the properties of highway materials in laboratory. 4. Understand the importance of drainage, construction methods for various roads, pavement failure and its maintenance. 5. Compute the transportation cost of highway project and outline the sources of highway financing. 6. Interpret the traffic data after conducting traffic survey and describe the traffic characteristics, traffic safety and traffic environment interaction.
22	CE-14505	Environmental Engineering - I	1. Identify different types of water demands and select suitable source of water. 2. Predict future population and estimate future water demands 3. Demonstrate a firm understanding of various water quality parameters. 4. Design different water treatment units to meet the drinking water quality standards and criteria. 5. Plan and design the water transportation, pumping stations and pipe network 6. Design low cost water treatment techniques in the rural areas.
23	CE-14506	Transportation Engineering Lab	1. Characterize the pavement materials as per the Indian Standard guidelines. 2. Evaluate the strength of subgrade soil by CBR test. 3. Conduct experiments to evaluate aggregate properties. 4. Determine properties of bitumen material and mixes 5. Evaluate the pavement condition by rough meter and Benkelman beam test. 6. Create a well organized report and present the results appropriately.
24	CE - 14507	Environmental Engineering Laboratory	1. Conduct experiments as per standard methods of sampling and analysis. 2. Demonstrate the expertise to characterize water and wastewater samples. 3. Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater. 4. Record the experimental observations and interpret the analysis results. 5. Use the analysis results for making informed decisions about the drinkability of water and disposal of wastewater. 6. Evaluate and compare different techniques of

S No	Course Code	Course Name	Course Outcomes
			experimental analysis.
25	DECE-14508	Computer Aided Structural Drawing & Detailing	1. Create, dimension and sketch a plot/plan for representation/expression of civil engineering designs. 2. Draft construction/design drawings including structural drawings for civil engineering projects. 3. Produce structural drawing of reinforced concrete elements such as beams, slabs and staircases. 4. Develop structural drawing of steel elements such as connections, tension members, compression members, beams, column base and roof trusses. 5. Understand various connection details. 6. Gain proficiency in CAD software.
26	DECE-14509	Computer Aided Structural Analysis & Design	1. Demonstrate the knowledge regarding the design of beams, slabs and staircase. 2. Prepare flow charts for the analysis and design of beams, staircases and slabs. 3. Create computer code for the analysis of beams, staircase and slab using spread sheets. 4. Predict flexural and shear capacity of rectangular RC beams for a given value of the tensile and the compression steel as per the provisions of IS 456. 5. Use modern engineering tools for the automation of analysis and design. 6. Use appropriate format and grammatical structure to create a well organized document.
27	TR-14501	Industrial Training – I	1. Conduct reconnaissance and survey of areas independently. 2. Apply basic and advanced surveying techniques for measuring distances and angles. 3. Interpret and plot topographical map using the data taken using different survey instruments. 4. Share responsibilities and duties in group assignments. 5. Create a well organized document and present the results appropriately. 6. Use modern equipment, tools and instrumentation in the survey.
28	CE-14601	Design of Concrete Structures – II	1. Demonstrate basicknowledge of structural analysis for beams and slabs in calculating BM and SF. 2. Understand the principles involved in analysis and design of reinforced concrete structures. 3. Employ the code of practice for design of reinforced concrete structural members and elementary

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			structural systems. 4. Design various sub – structure components like foundations, retaining walls. 5. Design various super – structure components like columns, continuous beams. 6. Apply the concepts of structure design to special structural elements like curved beams, domes, water retaining structures.
29	CE-14602	Foundation Engineering	1. Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations. 2. Analyze the settlement of substructures for cohesive and non-cohesive soils. 3. Predict the soil failure by understanding its criteria. 4. Apply the knowledge of soil bearing capacity for the design of shallow foundation. 5. Demonstrate the knowledge of earth pressure for the lateral stability of retaining wall and well foundations. 6. Understand the concept of deep foundation (pile foundation and well foundation).
30	CE-14603	Professional Practice	1. Prepare general and detailed specifications of different civil engineering works. 2. Formulate rough and detailed building estimates 3. Compute the quantity of materials required for civil engineering works as per the specifications 4. Evaluate contracts and tenders pertaining to construction practices 5. Analyze rates for the items not covered in CSR. 6. Demonstrate the knowledge related to various rules and regulation applicable to construction industry.
31	CE-14604	Environmental Engineering - II	1. Demonstrate a firm understanding of various sewerage systems and their suitability. 2. Design sewer and drainage systems layout for communities. 3. Evaluate the waste water characteristics to determine the degree of treatment required. 4. Explain the physical, chemical and biological techniques of wastewater treatment. 5. Compare the applicability of treatment technologies under different conditions 6. Design the treatment units and assess the efficacy of an entire treatment system.

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			7. Ability to make decisions regarding the treatment plant site selection, operation and maintenance and the need of advanced treatment
32	DECE-14605	Numerical Methods in Civil Engineering	1. Demonstrate the concept of approximations and errors in the implementation and development of numerical methods. 2. Select an appropriate solution to an engineering problems dealing with the roots of equations through numerical methods. 3. Execute the solution using of problems involving linear algebraic equations and appreciate the application of these problems in fields of engineering. 4. Apply the techniques to fit curves to data and be capable of choosing the preferred method for any particular problem. 5. Evaluate the solution of the problems through the numerical integration and differentiation and solve ordinary and partial differential equations and eigen value problems through various techniques. 6. Able to use New Marks Method for civil engineering problems.
33	DECE-14606	Finite Element Methods	1. Demonstrate the knowledge of theory of elasticity, solution of simultaneous equations by different techniques. 2. Understand the concept and terminology related to the concept of finite element analysis. 3. Apply different methods, such as Stationary principles, Rayleigh-Ritz, weighted residual method in the analysis. 4. Develop various types of matrix, such as element stiffness matrix, load vector, and equilibrium and compatibility conditions for different types of problems using different types of elements. 5. Analyze the determinate and indeterminate problems related to beams, frames, trusses, plates. 6. Execute the solution using a logic and structured approach offered by the finite element method.
34	DECE-14607	Reinforced Earth and Geotextiles	1. Understand the principle of reinforced earth and different types of reinforcement techniques. 2. Identify the types and functions of geosynthetics. 3. Compare the different geosynthetics products for different construction projects. 4. Identify the testing methods for geosynthetics. 5. Compare natural and artificial geosynthetics. 6. Design of paved and unpaved roads, embankments

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			and retaining walls with different types of geosynthetics.
35	DECE-14608	Infrastructure Development & Management	1. Understand the impact of infrastructure development on the economic development of a country. 2. Strategies the policy process for infrastructure development and to choose the best financing option for a project. 3. Demonstrate the construction components of various infrastructure sectors like highway, ports & aviation, oil & gas, power, telecom, railway and irrigation. 4. Remember the necessary conceptual insights, perspectives and the tools required for effective infrastructure management 5. Develop a skill to retrieve lessons from case studies in International/National project management. 6. Gather background information and research regarding various infrastructure sectors and to document the different phases in the life cycle of an infrastructure project.
36	OECE-14601	Building Maintenance & Safety	1. Establish robust maintenance and safety management systems. 2. Understand the principles and importance of maintenance and the factors affecting decision to carryout maintenance. 3. Describe various materials for maintenance and able to evaluate the compatibility and durability of various repair materials. 4. Identify various maintenance problems and their associated root cause. 5. Strategies the process for investigation and diagnosis for repair of structures. 6. Identify and compare various remedial measures for building defects and choose best remedial measure for building defect. 7. Assess features for maintenance of multi-storied buildings, including fire protection system, elevators booster pumps and generator sets.
37	OECE-14602	Project Monitoring & Management	1. Understand the need of project planning and device a plan to define the work to be performed in construction project. 2. Utilize various tools and techniques of project management and develop more realistic schedule by identifying the central problem and analyze the alternatives. 3. Analyze time estimates of different activities and

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			events in a network for better controlling of project by identifying critical path. 4. Determine minimum total cost in minimum time by conducting a crash program. 5. Develop understanding about techniques of updating, allocation of resources and rescheduling a project. 6. Apply computer skills to project management and evaluation.
38	CE-14609	Geotechnical Engineering Lab	1. Understand the procedure for classifying coarse grained and fine grained soils. 2. Evaluate the index properties of soil. 3. Determine the engineering properties of soil. 4. Interpret the results of compaction test for relative compaction in the field. 5. Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis. 6. Conduct experiments, analyze and interpret results for geotechnical engineering design.
39	CE-14610	Computer Aided Analysis & Design	1. Use software applications effectively in the analysis and technical reports writing 2. Produce working structural drawings. 3. Analyze the buildings located in some seismic zone. 4. Design overhead water reservoir. 5. Understand and interpret design aids. 6. Design and draw the building for wind load.
40	PRCE-14601	Minor Project	1. Find relevant sources of information 2. Conduct literature survey 3. Create a well organized document 4. Acknowledge the work of other in a consistent manner 5. Understanding of ethical and professional issues 6. Demonstrate effective oral communication and present the results appropriately.
41	CE-14801	Design of Steel Structures – II	1. Demonstrate knowledge of basic concepts for analysis and design of various structural steel elements like ties, struts, beams, columns and fasteners. 2. Identify importance of various elements of a plate girder and their design. 3. Compile various loads for a foot bridge, and thereby design its elements including wooden deck, cross beam and main girder 4. Plan structural framing of industrial building for given design data and design various elements like gantry girder, column bracket, mill bent and bracings.

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			5. Identify various loads and load combinations for design of different components of a railway bridge as per the railway code. 6. Design various elements of a railway bridge for given design data.
42	CE-14802	Elements of Earthquake Engineering	1. Identify and appreciate the role of earthquake forces in structural design of buildings. 2. Understand various parameters related to the seismic design of buildings. 3. Apply various codal provisions related to the seismic design of buildings. 4. Develop a skill to retrieve information from past structural failures and use it in future planning. 5. Analyze a structure subject to lateral forces due to earthquake. 6. Understand the concept and terminology related to the theory of vibrations. 7. Apply the concepts to analyze the dynamic behaviour of a structural system.
43	CE-14803	Irrigation Engineering-II	1. Understand the functioning and design consideration of various components of Diversion Head Work. 2. Analyze the various parameters of hydraulic structures for seepage and uplift pressure. 3. Recognize the concept and principles of silt control devices. 4. Design water distribution systems, regulators, canal falls, outlets, cross drainage works, weirs and barrages of irrigation network. 5. Apply knowledge to select best canal fall, outlet and cross drainage works according to real time situation. 6. Identify appropriate energy dissipation devices suitable for hydraulic structures as per site condition.
44	CE-14804	Transportation Engineering – II	1. Understand the importance of railway infrastructure planning and design. 2. Identify the functions of different component of railway track. 3. Apply existing technology to design, construction and maintenance of railway track. 4. Apprehend the advanced international technology being used in the field of railway engineering. 5. Outline the importance of Airport Infrastructure planning and design. 6. Evaluate the major issues and problems of current interest to airport engineering.
45	CE-	Seminar	1. Find relevant sources of information, research and

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	14805		gather information. 2. Create a well organized document using appropriate format and grammatical structure. 3. Acknowledge the work of other in a consistent manner. 4. Understanding of ethical and professional issues. 5. Demonstrate effective written and oral communication. 6. Awareness of implications to society at large.
46	DECE-14806	Dynamics of Structures	1. Demonstrate the fundamental theory of dynamic equation of motion for dynamic systems. 2. Identify the concepts of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response. 3. Model the response of single-degree-of-freedom (SDOF) systems to pulse and harmonic and periodic excitations and discrete lumped mass multi-degree-of-freedom (MDOF) systems. 4. Understand the response spectrum concept. 5. Evaluate the solution of the problem through the concepts of viscous damping, coulomb damping (by friction) and equivalent damping. 6. Analyze dynamic analysis of various structures using Numerical Methods. 7. Understand the dynamic response of continuous system.
47	DECE-14807	Advanced Reinforced Concrete Design	1. Demonstrate the fundamental theory design of RC elements. 2. Apply the design principles to the large span concrete roofs as per IS code. 3. Analyze the behaviour of slabs for different loading and boundary conditions. 4. Design the components of chimney. 5. Analyze and design the different type of retaining systems as per requirements. 6. Design the water tanks of different shapes and capacities
48	DECE – 14808	Prestressed Concrete	1. Understand the material characteristics of structural materials, such as high strength concrete and high strength steel, etc. 2. Understand and apply the concept and terminology related to the prestressed concrete. 3. Analyze the beam sections carrying the prestressed force, external loads and time-dependant effects, such as creep, shrinkage and other losses.

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			4. Evaluate and interpret the use of different prestressing systems on the PSC beams. 5. Design prestressed concrete beams and slabs for flexure, shear and torsion. 6. Apply various provisions prescribed by IS 1343 to the design of prestressed concrete members.
49	DECE-14809	Pavement Design	1. Identify the different types of pavement and factors affecting their design. 2. Design the flexible pavement using different methods and as per latest Indian Standard. 3. Understand the factors affecting Bitumen mix design and design procedure of bitumen mix 4. Design the rigid pavement using different methods and as per latest Indian Standard. 5. Evaluate the pros and cons of various other low cost pavements proposed by IRC. 6. Assess the need of overlay and design accordingly.
50	DECE-14810	Traffic Engineering	1. Understand the characteristics related to road user, vehicle, and traffic stream. 2. Conduct the various traffic studies to collect the data related to traffic. 3. Create the solution of the problem related to traffic regulation and control. 4. Design the traffic signal timing for pre-timed and traffic actuated signals. 5. Outline the procedure to assess the road safety audit. 6. Assess the need of modernization in traffic engineering.
51	DECE-14811	Bridge Engineering	1. Learn the basics of bridge classification, choice of bridge type, investigations for the bridges. 2. Learn loadings on the bridge, IRC loadings, and load combinations for the specific problem. 3. Understand the load distribution on a specific bridge system. 4. Analyze and design Steel and RCC bridge deck system. 5. Conceptualize the design of bridge substructures.
52	DECE-14812	Matrix Methods of Structural Analysis	1. Demonstrate knowledge of basic structural analysis for beams, trusses, frames, etc. 2. Apply the basic matrix operations in the structural analysis. 3. Understand the concept and terminology related to the structural analysis using the matrix. 4. Develop matrix and flexibility matrix for different types of structural elements. 5. Analyze the determinate and indeterminate beams,

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			frames, trusses using the matrix operations. 6. Evaluate and interpret the analysis results for their use in the design of various structural elements.
53	DECE-14815	Ground Improvement Techniques	1. Evaluate the existing characteristics of the soil to be improved. 2. Understand the mechanism of ground improvement. 3. Select a suitable type of ground improvement technique considering the existing soil. 4. Design various ground improvement techniques. 5. Monitor the efficiency of ground improvement methods. 6. Apply the selected ground improvement methods at site.
54	DECE-14816	Soil Dynamics & Machine Foundation	1. Recognize the scope and significance of soil dynamics. 2. Apply the concept of theory of vibrations to find the behavior of soil under dynamic loading. 3. Understand vibration concepts in soils like damping, wave propagation, resonance and effect of modes of vibrations. 4. Employ the code of practice for design of foundations for reciprocating machines. 5. Design foundations subjected to impact loads. 6. Predict the influence of vibrations and selection of remediation methods based on the nature of vibration, properties and behavior of soil.
55	DECE-14817	Earth and Earth Retaining Structures	1. Design of earthen dams considering seepage analysis and seepage control. 2. Analysis of earth retaining structures for their stability against earth pressure. 3. Prediction of lateral earth pressures associated with different earth systems. 4. Applying engineering knowledge for the designing of earth retaining structures in various site conditions. 5. Evaluation of rigid retaining structures using appropriate design methods, factors of safety, earth pressure diagrams. 6. Evaluation of flexible retaining structures using appropriate design methods, factors of safety, earth pressure diagrams.
56	DECE-14818	Advanced Environmental Engineering	1. Understand the basic concepts of inter-relationship between different ecosystems with environment. 2. Compute the causes of different types of pollution along with related regulations (local, national, and international). 3. Explain the mechanisms of air pollutants

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			transport/dispersion in the atmosphere and select the systems to control them at different sources. 4. Prepare the life cycle assessment of Solid waste from its generation to disposal. 5. Evaluate different methods of solid waste management and identify the suitable disposal alternatives available. 6. Explain different types of hazardous waste and correspondingly appropriate method for its treatment and disposal.
57	DECE-14819	Environmental Impact Assessment	1. Understand the concepts of environmental impact analysis and legislations involving EIA. 2. Identify the factors for assessing the impacts of field projects. 3. Use the methodologies to set up environmental indices and quantify the impacts. 4. Assess the environmental, socio-economic and health impacts of different projects. 5. Design an environmental proposal and evaluate the available alternatives. 6. Demonstrate knowledge of professional and ethical responsibilities.
58	DECE-14820	Flood Control & River Engineering	1. Appropriate the importance of river engineering and its social and environmental impacts. 2. Compute and forecast flood by various methods. 3. Identify suitable flood control method and select one according to economical condition. 4. Evaluate suitable method for river training and channel improvement. 5. Predict sediment load carried by river and its impact on flow. 6. Understand the concept of River Regime theories.
59	DECE - 14821	Hydrology and Dams	1. Understand the importance of hydrological data in water resources planning. 2. Design of rain gauge network according to requirement. 3. Compute depth of precipitation, run-off and infiltration over the basin by different methods. 4. Design peak flow and fix design floods. 5. Compare suitable type of dams according to site requirements. 6. Design different types of dams i.e; gravity dams, earthen dams, arch and buttress dams.
60	DECE-14822	Disaster Management	1. Identify various types of disasters, their causes, effects & mitigation measures. 2. Demonstrate the understanding of various phases of

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			disaster management cycle and create vulnerability and risk maps. 3. Understand the use of emergency management system to tackle the problems. 4. Discuss the role of media, various agencies and organisations for effective disaster management & preparedness for future through various case studies. 5. Design early warning system and understand the utilization of advanced technologies in disaster management. 6. Compare different models for disaster management and plan & design of infrastructure for effective disaster management.
61	PRCE-14701	MAJOR PROJECT	1. Identify a suitable problem after conducting a thorough literature survey. 2. Prepare hypothesis and select a suitable method to obtain the solution. 3. Design and conduct experiment 4. Record observations, data, and results and their interpretation 5. Use software applications effectively to write technical reports and oral presentations 6. Applying modern engineering tools for the system design, simulation and analysis.

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Course Outcome

After completing this course the student must demonstrate the knowledge and ability to:

S No	Course Code	Course Name	Course Outcomes
1.	PCCE-101	Surveying &Geomatics	1. Understand the concept, various methods and techniques of surveying. 2. Compute angles, distances and levels for a given area 3. Apply the concept of tachometry survey in difficult and hilly terrain. 4. Select appropriate instruments for data collection and survey purpose 5. Analyze and retrieve the information from remotely sensed data and interpret the data for survey. 6. Understand the concepts related to GIS and GPS and analyze the geographical data.
2.	PCCE-102	Solid Mechanics	1. Understand the concept of static equilibrium, deformations, and material constitutive behavior. 2. Describe the concepts of stress, strain and elastic behaviour of materials including Hooke's law relationships to analyze structural members subjected to tension, compression and torsion. 3. Apply the concept of Mohr's circle in the stress/strain calculations. 4. Develop SFD and BMD for different type of beams subjected to different types of loads 5. Plot elastic curves for beams undergoing displacements under different loadings 6. Understand the behaviour of columns and struts under axial loading.
3.	PCCE-103	Fluid Mechanics	1. Understand the basic terms used in fluid mechanics and its broad principles 2. Estimate the forces induced on a plane/ submerged bodies 3. Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale. 4. Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation. 5. Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them. 6. Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition

S No	Course Code	Course Name	Course Outcomes
4.	PCCE-104	Disaster Preparedness & Planning	1. Identify various types of disasters, their causes, effects & mitigation measures. 2. Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps. 3. Understand the use of emergency management system to tackle the problems. 4. Discuss the role of media, various agencies and organizations for effective disaster management. 5. Design early warning system and understand the utilization of advanced technologies in disaster management. 6. Compare different models for disaster management and plan & design of infrastructure for effective disaster management.
5.	ESCE-101	Basic Electronics & applications in Civil Engineering	1. Understand basics of electronics engineering 2. Understand the importance of electronic and soft computing in civil engineering 3. Providing inspiration to use the electronic products and other instruments to solve civil engineering problems 4. Use the computers / computing tools to solve civil engineering problems 5. Able to develop the program using basic language for solving civil engineering problems. 6. Appraise the use of sensors in civil engineering applications.
6.	HSMCE-101	Civil Engineering-Introduction, Societal & Global Impact	1. Introduction to what constitutes Civil Engineering 2. Understanding the vast interfaces this field has with the society at large 3. Inspiration for doing creative and innovative work for the benefit of the society 4. Need to think innovatively to ensure Sustainability 5. Depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field 6. Introduction and overview to Futuristic engineering systems
7.	LPCCE-101	Surveying &Geomatics Laboratory	1. Assess horizontal & vertical angles by Theodolite. 2. Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically. 3. Compute the reduce levels using various methods of leveling. 4. Predict the location of any point horizontally and vertically using Tachometry.

S No	Course Code	Course Name	Course Outcomes
			5. Setting out curves in the field. 6. Use electronic survey instruments.
8.	LPCCE-102	Fluid Mechanics Laboratory	1. Select appropriate pressure measuring device under different condition of flow. 2. Determine the stability of a floating body. 3. Understand and apply Bernoulli's theorem practically. 4. Find discharge of fluid through pipe, orifices and in open channel. 5. Estimate the major and minor losses in pipe. 6. Estimate the various elements and energy losses in hydraulic jump.
9.	LPCCE-103	Solid Mechanics Laboratory	1. Understand the importance of physical properties of steel. 2. Identify and comprehend code provisions for testing different properties of steel. 3. Develop stress-strain curve for axial compression, axial tension and shear. 4. Assess hardness and impact strength of steel. 5. Assess flexural strength of a given material. 6. Evaluate fatigue and impact strength of steel.
10.	PCCE-105	Concrete Technology	1. Understand the relevance of different properties of constituent materials on properties of concrete. 2. Understand the behavior and durability aspects of concrete under different loading and exposure conditions. 3. Understand the issues involved in production and use of concrete. 4. Design of concrete mixes as per BIS specifications. 5. Understand various testing methods for concrete and their applicability. 6. Knowledge of special type of non-conventional concretes.
11.	PCCE-106	Materials, Testing & Evaluation	1. Appraisal about the role of materials in civil engineering 2. Introduce common measurement instruments, equipments and devices to capture the material response under loading 3. Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice 4. Ability to write a technical Laboratory report 5. Draw inferences drawn from observations/reports for selection of suitable material 6. Use and draw relevant information from the standards and guidelines.

S No	Course Code	Course Name	Course Outcomes
12.	PCCE-107	Hydrology & Water Resources Engineering	1. Express the interaction among various processes in the hydrologic cycle 2. Calculate the average annual rainfall of any area using the rain gauge data and compile interrelations of various parameters as infiltration, evapotranspiration etc 3. Define the various components of hydrographs and calculate the estimated run off. 4. Find the water requirement for different crops and plan appropriate method of applying water. 5. Develop the distribution system of canal and various components of irrigation system. 6. Classify dams and plan dams according to suitability of sites available, their problems and able to determine forces exerted by fluid on dams.
13.	PCCE-108	Transportation Engineering	1. Appreciate the importance of different modes of transportation and characterize the road transportation. 2. Alignment and geometry of pavement as per Indian Standards according to topography. 3. Assess the properties of highway materials in Laboratory. 4. Understand the importance of railway infrastructure planning and design. 5. Identify the functions of different component of railway track. 6. Outline the importance of Airport Infrastructure
14.	BSCE-101	Mathematics-III	1. Study the use / application of mathematic theory in the solution of engineering problems. 2. Identify appropriate method / functions for obtaining solution 3. Use power series method to solve differential equation and its application to Bessel's and Legendre's equations. 4. Analyze Ordinary and Partial differential equations and learn simplest means to solve them. 5. Learn and apply binary operations, Laplace, Fourier transform methods to civil engineering applications 6. Use the concepts of limit, continuity and derivative of complex variables and use analytic functions which are widely applicable to two dimensional problems in engineering.
15.	LPCCE-104	Concrete Testing Laboratory	1. Evaluate properties of building materials, such as cement and aggregates. 2. Conduct experiments and check the acceptance criteria (if any).

S No	Course Code	Course Name	Course Outcomes
			3. Design concrete mixes as per BIS provisions. 4. Analyze the properties of concrete in fresh and hardened state. 5. Create a well organized document and present the results appropriately. 6. Understand and apply non destructive testing (NDT) for evaluating concrete quality.
16.	LPCCE-105	Transportation Laboratory	1. Characterize the pavement materials as per the Indian Standard guidelines. 2. Evaluate the strength of subgrade soil by CBR test. 3. Conduct experiments to evaluate aggregate properties. 4. Determine properties of bitumen material and mixes 5. Evaluate the pavement condition by rough meter and Benkelman beam test. 6. Create a well organized report and present the results appropriately.
17.	PRCE-101	Seminar and Technical Report Writing	1. Find relevant sources of information, research and gather information. 2. Create a well organized document using appropriate format and grammatical structure. 3. Acknowledge the work of other in a consistent manner. 4. Understanding of ethical and professional issues. 5. Demonstrate effective written and oral communication. 6. Awareness of implications to society at large.
18.	MCI-101	Environmental Science	1. Measure environmental variables and interpret results. 2. Evaluate local, regional and global environmental topics related to resource use and management. 3. Propose solutions to environmental problems related to resource use and management. 4. Interpret the results of scientific studies of environmental problems. 5. Describe threats to global biodiversity, their implications and potential solutions.
19.	TR-101	Training - I	1. Visualize things/ concepts and express the thoughts in the form of sketches, models, etc 2. Create a model through programming language using computer. 3. Know about the different materials used at construction sites. 4. Understanding of ethical and professional issues. 5. Demonstrate effective oral and written communication.

S No	Course Code	Course Name	Course Outcomes
			6. Work in team.
20.	PCCE-109	Engineering Geology	1. Understand the geological considerations in civil engineering projects. 2. Predict the different properties of rocks. 3. Identify the geological problems associated with civil engineering structures and suggest remedies. 4. Analyze geological data for civil engineering projects. 5. Inter predict the engineering properties of rocks in laboratory and field 6. Plan appropriate techniques for improvement the engineering properties of rocks.
21.	PCCE-110	Engineering Economics, Estimation and Costing	1. Applying different concepts of economics in engineering projects 2. Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives. 3. Evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives 4. Formulate technical specifications for various works to be performed for a project and how they impact the cost of a structure 5. Quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure 6. Write and prepare tender documents.
22.	PCCE-111	Construction Engineering and Management	1. Identify various construction methods with their respective features. 2. Decide various resources required for a particular construction project. 3. Use CPM and PERT techniques to identify the best course of action for the given input parameters. 4. Explain different techniques and elements of monitoring a construction project. 5. Draw a comprehensive checklist required for quality control at a construction project. 6. Differentiate and explain type of civil engineering contracts including important features.
23.	PCCE-112	Environmental Engineering	1. Identify different types of water demands and select suitable source of water. 2. Analyze water and wastewater quality for a given end use and disposal, respectively. 3. Design and provide an appropriate sewerage system. 4. Examine physical and chemical composition of solid wastes and to investigate the activities associated with the management of solid waste.

S No	Course Code	Course Name	Course Outcomes
			5. Define various sources of air pollution and their effects on environment. 6. Select the most appropriate technique for the treatment of water, wastewater, solid waste and contaminated air.
24.	PCCE-113	Structural Engineering	1. Calculation of loads and its effects in structural members. 2. Selection of appropriate structural type and load for a given set of constraints 3. Analyse structural system and determination of forces and displacements 4. Select suitable material for construction of structural system 5. Design of different structural elements 6. Detail different structural element as per different applicable BIS guidelines.
25.	PCCE – 114	Geotechnical Engineering	1. Classify different types of soils based on their origin & formation, and derive various phase relationships of the soil 2. Determination of different physical and engineering characteristics of soils 3. Evaluate shear strength and permeability parameters of different soils 4. Compute elastic and consolidation settlements 5. Apply the principles of compaction to field problems 6. Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations.
26.	LPCCE - 106	Geotechnical Lab	1. Comprehend the procedure for classifying coarse grained and fine-grained soils 2. Evaluate the index properties of soil 3. Determine the engineering properties of soil 4. Interpret the results of compaction test for relative compaction in the field 5. Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis. 6. Conduct experiments, analyze and interpret results for geotechnical engineering design
27.	LPCCE-107	Environmental Engineering Laboratory	1. Conduct experiments as per standard methods of sampling and analysis. 2. Demonstrate the expertise to characterize water and wastewater samples. 3. Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.

S No	Course Code	Course Name	Course Outcomes
			4. Record the experimental observations and interpret the analysis results. 5. Use the analysis results for making informed decision about the potability of water and disposal of wastewater. 6. Recognize the working of air pollution monitoring equipment and noise meter.
28.	LPCCE-108	Structural Lab	1. Verify theoretical formulas by conducting experiments. 2. Predict the behavior of statically determinate beams and trusses. 3. Depict the behavior of two hinged arch and three hinged arch structures. 4. Demonstrate the influence lines for statically determinate and indeterminate beams. 5. Observe and compute deflections of simply supported beams, curved beams and frames using classical methods. 6. Outline the deflected shapes of columns and struts with different end conditions.

Program: M.Tech. (Structural Engineering)

PG Scheme (2019)

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.

Course Outcome

After completing this course the student must demonstrate the knowledge and ability to:

S No	Course Code	Course Name	Course Outcomes
1.	MST-101	Advanced Structural Analysis	1. Develop Stiffness and flexibility matrices for skeletal structural systems 2. Analyze and evaluate the response of skeletal structural systems using force method. 3. Analyze and evaluate the response of skeletal structural systems using displacement method. 4. Apply member approach for analyzing higher order skeletal structural systems 5. Illustrate the use of matrix methods for analyzing skeletal structural systems subjected to secondary stresses due to lack of fit, temperature change and differential settlement 6. Comprehend and apply finite element approach for solving boundary value problems.
2.	MST-102	Finite Element Method in Structural Engineering	1. Learn elemental stiffness technique 2. Formulate finite element equation, equilibrium equation. 3. Apply the concepts of Finite Element Formulation and loads 4. Learn computer applications of FEM.
3.	MST-103	Advanced Solid Mechanics	1. Develop stress and strain tensors and perform transformations. 2. Solve the advanced practical problems related to the theory of elasticity, concepts of stress and strain, strain energy. 3. Learn about the elastic and plastic behavior of material and evaluate stress invariants, principal stresses and their directions and determine strain invariants, principal strains and their directions.

S No	Course Code	Course Name	Course Outcomes
			4. Develop constitutive relationships between stress and strain for linearly elastic solid. 5. Understand the concept of stresses and strains in 2D 6. Know the different theories for Torsion
4.	MST – 111	Theory of Thin Plates and Shells	1. Plate equation in Cartesian and polar coordinates 2. Analyze rectangular and circular plates with different boundary conditions and loads 3. Apply the concepts rectangular and circular plates with different boundary conditions and loads. 4. Analyze the shells.
5.	MST – 112	Theory of Structural Stability	1. Learn the basic requirements of structural design, including stability in addition to strength and stiffness. Understand the classical concept of stability of discrete and continuous systems, linear and nonlinear behaviour. 2. Determine the buckling loads for simple columns by analytical solution. Have appreciation of combined axial, flexural and torsion buckling. 3. Investigate stability of frames with respect to member buckling and global buckling. Find slenderness ratio of frame members. 4. Study stability of beams with respect to lateral torsion buckling. 5. Study the stability of plates like axial flexural buckling, shear flexural buckling, buckling under combined loads. 6. An appreciation of the fundamental basis of design rules concerned with structural instability.
6.	MST-113	Theory and Applications of Cement Composites	1. Know different types of composite materials and their importance, utility 2. Classify these materials based upon the engineering properties and behavior 3. Learn about the construction / production techniques and behavior of materials 4. Use different available material models in the analysis and response prediction 5. Design structural members using the composite materials 6. Explore different application areas of composites
7.	MST-114	Structural Optimization	1. Conceptualize and formulate an optimization research problem. 2. Understand the difference between classical and advanced optimization methodologies. 3. Select a methodology for carrying out optimization on a research problem. 4. Solve optimization problems using various

S No	Course Code	Course Name	Course Outcomes
			techniques. 5. Perform optimization on a problem having single objective or multi-objectives. 6. Optimize a structural member under optimal conditions.
8.	MST-115	Structural Health Monitoring and Retrofitting	1. Understand the fundamentals of monitoring the structural health and its maintenance strategies. 2. Diagnose for serviceability and durability aspects of concrete. 3. Know the various techniques for Static and Dynamic Field Testing. 4. Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building. 5. Use the modern techniques for Structural Heath Monitoring 6. Use an appropriate health monitoring technique and demolition technique.
9.	MST-116	Bridge Engineering	1. Learn bridge classification; selection of a suitable bridge type for a given set of constraints; criterion for deciding their layout; preliminary and detailed investigations *w.r.t.* the traffic and hydraulic design of bridges. 2. Understand the various primary loads, load combinations for obtaining a worst design load for the superstructure and substructure system of bridges. 3. Apply the concepts of structural design to obtain suitable member sizes/sections of bridges and they will be able to prepare and deliver rough sketches to the draftsman etc. 4. Perform the analysis and design of foundations. 5. Appreciate the role of modern construction methods and their impact on the analysis and the design of bridge components. 6. Perform necessary bridge inspection/maintenance and their rehabilitation.
10.	MST-121	Industrial Structures	1. Carry out plastic design of structural elements. 2. Analyze the loads & stresses of gantry girder. 3. Analyze and design structures using light gauge material. 4. Analyze and design steel chimneys, storage structures and industrial building.
11.	LMST-101	Structural Design Lab	1. Understand the planning of multistory building. 2. Understand the latest IS code of practice for the design of steel and concrete structural elements. 3. Apply the fundamental concepts, techniques in

S No	Course Code	Course Name	Course Outcomes
			analysis and design of reinforced concrete and steel element. 4. Apply the design principles by undertaking multistory building. 5. Apply the various codal requirements related to various members. 6. Produce structural drawing of detailing of Reinforced Concrete and Steel Elements
12.	LMST-102	Advanced Concrete Technology Lab	1. Comprehend and illustrate the design requirements of different types of concrete 2. Design different grades of concrete mixes as per Indian code requirements 3. Design and judge the experiments for evaluating various properties of concrete 4. Evaluate and relate various strength test results to judge the requirements of a given concrete type 5. Decide and implement suitability of various non-destructive tests methods for evaluating condition of existing concrete structures
13.	MRM-101	Research Methodology and IPR	1. Understanding and formulation of research problem. 2. Analyze research related information. 3. Understand plagiarism and follow research ethics. 4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. 5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. 6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits
14.	MAC-102	DISASTER MANAGEMENT	1. know about the various types of disaster and their components. 2. know about the measures and precautions at the time of a disaster. 3. know about various disaster-prone areas and various concepts about disaster preparedness, GIS and remote sensing. 4. assess risk caused by a disaster and learn about various mitigation measures.
15.	MST 104	Structural Dynamics	1. Specify principles of structural dynamics. 2. Analyze and study dynamic responses of "Single

S No	Course Code	Course Name	Course Outcomes
			Degree of Freedom System" using fundamental theory and equations of motion for free and forced vibration. 3. Model and analyze the continuous vibratory systems. 4. Analyze the response of structure of "Multiple Degree of Freedom System" for free and forced vibrations. 5. Analyze dynamic response through numerical solution of "Multiple Degree of Freedom System".
16.	LMST-103	Model Testing Laboratory	1. Model the material response. 2. Plan experimental setup to capture the test response of concrete members. 3. Conduct NDT on RC members. 4. Develop computing codes for analysis & design. 5. Develop the material models to design the concrete elements, such as beams, and, columns.
17.	LMST-104	Numerical Testing Laboratory	1. Identify suitable mathematical model. 2. Select appropriate solution technique. 3. Generate FE models, loadings, boundary conditions. 4. Obtain solution for common engineering problems. 5. Interpret the results to see the efficacy of various selections.
18.	LMPST-101	Project	1. Identify problems in the field of structural engineering. 2. Conduct literature survey to formulate objectives of the problem. 3. Plan appropriate solution strategy. 4. Analyze multiple possible solutions to decide the best possible among these for the given set of conditions. 5. Present the results/findings in oral and written form.
19.	MAC-101	English for Research Report/Paper Writing	1. Apply the acquired skills and excel in the professional environment. 2. Translate vast data into abstract concepts. 3. Improve the writing skills and level of readability. 4. Present the report / paper in oral and written form. 5. Ensure good quality of the paper during the initial submission.
20.	MST-113	Theory and Applications of Cement Composites	1. Classify materials as per orthotropic or anisotropic behaviour. 2. Estimate strain constants using theories applicable to composite materials. 3. Predict the behaviour of composite materials by use of available models. 4. Analyse and design the cement composite structural elements. 5. Suggest the use of cement composites for

S No	Course Code	Course Name	Course Outcomes
			miscellaneous structures.
21.	MST-117	Design of High Rise Structures	1. Analyze, design and detail 'Transmission/ TV tower', 'Mast and Trestles' with different loading conditions. 2. Analyze, design and detail the 'RC and Steel Chimneys'. 3. Analyze, design and detail the tall buildings subjected to different loading conditions using relevant codes. 4. Analyze and design the foundations for high rise structures. 5. Analyze and design high rise structures using different softwares.
22.	MST-118	Design of Masonry Structures	1. Identify appropriate masonry materials for construction work. 2. Use applicable BIS guidelines for construction of masonry works. 3. Calculate the safe stress levels for brick masonry elements, such as piers, walls. 4. Design different types of wall elements, such as cavity, solid, cross walls, etc. 5. Design & detail low rise brick masonry buildings.
23.	MST-119	Advanced Steel Structural Design	1. Compute plastic moment capacity of steel members. 2. Analyze beams and frames using theory of plasticity. 3. Design a frame using minimum weight design concept. 4. Calculate deflection of beam at ultimate and working loads. 5. Interpret the design of a frame considering secondary design parameters.
24.	MST-120	Advanced Design of Foundations	1. Identify the type of foundation to be provided as per site conditions. 2. Calculate the bearing capacity of shallow foundations. 3. Evaluate the load carrying capacity of pile and well foundations. 4. Analyze and design machine foundations. 5. Design sheet pile structures.
25.	MST-122	Soil Structure Interactions	1. Understand soil structure interaction concept and complexities involved. 2. Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics. 3. Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc. 4. Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear

S No	Course Code	Course Name	Course Outcomes
			stress-strain characteristics. 5. Evaluate action of group of piles considering stress-strain characteristics of real soils.
26.	MST-123	Advanced Concrete Structural Design	1. Analyze the behavior and calculate deflection and crack widths under different loading conditions. 2. Design special structures such as Deep beams, Corbels, and, Grid floors. 3. Design the flat slab as per Indian Standards. 4. Understand the behavior of concrete beams under stresses. 5. Design and detail beams, columns and joints for ductility.
27.	MST-124	Pre-Stressed Concrete Structures	1. Identify the concepts and principles of prestressing; tools/methods of prestressing; role of materials viz: concrete and steel in the process, principle of limit analysis, 2. Evaluate different loses in the prestress and analyze the sections for resultant stresses and/or capacity, 3. Characterize different modes of section failure and also identify anchorage zone, 4. Analyze and comprehend upon the applications of determinate and indeterminate systems, provisions of IS 1343, and, 5. Design prestressed concrete members such as prestressed slabs and tanks.
28.	MST-125	Fracture Mechanics of Concrete	1. Identify and classify cracking of concrete structures based on fracture mechanics. 2. Select suitable technique needed for the analysis. 3. Apply fracture mechanics models to high strength concrete and FRC structures. 4. Analyze the concrete elements at service and ultimate state. 5. Apply the concepts of CTOD/CMD in the analysis of concrete elements.
29.	MST-126	Design of Plates and Shells	1. Analyze and design prismatic folded plate systems. 2. Develop shell equations for different type of shells. 3. Analyze and design shells using approximate solutions. 4. Analyze and design cylindrical shells. 5. Analyze and design doubly curved shells using approximate solutions.

Program: M.Tech. (Geotechnical Engineering)

PG Scheme (2019)

Program Outcomes (POs):

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

Course Outcome

After completing this course the student must demonstrate the knowledge and ability to:

S No	Course Code	Course Name	Course Outcomes
1.	MGT-101	ADVANCED SOIL MECHANICS	1. Understand the behavior of different types of soils under drained and undrained conditions. 2. Compute consolidation settlements. 3. Evaluate shear strength of different soils. 4. Understand the concept of critical state soil mechanics. 5. Trace the stress path under drained and undrained conditions. 6. Compute the elastic and plastic deformations.
2.	MGT-102	SUBSURFACE INVESTIGATIONS AND INSTRUMENTATION	1. Understand the importance of sub surface soil investigation and learn the various techniques of soil investigation. 2. Suggest stabilization method for bore hole stability. 3. Apply appropriate sampling techniques as per site conditions. 4. Identify the various soil parameters required for the preparation of geotechnical report using in-situ and laboratory tests. 5. Update their skills with regard to the new technology available in the field of geotechnical engineering. 6. Have sufficient exposure about the soil investigation for off-shore structure using instruments.
3.	MGT-103	ADVANCED FOUNDATION ENGINEERING	1. Plan soil exploration program for different projects. 2. Select different types of foundations based on site

S No	Course Code	Course Name	Course Outcomes
			conditions 3. Analyze the bearing capacity and settlement characteristics of foundations. 4. Design the shallow and deep foundations for various site conditions as per codal provisions. 5. Suggest foundations for problaematic soils. 6. Analyze and design of foundation for coffer dams.
4.	MGT-111	SOIL STRUCTURE INTERACTIONS	1. Understand the interaction of soil and structure and factors affecting the interaction. 2. Understand the concept of various model developed to simulate the soil structure interaction. 3. apply different soil response models for specific problem based on the requirement. 4. analyze footings/rafts resting on soil as beams/plates on elasticfoundation and work out design bending moments/shear anddisplacements. 5. compute pile and pile cap response under vertical loading for designpurpose. 6. Compute the settlement and load carrying capacity of pile and pile group under lateral loading condition.
5.	MGT-112	GROUND IMPROVEMENT TECHNIQUES	1. Understand the mechanism of ground improvement. 2. Identify the necessity of ground improvement. 3. Identify the ground conditions and suggest suitable methods of improvement. 4. Design and assess the degree of improvement required. 5. Understand the functions of geosynthetics and soil nailing in engineering constructions. 6. Design reinforced soil structures.
6.	MGT-113	PAVEMENT ANALYSIS AND DESIGN	1. appreciate the functions of various components of a pavement. 2. identify the factors affecting design of pavements 3. design flexible pavements 4. design of rigid pavements. 5. evaluate performance of pavement and . 6. design the overlay on flexible and rigid pavement.
7.	MGT-	FEM IN GEOMECHANICS	1. Understand the fundamentals of Finite element method.

S No	Course Code	Course Name	Course Outcomes
	114		2. impart the knowledge and skill of analyzing physical problems with FE software. 3. understand the basic functions of FE based software and its applications in geotechical engineering. 4. select the appropriate element and mesh for FE analysis for given problem. 5. evaluate the type of problem and develop the FE-model. 6. estimate the stresses and strain in soil through FE analysis for given physical problem
8.	MGT-115	ENVIRONMENTAL GEOTECHNOLOGY	1. Understand soil environment interaction, composition, soil structure and its behaviour. 2. Specify site investigation techniques for characteristics of contaminated site. 3. Identify contaminant transport mechanisms in soils. 4. Specify site investigation techniques for characterization of contaminated site 5. Understand the principles of soil treatment techniques 6. Identify contaminants transport mechanism in soil.
9.	MGT-116	CRITICAL SOIL MECHANICS	1. Characterize stress-strain behaviour of soils, the failure criteria and to evaluate the shear strength and compressibility parameters of soils. 2. Use the concepts of stress path for different conditions. 3. Acquire knowledge for computing stress and changes in boundary surface, volume and pore water pressure. 4. Understand failure criteria of soils and apply models to study the time-deformation behaviour of soils. 5. Understand both the applications and limits of engineering methods commonly used to solve soil mechanics problems. 6. Understand the development of various elastic-plastic model.
10.	MGT-120	Earth Retaining Structures	1. Analyze the earth retaining structures for their stability against earth pressure. 2. Apply engineering knowledge for the designing of earth retaining structures in various site conditions and evaluation of retaining structures

S No	Course Code	Course Name	Course Outcomes
			using appropriate design methods, factors of safety, earth pressure diagrams and check their stability. 3. Determine the required depth of penetration and embedment of free and fixed sheet pile walls in cohesion and cohesionless soils. 4. Evaluate anchored sheet pile walls in free and fixed earth support conditions, spacing between bulkheads and anchors, resistance of anchor plates. 5. Explain the stress distribution around tunnels, types of conduits, arching and open cuts in soils. 6. Evaluate earth pressure against bracings in cuts and heave of the bottom of clay.
11.	LMGT-101	(Soil Mechanics Laboratory-I)	1. Understand the procedure for classifying coarse grained and fine grained soils. 2. Evaluate the index properties of soil. 3. Determine the engineering properties of soil. 4. Interpret the results of compaction test for relative compaction in the field 5. Conduct experiments analyze and interpret results for geotechnical engineering design. 6. Compute and analyze the consolidation settlements.
12.	LMGT-102	Soil Mechanics Laboratory-II)	1. To develop an appreciation the use of field tests in the engineering of civil infrastructure. 2. To develop an understanding of the relationships between physical characteristics and mechanical properties of soils. 3. To understand and experience experimental measurement of the mechanical soil properties commonly used in engineering practice. 4. To determine thickness of outlay required for existing pavements 5. To determine bearing capacity of site for providing shallow foundation. 6. To determine load carrying capacity of pile foundation through soil testing.
13.	MRM-101	Research Methodology and IPR	1. Understanding and formulation of research problem. 2. Analyze research related information. 3. Understand plagiarism and follow research ethics. 4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept,

S No	Course Code	Course Name	Course Outcomes
			and creativity. 5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. 6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
14.	MAC-102	DISASTER MANAGEMENT	1. Know about the various types of disaster and their components. 2. Know about the measures and precautions at the time of a disaster. 3. Know about various disaster-prone areas and various concepts about disaster preparedness, GIS and remote sensing. 4. Assess risk caused by a disaster and learn about various mitigation measures
15.	MGT - 104	Soil Dynamics	1. Understand theory of vibration and resonance phenomenon, dynamic amplification. 2. Understand propagation of body waves and surface waves through soil. 3. Apply different methods for estimation of dynamic soil properties required for design purpose. 4. Predict dynamic bearing capacity and assess liquefaction potential of any site. 5. Apply theory of vibrations to design machine foundation based on dynamic soil properties and bearing capacity.
16.	LMGT - 103	Model Testing Lab	1. Setup confined fill under control conditions. 2. Setup sloping fill under control conditions. 3. Analysebehaviour of footings of various shapes on confined fill conditions. 4. Analysebehaviour of footings of various shapes on sloping fill conditions. 5. Interpreting results of model testing.
17.	LMGT - 104	Numerical Analysis Lab	1. Formulate the algorithm to analyze a geotechnical problem and find the optimized solution of the problem. 2. Evaluate the slope stability using limit equilibrium and FEM software. 3. Calculate bearing capacity and settlement of

S No	Course Code	Course Name	Course Outcomes
			shallow and deep foundation using software. 4. Simulate the geotechnical problem and observe the effect of soil structure interaction. 5. Decide the most appropriate and optimized techniques to strengthen the ground up to a desirable limit.
18.	LMPGT - 101	Project	1. Identify geotechnical engineering problems reviewing available literature. 2. Decide the methodology to solve the problems related to geotechnical engineering. 3. Find multiple possible solutions and decide the best suited solution under the given conditions. 4. Analyse the effects of various parameters as applicable to the given solution. 5. Present a report that completely defines the problem and its solution.
19.	MGT - 116	Critical Soil Mechanics	1. Define the behavior of soils under different stress conditions. 2. Plot the CSL under drained and undrained loadings for lightly and heavily consolidated soils. 3. Evaluate the volume changes and pore pressure changes in soils. 4. Express the effect of dilation in sands. 5. Develop the elastic-plastic model based on critical state soil mechanics.
20.	MGT - 117	Rock Mechanics	1. Develop the co-relation between rock mechanics, engineering geology and soil mechanics. 2. Define the formation and classification of rocks. 3. Evaluate lab and in-situ properties of rock mass. 4. Analyse the stress distribution in situ and around opening in rock. 5. Summarize the applications of rock mechanics in various Civil Engineering projects.
21.	MGT - 118	Computational Geomechanics	1. Understand different numerical and statistical tools for analyzing various geotechnical engineering problems. 2. Solve linear and non-linear equations using numerical techniques. 3. Apply finite difference and finite element method for analyzing behavior of geotechnical structures. 4. Apply correlation and regression analysis for the geotechnical data. 5. Solve problem of consolidation and flow through porous media using numerical technique.
22.	MGT -	GeosyntheticsEngineering	1. Classify the Geosynthetics, it's functions and

S No	Course Code	Course Name	Course Outcomes
	119		assessment of their properties. 2. Describe the mechanism of improvement of bearing capacity and Geosynthetics's application in different Geotechnical problems. 3. Design with geosynthetics for the various functions in different Geotechnical problems. 4. Depict the mechanism of the drainage and filtration for different Geotechnical problems. 5. Evaluate the quality and monitor the performance of Geo-synthetics used in field.
23.	MGT - 121	Tunneling Techniques in Soil	1. Identify the need, planning and exploration of various underground construction projects. 2. Understand elastic and plastic analysis in the design of underground support system. 3. Develop understanding of the application of rock mass classification systems, ground conditions in tunneling and rock mass-tunnel support interaction analysis. 4. Elaborate the field tests generally conducted during and after construction of under structures. 5. Understand the system of instrumentation and monitoring of underground excavations during and after construction.
24.	MGT - 122	Clay Mineralogy	1. Identify the importance of soil mineralogy and mechanisms of formation on engineering behavior of soils. 2. Analyze basic mechanism behind the physical and engineering properties of soils. 3. Evaluate possible reasons for the observed phenomenon under scientific investigations for solving engineering problems. 4. Identify soil fabric by direct and indirect measuring methods. 5. Determining the properties of clayey soil.
25.	MGT - 123	Stability Analysis of Slopes	1. Understand the types and causes of slope failures. 2. Explain the method for checking the stability of an infinite and finite slope with and without water pressure. 3. Understand the stability of slopes with different methods and concept of factor of safety. 4. Determination of phreatic line, flow net in homogeneous and zoned earth dams under steady seepage and draw-down conditions, seepage control in earth dams. 5. Suggest the stabilization and strengthening of slopes with different method, rock bolting,

S No	Course Code	Course Name	Course Outcomes
			anchoring, instrumentation, monitoring and maintenance of slopes.
26.	MGT - 124	Geotechnical Earthquake Engineering	1. Summarize the source and causes of the earthquake. 2. Describe the concept of earthquake ground motion and its response. 3. Evaluate the liquefaction potential for a given site. 4. Design the different types of foundations and retaining walls considering the seismic safety. 5. Analyze the stability of a slope under seismic conditions.
27.	MGT - 125	Design of Foundations on Weak Soils & Rocks	1. Calculate swelling potential and design foundation on swelling/expensive soil. 2. Compute the Collapse settlement and design foundation on collapsible soil with or treatment. 3. Determine the bearing capacity/ bearing pressure of foundation under uniform or layered rocks. 4. Design the foundation or suggest the techniques to repair foundation in different condition as per requirement in the field. 5. Access the bearing capacity of piles in the field on week rock or rock mass.
28.	MAC-101	English for Research Report/Paper Writing	1. Apply the acquired skills and excel in the professional environment. 2. Translate vast data into abstract concepts. 3. Improve the writing skills and level of readability. 4. Present the report / paper in oral and written form. 5. Ensure good quality of the paper during the initial submission.

Program: M.Tech. (Environmental Science & Engineering)

PG Scheme (2019)

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.

Course Outcome

After completing this course the student must demonstrate the knowledge and ability to:

S No	Course Code	Course Name	Course Outcomes
1.	MEV-101	Physico-Chemical Treatment Methods	1. Know the sampling and analysis techniques required for the monitoring of water treatment plants and for the characterization of the water. 2. Understand the water quality guidelines, criteria and standards 3. Evaluate various physical and chemical treatment options for treatment of water and wastewater. 4. Explain the mechanism behind the treatment processes and their advantages and disadvantages.
2.	MEV-102	Solid and Hazardous Waste Management	1. Examine physical and chemical composition of wastes and to analyze activities associated with the management of solid waste. 2. Understand method to recover materials, conserve products, and to generate energy from solid and hazardous wastes. 3. Design and locate waste containment systems as per regulatory standards and to appreciate the increasing importance of waste and resource management in achieving environmental sustainability. 4. Define and explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste. 5. Understand the role legislation and policy drivers

S No	Course Code	Course Name	Course Outcomes
			play in stakeholders' response to the waste and apply the basic scientific principles for solving practical waste management challenges including landfill operations. 6. Define and elucidate the management, treatment and disposal of hazardous wastes and skill to assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes.
3.	MEV-111	Environmental Chemistry and Microbiology	1. Understand the interactions between air, water, soil sediments, equilibrium, acid base reactions and different water quality parameters. 2. Solve redox reactions and to understand various heavy metals in waste water. 3. Identify various sources and effects of indoor and outdoor air pollution. 4. Identify various microorganism and their importance. 5. Analyze the growth kinetics of microorganisms and microbiology of aquatic ecosystem. 6. Know the role of microorganisms in waste water treatment processes.
4.	MEV-112	Environmental Change and Sustainable Development	1. Identify factors influencing the global climate systems 2. Understanding of monitoring and modeling of predicting climate change. 3. Assess impacts of climate change on global, regional and local scales 4. Understanding of the climate system and anthropogenic effects. 5. Develop strategies for adaptation and mitigation measures 6. Identify clean technologies for sustainable development
5.	MEV-113	Environmental Hydraulics and Hydrology	1. Facilitate understanding of hydrological aspects of water resources. 2. Understand principles of need based activities such as pumps, mixers related to water. 3. Develop competence to propose effective convergence and design features of water supply projects. 4. Understand the application of pipe flow and open channel flow in water distribution networks and sewers, respectively.
6.	MEV-	Environmental Policies and	1. Describe national and international policy issues related to environmental media.

S No	Course Code	Course Name	Course Outcomes
	114	Legislation	2. Understand existing environmental laws and regulation. 3. Assess influence of policy decisions on the environment. 4. Apply knowledge of environmental analysis in planning and policy making. 5. Understand the various international and national treaties, and convention that laid the foundation for environmental awareness and revolution globally. 6. Elucidate and assess the Indian regulations on control and prevention of air pollution, water pollution; protection of forest and wildlife, and public liability insurance.
7.	MEV-115	Rural Water Supply and Sanitation	1. Identify various techniques and problems in rural water supply. 2. Monitor the quality and maintenance of rural water supply. 3. Design low cost water treatment system for rural areas. 4. Understand the rural sanitation and the management of grey and storm water. 5. Recognize different types of waste water treatment systems. 6. Know safe disposal of solid waste and different methods of solid waste management
8.	MEV-116	Urban Stormwater Management	1. Identify factors affecting urban hydrological cycle. 2. Estimate urban water demand and urban stormwater quantity. 3. Investigation of resources for drainage master plan. 4. Plan and design stormwater control and disposal systems. 5. Develop integrated urban water management system. 6. Understand the operation and maintenance of urban drainage system.
9.	LMEV-101	Advanced Water and Wastewater Laboratory	1. Understand the application of analytical equipment in water and wastewater analysis. 2. Develop the methods for the analysis of different pollutants in water and wastewater. 3. Perform the analysis of heavy metals using atomic absorption spectrometer, spectrophotometer.

S No	Course Code	Course Name	Course Outcomes
			4. Determine the BOD and ASP kinetic parameters for different types of wastewater.
10.	LMEV-102	Environmental Chemistry Laboratory	1. Conduct experiments as per the standard methods of sampling and analysis. 2. Understanding the importance of laboratory analysis as a controlling factor in the treatment of water and waste water. 3. To interpret the results in comparison with public health considerations and standards. 4. Use the analysis results for making informed decisions about the drinkability of water and disposal of waste water. 5. Determine the concentration of solids, chlorides, hardness, residual chlorine, dissolved oxygen etc. in water and waste water. 6. Evaluate and compare different techniques of experimental analysis.
11.	MRM-101	Research Methodology and IPR	1. Understanding and formulation of research problem. 2. Analyze research related information. 3. Understand plagiarism and follow research ethics. 4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. 5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. 6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
12.	MAC-102	DISASTER MANAGEMENT	1. Know about the various types of disaster and their components. 2. Know about the measures and precautions at the time of a disaster. 3. Know about various disaster-prone areas and various concepts about disaster preparedness, GIS and remote sensing.

S No	Course Code	Course Name	Course Outcomes
			4. Assess risk caused by a disaster and learn about various mitigation measures.
13.	MEV - 103	Biological Treatment Methods	1. Analyse and design the biological processes in wastewater treatment. 2. Solve the complex issues in biological wastewater treatment systems. 3. Understand and implement process kinetics. 4. Develop low cost biological treatment methods for rural areas. 5. Implement the efficient disposal methods of treated wastewater.
14.	MEV - 104	Air Pollution and Control	1. Define the various sources of air pollution and their effects on human health and environment. 2. Develop the energy balance and plume behaviour for different atmospheric stability conditions. 3. Paraphrase the sampling techniques and analyse air quality. 4. Interpret various techniques used to control particulate matter and gaseous pollutants. 5. Explain the implementation of biological air pollution control technologies.
15.	LMEV - 104	Environmental Computation Lab	1. Understand different software used in environmental science and engineering 2. Compare that how software reduces the work load of design. 3. Design a model of water supply network. 4. Develop a model to transport and discharge the wastewater to treatment unit. 5. Design a model for rain water harvesting.
16.	LMEV - 105	Solid Waste Analysis Lab	1. Identify the type of solid waste through physical and chemical evaluation, 2. Analyze the environmental impacts of waste, 3. Ascertain the economical value of different streams of solid waste, 4. Implement waste to energy strategies, and 5. Understand the optimum disposal method of solid waste.
17.	LMPEV - 101	Project	1. Identify environmental engineering problems by reviewing available literature. 2. Decide the methodology for collecting relevant data to solve the problem. 3. Analyse multiple possible solutions to present a solution that suits best for the given conditions. 4. Analyse the effects of various parameters as applicable to the given solution.

S No	Course Code	Course Name	Course Outcomes
			5. Present a report that completely defines the problem and its solution.
18.	MEV - 117	Geo-environmental Engineering	1. Identify the causes and effects of subsurface contamination. 2. Define contaminant transport mechanisms in soils and its detection and control. 3. Plan a site for the landfill by monitoring the environmental conditions. 4. Design landfill and liners for contaminants. 5. Categorize the reuse of solid waste materials.
19.	MEV - 118	Environmental Impact Assessment and Management	1. Summarize the importance of environmental impact assessment in various engineering projects. 2. Identify various key issues in the impact assessment of various projects. 3. Predict the magnitude of an impact using mathematical tools and prepare methodology to prepare EIA reports. 4. Apply proper mitigation measures to avoid environmental impacts. 5. Generate EIA report with suitable environmental management plan.
20.	MEV - 119	Life Cycle Analysis and Design for Environment	1. Perform life cycle inventory analysis of products. 2. Develop strategies to bring energy efficiency in all stages of the product development cycle. 3. Formulate plans for comprehensive environmental protection, in order to comply with environmental laws. 4. Resolve issues in the lifecycle analysis from raw material to disposal/reuse stage. 5. Develop waste management strategies of the disposed products.
21.	MEV - 120	Water Distribution and Sewerage Network Design	1. Estimate water demand and analyze water quality. 2. Design conventional water treatment systems. 3. Design treatment systems for removal of dissolved solids. 4. Analyze and design water distribution systems. 5. Assess methods employed for water reuse, wastewater reclamation and storm water control.
22.	MEV - 121	Watershed management	1. Demarcate and characterize watersheds. 2. Analyze the watersheds and identify the issues and concerns associated with them. 3. Frame the watershed management objectives. 4. Comprehend and analyze the hydrological and remote sensing data.

S No	Course Code	Course Name	Course Outcomes
			5. Define the best management practices for the sustainable management of watershed.
23.	MEV - 122	Environmental Quality Modelling	1. Develop and evaluate model. 2. Define various drinking water quality parameters. 3. Classify and validate water quality models. 4. Identify air quality models. 5. Exemplify the various components and types of air quality models.
24.	MEV - 123	Industrial Wastewater Management and Reuse	1. Sample and analyze the characteristics of industrial wastewaters. 2. Analyze the effects of disposal of industrial wastes. 3. Identify and design treatment options for handling industrial wastewater. 4. Implement the effective reuse of treated industrial wastewater. 5. Suggest waste minimising techniques to industries.
25.	MEV - 124	Analytical Methods of Environmental Monitoring	1. Analyze the principles of volumetric and instrumental analytical methods in environmental monitoring. 2. Study the principle of chromatography, spectrophotometry and their applications. 3. Apply statistical methods for evaluating and interpreting data of environmental interest. 4. Categorize various electrochemical methods. 5. Summarize various material characterization techniques and its principles.
26.	MEV - 125	Ground Water Recharge	1. Infer the importance of ground water hydraulics in interpreting the groundwater processes. 2. Determine the effect of different natural and anthropogenic activities on ground water. 3. Articulate different techniques to recharge ground water. 4. Design and develop ground water recharge facilities and reuse of wastewater for the same. 5. Analyze the effect of chemical, microbiological activities in aquifer transport.
27.	MEV - 126	Environmental Remote Sensing and GIS	1. Apply basic principles of remote sensing for resource mapping and evaluation. 2. Understand and operate GIS softwares. 3. Develop geospatial database of water resources and environmental engineering systems. 4. Implement GIS models for hydrological simulation. 5. Enact GIS models for planning environmental

S No	Course Code	Course Name	Course Outcomes
			engineering systems.
28.	MEV - 127	Biodegradation and Bioremediation Techniques	1. Identify the benefit of microorganisms in degrading the contaminants. 2. Summarize the fate and transport of contaminants in soil and water bodies and principle of biodegradation. 3. Determine suitable microorganism for biodegradation of selected compound. 4. Analyze the role of strains and protein in the enhancement of biodegradation. 5. Carryout suitable assessment methods for bioremediation.
29.	MEV - 128	Environmental System Engineering	1. Analyze the system performance using simulation models. 2. Optimize environmental engineering systems using optimization models. 3. Employ model-based environmental analysis. 4. Choose a suitable environmental systems analysis method and tool for a given decision situation. 5. Identify the contemporary issues, design, formulate and solve the problem.
30.	MEV - 129	Membrane Processes	1. Classify types of membrane filtrations techniques and the selection of particular type according to requirement. 2. Explain the principle and applications of common membrane processes. 3. Analyze the principle and design of MBR. 4. Interpret membrane fouling and techniques to control it. 5. Summarize and monitor pretreatment methods and strategies.
31.	MAC-101	English for Research Report/Paper Writing	1. Apply the acquired skills and excel in the professional environment. 2. Translate vast data into abstract concepts. 3. Improve the writing skills and level of readability. 4. Present the report / paper in oral and written form. 5. Ensure good quality of the paper during the initial submission.

Mechanical Engineering

Program Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

1. Will be able to apply the acquired theoretical and practical skills to solve the industrial and research problems in the major streams such as thermal, design, manufacturing and industrial engineering.

2. Will be able to take up their career in government, public, private sector industrial/research organizations, start enterprises and pursue higher studies with high regard for social and professional ethics.

Course Outcome

3rdSemester **ME 14301 Strength ofMaterials- I**

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

Course Outcomes:

After studying this course, students shall be able to:

1. Apply the concept of stresses, strains and their relationships to determine the principalstresses.
2. Construct and analyze the shear force and bending moment diagram under different loadingconditions.
3. Calculate the bending stresses in different type ofbeams.
4. Design simple bars and shafts for allowable shearing stresses andloads.
5. Analyse the stresses in slender and long columns subjected to axialloads.
6. Evaluate slope and deflection in different type of beams under different loadingconditions.

3rdSemester **ME 14302 Theory ofMachines-I**

	L	T	P	C
InternalMarks:40				
ExternalMarks: 60	**3**	**1**	**-**	**4**
Total Marks: 100				

Course Outcomes:

After studying this course, students shall be able to:

1. Understanding the basic concept of kinematics and kinetics of machineelements.
2. Analyse the mechanism by velocity and accelerationdiagrams.
3. Understanding the various lower and highpairs.
4. Calculate loss of power due to friction in various machineelements.
5. Applying the concepts of flywheel and governor to control the speed ofengine.
6. Creating and designing of different types ofcams.

3rd Semester **ME-14303 Machine Drawing**

	L	T	P
Internal Marks: 40			

External Marks: 60 **2 - 4**
Total Marks: 100
Course Outcomes:
After studying this course, students shall be able to:
1. Read, draw and interpret the machine drawings and relatedparameters.
2. Understand and monitor the manufacturing of components at shop floor level as per the information in the givendrawing.
3. Apply and analysis the proper use of various types of screw threads, nuts and bolts, locking deviceetc.
4. Understand the concept of limits, fits and tolerances in various matingparts.
5. Draw free hand sketches of various machinecomponents.
6. Visualize and create/generate different views of a component with detailed internal information in the assembly.

3rd Semester **ME 14304 Applied Thermodynamics-I**
Internal Marks: 40 **L T P C**
External Marks: 60 **3 1 - 4**
Total Marks: 100
Course Outcomes:
After studying this course, students shall be able to:
1. Analyse the products of combustion in boilers and I.C.engines.
2. Use the steam table and Mollier chart to evaluate properties ofsteam.
3. Analyse various vapour power cycles and suggest appropriate cycle for practicalapplications.
4. Design the steam nozzles from point of view of thermal and fluidconsiderations.
5. Evaluate the Performance of impulse and reaction turbines and determine the bladeparameters.
6. Understand the various methods for the improvement of performance of turbines andsteam condensers.

3rd Semester **ME 14305 Manufacturing Processes –I**
Internal Marks: 40 **L T P C**
External Marks: 60 **4 - - 4**
Total Marks: 100
Course Outcomes:

After studying this course, students shall be able to:
1. Use the Knowledge of Fundamental principles of Castings and Welding processes for theirpractical applications.
2. Identify and suggest equipments, tools and accessories required for performing the casting and welding processes.
3. Design the riser and gating system for casingprocesses.
4. Test the products made by casting and welding processes using destructive and non-destructive means so as to appreciate theirutility.
5. Design the weld joints and select suitable welding electrodes and consumables for variouswelding processes.
6. Understand the latest technologies in Casting and WeldingProcesses.

3rd Semester **ME 14306 Engineering Materials & Metallurgy**
Internal Marks: 40 **L T P C**

External Marks: 60 **4 - - 4**
Total Marks: 100
Course Outcomes:

Course Outcomes

After studying this course, students shall be able to:

1. Understand the significance of the metallurgical characteristics of engineering materials (bothferrous andnonferrous).
2. Explain the theories of diffusion, plastic deformation andre-crystallization.
3. Analyze various heat treatment processes and their applications for differentmaterials.
4. Explain the role of Fe-C and TTT diagram for controlling the desired structure and properties of the materials.
5. Suggest the methods to determine the hardiness ofmaterials.
6. Understand the significance of ferrous and non ferrous metals and theiralloys

3rdSemester ME 14307 Manufacturing Processes & MetallurgyLab

Internal Marks: 30	**L**	**T**	**P**	**C**
External Marks: 20	**-**	**-**	**2**	**1**

Total Marks: 50
Course Outcomes:

After studying this course, students shall be able to:

1. Remember the major characteristics of mouldingsand.
2. Analyse the properties of moulding sand by performing varioustests.
3. Understand the basis of welding processes like MIG, TIG & SEAMWelding.
4. Evaluate the effect of welding parameters on welding of mild steelsheets.
5. Apply various techniques of heat treatment to understand their effect on properties ofsteel.
6. Create/Prepare specimens of mild steel for study ofmicrostructure.

3rdSemester ME 14308 Strength of Materials Lab

InternalMarks:30	**L**	**T**	**P**	**C**
ExternalMarks:20	**-**	**-**	**2**	**1**

Total Marks: 50
Course Outcomes:

After studying this course, students shall be able to:

1. Conduct mechanical testing (Tensile, compression, Impact, bending, torsion of various materials).
2. Compare mechanical properties of variousmaterials.
3. Determine buckling load of longcolumns.
4. Understand load –deflection relation of helicalspring.
5. Conduct fatigue testing of thematerials.
6. Conduct hardness test on variousmaterials.

3rd Semester ME 14309 Applied Thermodynamics Lab

Internal Marks: 30 | **L T P C**
External Marks: 20 | **- - 2 1**
Total Marks: 50

Course Outcomes:

After studying this course, students shall be able to:

1. Identify different types of IC engines and their parts; understand construction & working of IC engines.
2. Understand impact of valve timing on performance of ICengines.
3. Demonstrate the construction and working of different types of steam generators and theirparts.
4. Evaluate the performance of steamgenerators.
5. Evaluate the performance of ICengines.
6. Demonstrate the construction and working of power plant parts likecondensers.

4thSemester **ME 14401 Strength of Materials – II**

Internal Marks: 40 | **L T P C**
External Marks: 60 | **3 1 - 4**
Total Marks: 100

Course Outcomes:

After studying this course, students shall be able to:

1. Analyze strain energy in bean under different kinds ofloads
2. Perform design analysis of pressure vessels andsprings.
3. Use Application of failure theory for safe design of mechanicalcomponents.
4. Analyze and design beam under shearingstresses.
5. Analyze rotational stresses in various sections of machinecomponent.
6. Design various cross-sectional curved beams for differentapplications.

4th Semester **ME 14402 Theory of Machines – II**

Internal Marks: 40 | **L T P C**
External Marks: 60 | **3 1 - 4**
Total Marks: 100

Course Outcomes:

After studying this course, students shall be able to:

1. Evaluate inertia forces and couples applied to the reciprocating parts ofmachines.
2. Applying the concept of Static and dynamic balancing of rotating and reciprocatingmasses.
3. Understand the function and application ofgears.
4. Evaluate the velocity ratio and torque in different geartrains.
5. Analyze gyroscopic couple and effect in two and fourwheelers.
6. Identifies the motion characteristics of differentmechanisms.

4thSemester **ME 14403 FluidMechanics**

InternalMarks:40 | **L T P C**

ExternalMarks:60 | **3 1 - 4**

Total Marks: 100

Course Outcomes:

After studying this course, students shall be able to:

1. Understand the concept of fluids and various fluidproperties.
2. Analyse problems related to fluid in rest/ relative equilibriumconditions.

3. Comprehend the fluid flow classifications, flow parameters and flowvisualization.
4. Evaluate fluid dynamics problems on the basis of momentum and energyconcepts.
5. Apply dimensional analysis and similitude techniques to various physical fluidphenomena.
6. Design pipe networks for different flow situations by considering different headlosses.

4th Semester **ME 14404 Applied Thermodynamics-II**

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

Course Outcomes:

After studying this course, students shall be able to:
1. Use and apply the analysis of positive and dynamiccompressors.
2. Analyze the single and multi-stage reciprocating air compressorcycles.
3. Recognition, construction and working of rotary aircompressor.
4. Performanceevaluationatvariousapplicationsofcentrifugalcompressorsaxialflow compressors.
5. Analyze the gas turbine system for various applications.
6. Identify the description of various propulsionsystems.

4thSemester **ME 14405 Manufacturing Processes-II**

	L	T	P	C
InternalMarks:40				
ExternalMarks:60	**4-**	**-**	**4**	
Total Marks: 100				

Course Outcomes:

After studying this course, students shall be able to:
1. Understand the fundamental principles of metal forming, Metal Cutting, and Powder Metallurgyand recognize related machine tools and parameters of the processes for analyzing the effect of process parameters onperformance.
2. Select metal machining and metal forming processes needed for the manufacturing ofvarious geometrical shapes ofproducts.
3. Acquire knowledge of geometry of cutting tools and develop relationship of cutting forces in metal cutting.
4. Understand cutting tool materials and related concepts like tool life, wear, andcoolants/lubricants.
5. Use machine tools for various machining operations in conventionalmanufacturing
6. Calculate cutting speed, feed depth of cut for various machiningprocesses.

4thSemester **ME 14406 Fluid MechanicsLab**

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

Course Outcomes:

After studying this course, students shall be able to:
1. Validate/justify Bernoulli's equation in duct flow..

2. Distinguish various type of flows and flow measurementtechniques.
3. Determine discharge, pressure, velocity, hydraulic coefficients for different types of flowsituations.
4. Determine the different types of head losses in pipe networks with friction coefficientvalues.
5. Understand metacentre concept of a floating vessel and concept ofstability.
6. Understand flow patterns and various flow visualizationtechniques.

4thSemester **ME 14407 Manufacturing ProcessLab**

	L	T	P	C
Internal Marks: 30				
External Marks: 20	**-**	**-**	**2**	**1**

Total Marks: 50

After studying this course, students shall be able to:

1. Conduct various tests to determine major characteristics of moldingsand.
2. Understand the constructional details and working of major equipment used in metal forming and press tools.
3. Grind single and multipoint cuttingtools.
4. Perform various operations on Centre lathe, shaper and millingmachine.
5. Understand the importance of various angles on single and multi point cuttingtools.
6. Apply the fundamentals of metal cutting for determining cutting forces with the use oftool dynamometer.

4thSemester **ME 14408 Theory of MachinesLab**

	L	T	P	C
InternalMarks:30				
ExternalMarks:20	**-**	**-**	**2**	**1**

Total Marks: 50

Course Outcomes:

After studying this course, students shall be able to:

1. Conceptualize the function and applications of kinematic chains,mechanisms.
2. Calculate coefficient of friction for different types of belt-pulleys and materialcombinations.
3. Understand the function of gears and evaluate gear train value of different geartrains.
4. Determine magnitude and position of balancing mass for unbalanced rotatingparts.
5. Create the profile of cam with various followers and pressure distribution profile of journalbearings.
6. Compare the function of governors and flywheels to control the enginespeed.

5th Semester **ME -14500 Mathematics-III**

	L	T	P	C
Internal Marks: 40				
External Marks: 60	**3**	**1**	**-**	**4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Decompose periodic functions or periodic signals into the sum of a (possibly infinite) set ofsimple oscillating functions namely sines and cosines (or complexexponentials).
2. Apply De-Moivre's theorem to basic functions of complexvariables
3. Use power series method to solve differential equation and its application to Bessel's andLegendre's equations.

4. Analyze Partial differential equations and learn simplest means to solvethem.
5. Apply method of separation of variables to solve wave and heatequation.
6. Understand the concepts of limit, continuity and derivative of complex variables and useanalytic functions which are widely applicable to two dimensional problems inengineering.

5thSemester **ME - 14501 Design of MachineElements-I**

	L	T	P	C
Internal Marks: 40				
External Marks: 60	**4**	**-**	**-**	**4**
Total Marks: 100				

Course Outcomes

After studying this course, students shall be able to:

1. Remember the meaning of machine design and types of designprocesses.
2. Understand various design considerations like stress concentration factor and factor ofsafety.
3. Design of various basic machine components under different loadingconditions.
4. Analyse the fastening processes like welding, riveting etc. For differentapplications.
5. Evaluate machine members like levers,shafts,axles,keys, coupling and cotters etc. As perdifferent requirements in theindustry.
6. create the design and suggest/apply suitable modifications in thedesign

5thSemester **ME-14502 Computer Aided Design and Manufacturing**

	L	T	P	C
Internal Marks: 40				
External Marks: 60	**4**	**-**	**-**	**4**
Total Marks: 100				

Course Outcomes

After studying this course, students shall be able to:

1. Describe the role of computer systems in design andmanufacturing.
2. Understand and create geometric models by using various techniques of geometricmodeling.
3. Apply geometric transformations on different modelentities.
4. Describe the key concept of NC / CNC /DNC.
5. Create and validate NC part program data using manual data input(MDI).
6. Evaluate integration of CAD/CAM and business aspects in anindustry

5thSemester **ME-14503 Mechanical Measurements and Metrology**

	L	T	P	C
InternalMarks:40				
ExternalMarks:60	**4**	**-**	**-**	**4**
Total Marks: 100				

Course Outcomes

After studying this course, students shall be able to:

1. Understand the different types of mechanical measurements and measuring standards usedfor industrialapplications
2. Derive relationship for static/dynamic characteristics and their response on measurementsystems.
3. Analyze errors in measurements by statisticalmethods
4. Measure various elements of thread andgears.

5. Analyze the functions of various sensors and transducers for measurements of pressure,temperature andflow.
6. Identify various instruments used for measurement of speed, torque andforce.

5thSemester ME-14504 Industrial Automation andRobotics

	L	T	P	C
Internal Marks: 40				
External Marks: 60	**4**	**-**	**-**	**4**
Total Marks: 100				

Course Outcomes

After studying this course, students shall be able to:

1. Understand the concept, need and application of hard automation, soft automation andtheir advantages.
2. Use the hydraulic/pneumatic valves and cylinders for their application inautomation.
3. Design the pneumatic and hydraulic circuits for industrial automationapplications.
4. Analyze the working of fluidic sensors for their industrialapplications.
5. Understand the working of various transfer devices and feeders in manufacturingindustry.
6. Programme the robotic arm for its industrialapplications.

5thSemester ME-14505 Computer Aided Design and Manufacturing Lab.

	L	T	P	C
InternalMarks:30				
ExternalMarks:20	**-**	**-**	**2**	**1**
Total Marks: 50				

Course Outcomes

After undergoing this course, students shall be able to:

1. Understand and execute various features to create differentparts.
2. Assemble and draft mechanical part using simple and advancedfeatures.
3. Generate different views and provide relative movement betweencomponents.
4. Write manual part programme (G-Code) for CNC turning and milling using manual data input(MDI)
5. Execute machining of simple profiles on CNC turning and millingtrainer.
6. Create and validate NC part program data) automatically using standard commercial CAM packagefor manufacturing of requiredcomponent.

5thSemester ME-14506 Mechanical Measurements and MetrologyLab

	L	T	P	C
InternalMarks:30				
ExternalMarks:20	**-**	**-**	**2**	**1**
Total Marks: 50				

Course Outcomes

After undergoing this course, students shall be able to:

1. Understand the basics of measurements and their needs in industry.
2. Measure dimensions; angles and shaftspeed.

3. Measure the surface roughness of any metallic flat surface; pipe androd.
4. Calibrate the pressure gauge and prepare a thermocouple and itscalibration.
5. Measure threads elements and gearelements.
6. Plot the velocity profile by using Pitottube.

5thSemester ME-14507 Industrial Automation and RoboticsLab

	L	T	P	C
InternalMarks:30				
ExternalMarks:20	-	-	2	1

Total Marks: 50

Course Outcomes

After undergoing this course, students shall be able to:

1. Understand the working of hydraulic and pneumatic valves and theirsymbols
2. Design the basic hydraulic and pneumatic circuits using different types ofvalves.
3. Demonstration of the working of reciprocating movement of single acting and double actingcylinder
4. Design pneumatic/hydraulic clamping device for Jigs andfixture.
5. Understand the working of power steeringmechanism
6. Understand the working of Robotic arm and endeffectors.

6thSemester ME-14601 Design of Machine Elements-II

	L	T	Pr	C
InternalMarks:40				
ExternalMarks:60	4	- -		4

TotalMarks : 100

CourseOutcomes

After studying this course, students shall be able to:

1. Remember the various drives to transmit power for short distances, moderate distances and long distances.
2. Understand the design and selection of bearings for different industrialapplications.
3. Apply the suitable lubricants (thin film lubricants, partial film lubricants and thick film lubricantsetc.) as per the need of the mechanicalsystem.
4. Analyse the design of various machine members like: springs, flywheel for differentapplications.
5. Evaluate machine members like clutches and brakes etc. as per different requirements in theindustry.
6. Create the design and suggest/apply suitable modifications in thedesign.

6thSemester ME-14602 HeatTransfer

	L	T	P	C
Internal Marks: 40				
External Marks: 60	3	1	-	4

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Recognize the predominant mode of heat transfer in various engineeringapplications.

2. Analyze the various heat transfer problems (mainly one dimensional under steady statecondition) using basic laws of heat transfer and electricalanalogy.
3. Develop mathematical relations to solve heat transferproblems.
4. Select and design the fins for various engineeringapplications.
5. Apply the basic laws of radiation and electrical network analysis to solve radiative heatexchange problems.
6. Design the heat exchangers by using the concept of conductive and convective (simple andphase change) heat transferphenomenon.

6thSemester ME-14603 HydraulicMachines

InternalMarks:40 **L T P C**

ExternalMarks:60 **3 1 - 4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Recognize basic components of turbo machines and understand related fundamental laws/ principles and apply these for calculation of parameters like work done andefficiency.
2. Comprehend and evaluate constructional details, working and design aspects of runner/wheel of various waterturbines.
3. Comprehend and evaluate constructional details, working and design aspects of Positive Displacement and Centrifugalpumps.
4. Analyse the Performance characteristics of Hydraulic Machines on the basis similitudeanalysis.
5. Understand various operating problems related with Hydraulic Turbines and Pumps and suggest respective preventivemeasures.
6. Demonstrate knowledge about various hydraulic devices like fluid coupling, accumulator and intensifier,etc.

6th Semester ME-14604 Heat Transfer Lab

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

Course Outcomes

After undergoing this course, students shall be able to:

1. Design and fabricate the experimental setups related to heat transfer phenomena.
2. Measure and analyse different heat transferparameters.
3. Apply finite difference methods to solve simple heat transferproblems.
4. Perform experimentation on fabricated ExperimentalSet-up.
5. Assess relevance of prominent heat transfer mode in givencircumstances.
6. Simulate various Heat Transfer situations by experimentaltechniques.

6thSemester ME-14605 Hydraulic Machines Lab

Internal Marks: 30 **L T P C**
External Marks: 20 **- - 2 1**

Total Marks: 50

Course Outcomes

After undergoing this course; students shall be able to:

1. Conduct experiments on scaled down models/ actual size hydraulic machines and evaluate results in terms of unit or specific quantities for comparisonpurpose.
2. Suggest different hydraulic machines for different conditions in order to have maximumefficiency.
3. Utilize various combinations of hydraulic systems to enhance overall efficiency of thesystem.
4. Suggest installations of hydraulic machines depending on differentrequirements.
5. Understand working of various pumps and can suggest remedial solutions for differentfaults.
6. Determine performance of centrifugal and reciprocatingpumps.

6thSemester ME-14607 Design of Machine Elements –II Practice

	L	T	P	C
Internal Marks: 30				
External Marks: 20	**-**	**-**	**2**	**1**

Total Marks: 50

After undergoing this course; students shall be able to:

1. Understand the belt and pulley assembly mechanism and do the complete design calculations, then justify the existingdesign.
2. Design a transmission system involving the chain drives / gear drives by specifying inputs parameters and then justify thedesign.
3. Design flywheel for industrial applications and suggest itssuitability.
4. Design completely a hydrodynamic journal bearing and specify its suitability by using heat balance equation.
5. Design springs for automobile application by specifying conditions and constraints. An application of spring can be taken and some input parameters can beassumed.
6. Design a clutch/ brakes of an automobile and justify itssuitability.

	L	T	P	C

7th/8thSemester ME 14801 Refrigeration and Air Conditioning

internal marks:40				
External Marks: 60	**3**	**1**	**-**	**4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Understand and identify method/type of refrigeration and air conditioningsystems.
2. Analyze and evaluate air refrigeration cycles and systems especially for aircraft airconditioning.
3. Analyze and evaluate vapour compression refrigeration cycle andsystem.
4. Identify the different refrigerants from their nomenclature and select them from environmental aspects and field ofapplication.
5. Understand and determine psychrometric properties, evaluate various psychometric processes and calculate cooling and heating loads for different domestic, commercial and industrialconditions.
6. Design air conditioning and refrigeration systems for various applications and select theircomponents.

7th/8thSemester ME 14802 MechanicalVibrations

	L	T	P	C
Internal Marks: 40				
External Marks: 60	**3**	**1**	**-**	**4**

Total Marks: 100

Course Outcomes:

After studying this course student will be able to:

1. Formulate mathematical models of problems in vibrations using Newton's second law orenergy principles.
2. Understand the need and measurement of vibration in mechanicalsystems.
3. Calculate principal modes ofvibrations.
4. Explore the suitable methods of vibration reduction andabsorption.
5. Ability to determine vibratory responses of SDOF, MDOF and continuoussystems
6. Create the mathematical model of a vibratory system to determine itsresponse.

7th/8thSemester ME 14803 AutomobileEngineering

Internal Marks: 40	**L**	**T**	**P**	**C**
External Marks: 60	**4**	**-**	**-**	**4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Identify the different parts of the automobile and to know the terminology related toautomobiles.
2. Understand various types of frames, chassis, power units, suspension systems and wheel tyre constructional details and theirapplications
3. Analyse the environmental implications of automobile emissions and theirmitigation
4. Understand the working and application of fuel supply system and various characteristics offuels.
5. Understand the working of various lubrication and cooling systems and rating/characteristics of lubricants andcoolants
6. Understand the automated/manual transmissions, steering system with geometry, braking system, electronic and electric systems with complete vehiclemaintenance.

7th/8thSemester ME 14804 Refrigeration and AirConditioning Lab

Internal Marks: 30	**L**	**T**	**P**	**C**
External Marks: 20	**-**	**-**	**2**	**1**

Total Marks: 50

Course Outcomes

After studying this course, students shall be able to:

1. Understand and evaluate the performance of different types of refrigerationsystems.
2. Estimate cooling and heating load of desired space for different refrigeration and airconditioning applications.
3. Understand the working of various commercial and industrial RACsystems.
4. Evaluate the performance of an air conditioningsystem.
5. Understand the importance of Psychrometric properties of moist air for an air conditioningsystem.
6. Recognize and select the different parts/components required for RACsystems.

7th/8thSemester ME 14805 Mechanical Vibration Lab

Internal Marks:30	**L**	**T**	**P**	**C**

External Marks: 20 **- - 2 1**
Total Marks: 50

Course Outcomes

After performing the experiments student will be able to:

1. Determine the viscosity offluid.
2. Determine radius of gyration of compoundpendulum.
3. Determine natural frequency of simplestructure.
4. Determine modulus of elasticity of given samplewire.
5. Demonstrate forcedvibration.
6. Determine coefficient of dryfriction.

7th/8thSemester **ME 14807 Automobile EngineeringLab**

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

Course Outcomes:

1. Understand the working of various automobilesystems.
2. Identify the importance and features of different automobile components *viz.*axle,differential,brakes, steering, suspensionetc.
3. Reface and grind the valves and check the leakages in valves.
4. Understand the fundamental knowledge of systems used to transfer and control energy from engine to the wheels which includes transmission system with gear box assembly, differential, clutches and brakes.
5. Understand the important parameters of ignition system and coolingsystem.
6. Understand and demonstrate different geometries involved in steeringsystems.

DEPARTMENT ELECTIVES

I. SPECIALIZATIONGROUP

DEME14104	Energy Conservation and Management
DEME14105	Fluid Mechanics-II
DEME14108	Power Plant Engg.

DEME-14104 Energy Conservation and Management

InternalMarks:40 **L T P C**

ExternalMarks:60 **4 - - 4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Apply the basic knowledge of different engineering concepts and principles for energy conservation and management ofsystem.
2. Evaluate the energy saving & conservation in different electrical and thermalutilities.
3. Understand efficient steam, thermal & electric power utilization, saving and energy recovery in these

systems.
4. Prepare energy audit report for different energy conservationinstances.
5. Understand Importance and role of Energy Manager/ EnergyAuditor
6. Comprehend current global energy scenarios, various energy protocols and energycrisis.

DEME-14105 Fluid Mechanics -II

	L	T	P	C
InternalMarks:40				
ExternalMarks:60	**4**	**-**	**-**	**4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:
1. Evaluate the fluid flow problems which can be modeled as potentialflow.
2. Apply viscous flow theory to various Laminar flowapplications.
3. Know characteristics of Turbulent flow and need of Turbulencemodeling.
4. Understand Boundary Layer features and can derive quantitative correlations for various Boundary Layerparameters.
5. Evaluate the coefficient of lift and drag for different shaped immersedbodies.
6. Understand the basics of compressible flow and static/ stagnationproperties.

DEME-14108 Power Plant Engineering

	L	T	P	C
InternalMarks:40				
ExternalMarks:60	**4**	**-**	**-**	**4**

Total Marks: 100 Course Outcomes Course Outcomes (CO)

After studying this course, students shall be able to:
1. Understand energy sources for power generation and principles types of powerplants.
2. Understand about essential features and types of hydro-electric and nuclear powerplant.
3. Understand about essential features of steam power plant and also have knowledge about coal and ash handlingsystems.
4. Understand the working of I.C engines and able to compare its performance with otherplants.
5. Conceptualize understanding of load factor, capacity factor, average load and peak load onpower plant.
6. Understand different direct energy conversionsystems.

MANUFACTURING

DEME14201	Non-Traditional Machining
DEME14202	Modern Welding and Forming Processes
DEME14203	Computer integrated Manufacturing

DEME14204	Computer Aided Process planning
DEME14205	MachiningScience
DEME14206	Rapid Prototyping
DEME14207	Modern Casting Processes
DEME14208	MicromachiningTechnologies
DEME14209	ManufacturingSystems

DEME 14201 Non-Traditional Machining

	L	T	P	C
Internal Marks: 40				
External Marks: 60				
TOTAL MARKS: 100	**4**	**-**	**-**	**4**

Course Outcomes:

After studying this course, students shall be able to:

1. Understand the concept of latest technologies and need of Non-Traditional Machining processesin manufacturing.
2. Understand the principle, mechanism of metal removal of various non-conventional machining processes.
3. Analyze the various process parameters and their effect on the component machined onvarious unconventional machiningprocesses.
4. Evaluate advantages, applications and limitations of the various non-traditional machining processes under different workingconditions.
5. Understand the applications of different processes.
6. Select suitable process for stringent requirement of manufacturingindustry.

DEME-14203 Computer Integrated Manufacturing

	L	T	P	C
InternalMarks:40				
External Marks: 60				
TOTALMARKS:100	**4**	**-**	**-**	**4**

Course Outcomes:

After studying this course, students shall be able to:

1. Understand the computer role inmanufacturing.
2. Develop part programming for machiningoperations.
3. Describe scope of group technology in fabricationindustry.
4. Prepare CAPP (Computer Aided Process Planning) for fabrication processequipment.
5. Design considerations forFMS.
6. Analyze problems of PPC, MRP-I,MRP-II.

DEME-14204 Computer Aided Process Planning

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

Course Outcomes

After studying this course, students shall be able to:

1. Understand the role of process planning in actualmanufacturing.
2. Analyze and select the manufacturing processes and parameters to enable process plandevelopment.
3. Remember the fundamentals of tolerances and coding systems in the processplanning.
4. Create different production concepts to improve the manufacturability of theproduct.
5. Evaluate different approaches for process plandevelopment.
6. Apply integrated process planning in improvement of traditional planningsystems.

7th/8th Semester **DEME 14205 Machining Science**

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

Course Outcomes

After studying this course the students will be able to:

1. Elaborate the conceptual significance of conventional material removal inmanufacturing.
2. Apply basic principles of science to correlate the input parameters of conventional machining processes with output parameters like cutting forces, power, tool lifeetc.
3. Solve problems and derive theoretical relations related to mechanics of metalmachining
4. Develop procedure for experimental determination of cutting force, temperature and tool life by using suitableequipment.
5. Analyze and optimize machiningprocesses.
6. Suggest remedial measure to reduce the ecological impact of machiningprocesses.

7th/8th Semester **DEME 14206 Rapid Prototyping**

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

Course Outcomes

After studying this course the students will be able to:

1. Understand and use techniques for processing of CAD models for rapidprototyping.
2. Understand and apply fundamentals of rapid prototypingtechniques.
3. Use appropriate tooling for rapid prototypingprocess.
4. Use rapid prototyping techniques for reverseengineering.
5. Design a CADmodel.
6. Evaluate errors in RPprocesses.

DESIGN

DEME14301	Design for X
DEME14302	Product Design and Development
DEME14303	Machine Tool Design
DEME14304	Tool Design
DEME14305	Experimental Stress Analysis
DEME14306	Industrial Tribology
DEME14307	Theory ofPlasticity

DEME14308 Mechatronics
DEME14309 Finite Element Method

DEME - 14302 Product Design and Development

Internal Marks: 40 **L T PC**
External Marks: 60 **4 0 0 4**
Total Marks: 100
Course Outcomes:

After studying this course, students shall be able to:

1. Understand the morphology ofdesign.
2. Design the product graphics.
3. Compare the product design for Impact, Stiffness andRigidity.
4. Analyse the economics of theproduct.
5. Design the product for ease of manufacturing andassembling.
6. Apply value engineering and modern approaches to minimize the cost of theproduct.

DEME-14306 Industrial Tribology

InternalMarks:40 **L T P C**

ExternalMarks:60 **4 - - 4**

Total Marks: 100

Course Outcomes:

After completion of this course, student shall be able to

1. Understand the surface and sub surface constituent layers in engineeringmaterials.
2. Analyse various methods for quality checking of engineering applicablesurfaces.
3. Understand the theories and rigs accounting friction andWear.
4. Analyse the variation of friction and wear in metals and nonmetals.
5. Select various lubrication systems and bearing for different workingconditions.
6. Identify and analyze causes of failure of tribologicalcomponents.

DEME-14309 Finite Element Method

InternalMarks:40 **L T P C**

ExternalMarks:60 **4 0 0 4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Understand the procedure involved to solve a problem using Finite ElementMethods.
2. Identify the application and characteristics of FEA elements such as bars, beams, planeand isoparametric elements, and 3-Delement.
3. Develop the element stiffness matrices using differentapproach
4. Able to apply suitable boundary conditions to a global structural equation, and reduce it to

asolvable form.

5. Analyze a 2D problem using line, triangular, axisymmetric and quadrilateralelement.
6. Analyze a 3D problem using tetrahedral and hexahedralelements.

II. MATERIALSGROUP

DEME14611	Non -Destructive Testing
DEME14612	Heat Treatment Processes
DEME14613	Plastic Technologies
DEME14614	Characterization of Materials
DEME14615	Degradation of Materials
DEME14616	CompositeMaterials
DEME14617	SurfaceScience

7th/8thSemester DEME 14611 Non Destructivetesting

	L	T	P	C
Internal Marks:40				
ExternalMarks:60	**4**	**0**	**0**	**4**

Total Marks: 100

Course Outcomes

After studying this course the students will be able to:

1. Understand and recognize various Non Destructive Testing Methods (NDT) used for testing of engineeringproducts.
2. Use NDT methods for detecting the flaws inspecimen
3. Suggest suitable NDT techniques for engineeringproducts.
4. Understand the role and benefit of NDT for improving the quality ofproduct.
5. Magnetic analysis of steel bars andtubing
6. Measurement of thickness by ultrasonicmethod.

6th Semester DEME 14614 Composite Materials

	L	T	P	C
Internal Marks: 40				
External Marks: 60	**4**	**0**	**0**	**4**

Total Marks: 100

Course Outcomes:

After studying this course the student shall be able to:

1. Understand the applications of compositematerials.
2. Identify various constituents of composite materials and theircharacteristics.
3. Suggest and use standard methods for determining mechanical properties of different types of compositematerials.
4. Apply various techniques for processing of compositematerials.
5. Use the basic concepts of micro-mechanics of composite laminates.
6. Analyze failure modes ofcomposite.

III. GENERALGROUP*

DEME14711	Modeling andSimulation
DEME14712	Optimization Techniques
DEME14713	OperationsManagement
DEME14714	Management Information System
DEME14715	Entrepreneurship
DEME14716	Industrial Engineering andManagement
DEME14717	Maintenance and ReliabilityEngg.

DEME14718 Industrial Safety andEnvironment DEME14719 Disaster Management
DEME14720 MaterialManagement

DEME-14714 Operations Management

InternalMarks:40 **L T P C**

ExternalMarks:60 **4 0 0 4**

Total Marks: 100

Course Outcomes

After studying this course, students shall be able to:

1. Understand the role of operations management in the overall business strategy of thefirm.
2. Know the interdependence of the operating system with other key functional areas of thefirm.
3. Identify and analyze the key factors in the design of effective operatingsystems.
4. Apply the operations management policies and techniques to the service sector as well as manufacturingfirms.
5. Select and evaluate the survey method and technique for operationsmanagement.
6. Analyze the market research data for sales forecasting and resourceplanning.

DEME-14716 Industrial Engineering and Management

InternalMarks:40 **L T P C**

ExternalMarks:60 **4 0 0 4**

Total Marks:100

CourseOutcomes

After studying this course, students shall be able to:

1. Know the functions and required qualities of an IndustrialEngineer.
2. Apply work sampling and time study techniques for productivityimprovement.
3. Identify and analyze the effect of working environment on worker'shealth.
4. Learn about organization structure, planning, directing, organizing and controlling techniques in the industry.

5. Understand current trends in Industrial Engineering and Management and apply theadvanced techniques for tackling the relatedissues.
6. Adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment andenergy.

OPEN ELECTIVES

OEME14601 Total Quality Management
OEME14602 Industrial Engg.

6th Semester **OEME-14601 Total Quality Management**

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

Course Outcomes

After studying this course, students shall be able to:

1. Develop an understanding on quality management philosophies andframeworks
2. Develop in-depth knowledge on various tools and techniques of qualitymanagement
3. Diagnose problems in the quality improvementprocess.
4. Develop analytical skills for investigating and analyzing quality management issues in the industryand suggest implementable solutions tothose.
5. Propose how business leaders might plan and execute quality management strategies to gainand sustain a competitive advantage in today's global businessarena.
6. Communicate why Total Quality Management (TQM) is fundamental to partnering for mutualbenefit.

Electrical Engineering

Program Outcomes

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusion using first principles of mathematics, sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques , resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need of sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively in complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

1. Graduates will demonstrate their knowledge in effective implementation during their practice of profession of Electrical Engineering with due regard to environment and social concerns.
2. Graduates will demonstrate their knowledge in analysis, design, erection and laboratory experimentation regarding Electrical Engineering.
3. Graduates will be motivated for continuous self learning in engineering practice and pursue research in advanced areas of Electrical Engineering in order to offer engineering services to the society, ethically.

3rdSemand 4thSem(2018 Scheme)

Subject Name	Subject Code	**Course Outcomes (CO)**
ENGINEERING MATHEMATICS-III (PROBABILITY AND STATISTICS)	BSEE-101	1. Apply probability theory via Bayes' Rule.
		2. Formulate the marginal and conditional distributions of bivariate random variables.
		3. Verify the predicted data sets using Binomial, Poisson and normal distribution.
		4. Predict the linear regression parameters and correlation coefficient.
		5. Select a critical value from a normal and chi -

		square distribution.
EDUCATION, TECHNOLOGY AND SOCIETY	HSMEE-101	1. Integrate Technical Education for betterment of Society as well get motivated to lead a good human life.
		2. Analyze different learning domains and Educational Transition.
		3. Acknowledge recent advancements in Electrical Technology.
		4. Use sustainable developments to address environmental issues.
		5. Estimate the Power scenario and ethics in the Urban and Rural sector.
ELECTRICAL CIRCUIT ANALYSIS	PCEE-101	1. Apply network theorems for the analysis of electrical circuits.
		2. Obtain the steady-state and transient response of electrical circuits.
		3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
		4. Analyze electrical circuits using Laplace Transform
		5. Analyze various types of two port networks and their inter connection.
ANALOG ELECTRONICS	PCEE-102	1. Analyze basic diode circuits.
		2. Understand the characteristics of transistors.
		3. Understand the characteristics of MOSFET.
		4. Design and analyze various rectifier and amplifier circuits.
		5. Understand the functioning of OP-AMP and design OP-AMP based circuits.
ELECTRICAL MACHINES-I (TRANSFORMER AND DC MACHINES	PCEE-103	1. Understand the concepts of magnetic circuits.
		2. Understand the operation of dc generator.
		3. Analyze the performance characteristics of DC Generator and Motor for different operating conditions.
		4. Testing of single phase transformer and evaluate efficiency and voltage regulation.
		5. Understand the concept of three phase and auto transformers.
ELECTROMAGNETIC FIELDS	PCEE-104	1. To understand the basic laws of electromagnetism.

		2. To obtain the electric and magnetic fields for simple configurations under static conditions.
		3. To analyze time varying electric and magnetic fields.
		4. To understand Maxwell's equation in different forms and different media.
		5. To understand the propagation of EM waves.
ANALOG ELECTRONICS LABORATORY	LPCEE-101	1. Ability to make circuits on bread-board and understand the use and importance of various types of equipment's used in the laboratory.
		2. Analyze, take measurements to understand circuit behavior and performance under different conditions.
		3. Troubleshoot, design and create electronic circuits meant for different applications.
		4. Acquire experience in creating and troubleshooting simple projects employing semiconductor devices.
		5. Evaluate the performance electronic circuits and working small projects employing semiconductor devices
ELECTRICAL MACHINES-I LABORATORY	LPCEE-102	1. Evaluation of equivalent circuit parameters, efficiency and voltage regulation by performing various tests on transformer.
		2. Analyze three-phase transformer connections and parallel operation of transformers
		3. Analyze performance characteristics of DC generators.
		4. Evaluate various speed controls and starting methods of DC motor.
		5. Construct and analyze torque slip characteristics of DC motor.
DIGITAL ELECTRONICS	PCEE-105	1. Understand working of logic families and logic gates.
		2. Design and implement Combinational logic circuits.
		3. Design and implement Sequential logic circuits.
		4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
		5. Be able to use PLDs to implement the given

		logical problem.
ELECTRICAL MACHINES – II (ASYNCHRONOUS & SYNCHRONOUS MACHINES)	PCEE-106	1. Understand the concepts of AC machine windings. 2. Analyze performance characteristics of Three Phase Induction motor. 3. Analyze performance characteristics of Induction Generator And Single Phase Induction Motor. 4. Understand the concepts of Synchronous machines. 5. Understand parallel operation of alternators with infinite bus with study of load sharing.
POWER ELECTRONICS	PCEE-107	1. Analyze various thyristor family and its commutation techniques. 2. Comprehend different single phase and three phase power converter circuits. 3. Understand categorization of chopper as per necessity of industrial electronics application 4. Develop skills to propose cyclo-converter circuits for various applications 5. Foster ability to understand the use of inverters in commercial and industrial applications.
SIGNALS AND SYSTEMS	PCEE-108	1. Understand the concepts of continuous time and discrete time systems. 2. Understand the behavior of continuous and discrete-time LTI 3. Understand the concept of Fourier Transforms 4. Understand the concept of Laplace and z-Transforms 5. Analyze Sampling and Reconstruction of control system
DIGITAL ELECTRONICS LABORATORY	LPCEE-103	1. Identify different types of digital IC's, read their specification sheets and the way to handle these. 2. Verify the truth tables of various gates and different laws and rules of Boolean Algebra. 3. Design and test different types of combinational and sequential circuits. 4. Analyze different types of DAC, ADC and memory devices. 5. Create and troubleshoot working projects using digital logic.
ELECTRICAL MACHINES LABORATORY-II	LPCEE-104	1. Construct equivalent circuits for single phase and three phase induction motor by performing no-load and blocked rotor test. 2. Comprehend the requirement of starting and speed control methods of induction motors in the various applications of industry. 3. Construct equivalent circuits of synchronous generator and motor.

		4. Construct characteristic curves for induction motors and synchronous machines.
		5. Compare various methods of parallel operation of three phase alternators.
POWER ELECTRONICS LABORATORY	LPCEE-105	1. Understand the properties and characteristics of thyristors.
		2. Evaluate and analyze the use of thyristors for different applications like phase control, speed control circuits.
		3. Acquire fault finding skills in thyristor based circuits.
		4. Develop thyristor based circuits for industrial use like understanding speed control of motors.
		5. Understand the different types of waveforms of inverter and chopper circuits.
SEMINAR AND TECHNICAL REPORT WRITING	PREE-101	1. Define and agree the purpose of the report and needs of your readers
		2. Design a document structure to effectively get your message across.
		3. Identify the necessary content and have an appropriate layout.
		4. Use a number of readily available tools to assist with report writing.
		5. Reference and quote correctly, and not infringe.
ENVIRONMENTAL SCIENCE	MCEE-101	1. Measure environmental variables and interpret results.
		2. Evaluate local, regional and global environmental topics related to resource use and management.
		3. Propose solutions to environmental problems related to resource use and management.
		4. Interpret the results of scientific studies of environmental problems.
		5. Describe threats to global biodiversity, their implications and potential solutions.

5thSEM(2014 Scheme)

Subject Name	Subject Code	**Course Outcomes (CO)**
SYNCHRONOUS MACHINES	**EE-14501**	1. Understand the principle, construction and analyze the operation of synchronous machine as an alternator, synchronous motor and compensator. 2. Evaluate different methods of voltage regulation and analyze the performance of synchronous machines for drawing the various associated phasor diagrams. 3. Understand parallel operation of alternators with infinite bus with study of load sharing. 4. Identify, formulate and solve synchronous machine related problems.

		5. Evaluate the starting methods of synchronous motor. **6.** Comprehend industrial problems associated with synchronous machines.
NUMERICAL & STATISTICAL TECHNIQUES	**EE-14502**	1. Apply the knowledge gained from numerical techniques in solving engineering andresearch problems. 2. Evaluate Linear & Non Linear equations via methods of convergence. 3. Create the suitable numerical and statistical technique for better and faster solutions. 4. Evaluate Differentiation and Integration problems using iteration approach. 5. Apply the gained knowledge for application in probabilistic approach. 6. Create and evaluate Sampling Distribution problems.
INDUSTRIAL ELECTRONICS	**EE-14503**	1. Acquire knowledge about fundamental concepts of industrial electronics. 2. Analyze various thyristor commutation techniques used in industrial electronics. 3. Comprehend different single phase and three phase power converter circuits. 4. Understand categorization of chopper as per necessity of industrial electronicsapplication. 5. Develop skills to propose cyclo-converter circuits for various applications. 6. Foster ability to understand the use of inverters in commercial and industrialapplications.
INSTRUMENTATION ENGINEERING	**EE-14504**	1. Demonstrate different types of electronic instruments and their usages. 2. Identify the use of CRO and DSO. 3. Understand the principle of various digital instruments. 4. Identify different types of transducers. 5. Apply knowledge of transducers for measurement of various parameters. 6. Demonstrate the techniques related to end devices.
LABORATORY-VII: ASYNCHRONOUS & SYNCHRONOUS MACHINES	**EE-14505**	1. Construct equivalent circuits for single phase and three phase induction motor byperforming no-load and blocked rotor test. 2. Comprehend the requirement of starting and speed control methods of induction motorsin the various applications of industry. 3. Construct equivalent circuits of synchronous generator and motor. 4. Apply knowledge to show utility of alternator, synchronous motors and synchronouscondenser for various applications in power system. 5. Construct characteristic curves for induction motors and synchronous machines.

		6. Compare various methods of parallel operation of three phase alternators.
LABORATORY-VIII: INDUSTRIAL ELECTRONICS	**EE-14506**	1. Understand the properties and characteristics of thyristors. 2. Evaluate and analyze the use of thyristors for different applications like phase control,speed control circuits. 3. Acquire fault finding skills in thyristor based circuits. 4. Develop thyristor based circuits for industrial use like understanding speed control ofmotors. 5. Understand the different types of waveforms of inverter and chopper circuits 6. Design of power saving variable D.C. sources.
LABORATORY-IX: INSTRUMENTATION & MEASURING DEVICES	**EE-14507**	1. Evaluate the values of power factor, pH 2. Evaluate the value of frequency 3. Evaluate the effect of displacement on voltage using a transducer. 4. Analyze characteristics of thermistor 5. Evaluate the value of earth resistance 6. Apply various transducers to measure different physical quantities.
LABORATORY-X: NUMERICAL& STATISTICAL TECHNIQUES	**EE-14508**	1. Create programs in C/C++/MATLAB software for practical understanding of numericalmethods. 2. Evaluate various iterative techniques for finding real roots of an equation. 3. Hypothesize and validate interpolation methods. 4. Design coding for solving simultaneous linear algebraic equations. 5. Analyze the techniques of numericalintegration &differentiation. 6. Apply the knowledge gained for evaluating numerical & statistical problems
RENEWABLE ENERGY RESOURCES	**DEEE-14501**	1. Judge the importance of renewable sources of energy 2. Evaluate the effect of non judicious use of conventional sources on environment. 3. Analyze the advantages and disadvantages of various schemes for harnessing energyfrom renewable sources. 4. Analyze to compare economics of harnessing power from renewable sources. 5. Analyze the solar energy prospectus in India. 6. Evaluate the energy harnessing from biomass.
ELECTRICAL DESIGN & ILLUMINATION ENGINEERING	**DEEE-14502**	1. Be able to analyze and evaluate the various types of light sources available. 2. Analyze various parameters required for good lighting design. 3. Create a general lighting scheme. 4. Evaluate the various lighting controls and their applications. 5. Understand and apply the various lighting design

		techniques to create lighting design forvarious utilities. 6. Evaluate the properties of various light sources and hence recommend their installation.
ELECTRICAL ENGINEERING MATERIALS	**DEEE-14503**	1. Analyze the different types of chemical bonds. 2. Analyze qualitatively the bonding scheme and its general physical properties. 3. Analyze the characteristics of different types of materials and calculate its dielectriclosses 4. Justify the selection of suitable material for manufacturing of carbon brushes , cores andinsulating material 5. Analyze the classification and applications for magnetic and special materials. 6. Create awareness of recent developments in material science and engineering
ENERGY AUDITING & MANAGEMENT	**DEEE-14504**	1. Understand the need, comparison and use of various type of electrical energy resources. 2. Understand and compare the basic energy audit report 3. Comprehend various energy management standards and justify its implementation 4. Acquire the knowledge to use various instruments for energy audit 5. Understand the environmental effects and various international protocols 6. Analyze the pollution situation and understand clean development mechanism.
SOLAR TECHNOLOGIES	**DEEE-14505**	1. Understand the basics of solar energy conversion and utilization processes. 2. Retrieve knowledge of semiconductors, optical system, energy storage related tophotovoltaic system. 3. Comprehend the challenges of sustainable energy, processes, designing of photovoltaicsystems 4. Comprehend and justify the different applications of solar technologies in domestic,commercial and industrial sectors. 5. Understand the manufacturing processes involving environmental challenges for gainingcarbon credits. 6. Plan and evaluate the standalone and grid connected PV system.
ANALOG INTEGRATED CIRCUITS	**DEEE-14506**	1. Understand differential and operational amplifiers. 2. Understand and read specifications sheets of different types of Op-Amps, 555 timer andother analog IC's. 3. Analyze different operations using Op-Amps. 4. Evaluate the performance of different operations using Op-amps, 555 timers. 5. Apply Op-Amps for different applications and understand the implications of differentwaveform

		generators and special function IC's. 6. Create and trouble shoot small working projects using Op-amp and other specialfunction IC's.

6thSEM(2014 Scheme)

Subject Name	Subject Code	**Course Outcomes (CO)**
POWER SYSTEM-II (SWITCH GEAR & PROTECTION	**EE-14601**	1. Analyze the principle of operation of different types of relays. 2. Analyze different types of faults occur in the generator, transformers and transmissionline. 3. Demonstrate the knowledge for various components used in the relays. 4. Evaluate the arc quenching mechanism used in different circuit breakers. 5. Design the relay setting for over-current and earth fault relays. **6.** Create the basic knowledge of power system protection concepts.
ELECTRICAL DRIVES & UTILIZATION	**EE-14602**	1. Analyze different motor applications. 2. Design various illumination systems. 3. Evaluate different heating schemes for a given application. 4. Understand process of electroplating. 5. Understand technology used in refrigeration and air conditioning. 6. Understand different schemes of electric traction and its main components.
ELECTRICAL GENERATION & ECONOMICS	**EE-14603**	1. Evaluate and compare the performance of conventional and non-conventional energysources. 2. Analyze the load curves and related factors for determining power generation needs. 3. Carry out economic analysis of different electric energy generation techniques. 4. Evaluate cogeneration plants. 5. Plan optimal method of loading turbo generator. 6. Justify the need of hydro thermal coordination.
MICROCONTROLLER & PROGRAMMABLE LOGIC CONTROLLERS	**EE-14604**	1. Comprehend the importance of 8051 microcontroller and understand its internalarchitecture. 2. Acquire programming skills in assembly and C language. 3. Acquire skill in interfacing peripherals with 8051 microcontroller.

		4. Create and troubleshoot the circuits involving interfacing of 8051 with real world. 5. Create and troubleshoot simple controllers employing 8051 microcontroller. 6. Evaluate the performance of 8051 controller and PLC based practical circuits
LABORATORY-XI: POWER SYSTEM	**EE-14605**	1. Plot characteristics of various transmission lines 2. Understand concept of relays and circuit breakers. 3. Analyze various protection schemes in power system. 4. Plot characteristics of different types of relays. 5. Measure the resistance of earth. 6. Demonstrate the operation of a circuit breaker.
LABORATORY-XII: ELECTRIC DRIVES	**EE-14606**	1. Analyze speed and direction control of single phase and three phase electric motorsusing ac and dc drive. 2. Analyze speed control of stepper motor using drives. 3. Evaluate methods of speed control of servo motor using drives. 4. Conduct and analyze PLC based ac/dc motor control operation. 5. Design a set up for microcontroller based speed control of stepper motor and dc motor. 6. Understand regenerative/dynamic braking operation of ac motor and dc motor.
LABORATORY-XIII: MICROCONTROLLER & PROGRAMMABLE LOGIC CONTROLLERS	**EE-14607**	1. Comprehend the importance of 8051 microcontroller, PLC and understand their internalarchitecture. 2. Acquire programming, simulation and testing skills in assembly and C language. 3. Acquire skill in interfacing peripherals, relays, LED, LCD, Keyboard and sensors with8051 microcontroller. 4. Create and troubleshoot the circuits involving interfacing of 8051and PLC with realworld. 5. Create and troubleshoot automatic controllers employing 8051 microcontroller. 6. Evaluate the performance of 8051 controller and PLC based practical circuits
POWER SYSTEM OPERATION & CONTROL	**DEEE-14601**	1. Retrieve characteristic features of power generation in steam units, co-generation plantsand hydro-electric units. 2. Understand economic dispatch problem. 3. Evaluate unit commitment problem and apply various solution methods. 4. Understand optimal power flow problem and

		find its solutions. 5. Understand hydro-thermal co-ordination. 6. Retrieve the techniques of automatic generation control
COMPUTER AIDED ELECTRICAL MACHINE DESIGN	**DEEE-14602**	1. Understand the general concepts of electrical machine design. 2. Acquire knowledge about various insulating materials used in electrical machine design. 3. Alleviate the problems of electric machine design by using different design techniques. 4. Understand the different ways of cooling and ventilation of electric machine. 5. Calculate the heat losses and efficiency in the electric machines. 6. Analyze, design, model and synthesize of Transformers and Induction motors.
OPTIMIZATION TECHNIQUES	**DEEE-14603**	1. Develop mathematical modeling of operation research problems. 2. Solve linear programming problems using graphical, simplex, Big M and two-phasesimplex methods. 3. Understand basic concept of duality of linear programming. 4. Perform sensitivity analysis of linear programming problems. 5. Develop mathematical model and solution of transportation and assignment problems. 6. Understand and apply integer programming to the mixed-integer problems
ENERGY CONVERSION	**DEEE-14604**	1. Understand and retrieve fundamentals of electrical engineering. 2. Understand the different energy conversation techniques. 3. Prepare the different techniques of conversion and its application. 4. Evaluate the performance of pumps and flow control strategies. 5. Understand and justify the choices of luminance requirements. 6. Carry out the process of selecting diesel generating system.
ROBOTIC CONTROL SYSTEM	**DEEE-14605**	1. Understand basic terminologies of Robotics. 2. Implement elements of robotics practically. 3. Understand differential motion planning and robot control system. 4. Paraphrase kinematics and robotic controls. 5. Recognize dynamic modelling. 6. Understand robotics control dynamics.
PROCESS DYNAMICS AND CONTROL	**DEEE-14606**	1. Create procedure models of different processes.

		2. Analyse the performance of Single Loop Regulatory Control. 3. Evaluate &deconstruct controller tuning. 4. Evaluate Model Based Control Schemes. 5. Create and design controllers for interacting multivariable systems. 6. Interpolate Optimal Control Systems
ENERGY AUDITING AND MANAGEMENT	**OEEE-14602**	1. Understand the need, comparison and use of various type of electrical energy resources. 2. Understand and compare the basic energy audit report 3. Comprehend various energy management standards and justify its implementation 4. Acquire the knowledge to use various instruments for energy audit 5. Understand the environmental effects and various international protocols 6. Explain and analyze the pollution situation and understand clean developmentmechanism.

7th /8th SEM (2014 Scheme)

Industrial Training (One Semester)

Subject Name	Subject Code	**Course Outcomes (CO)**
Industrial Training - II	**TREE-14701**	
Industry Oriented Training (02 week)	**TREE-14702**	

7th / 8th SEM (2014 Scheme)

Subject Name	Subject Code	**Course Outcomes (CO)**
COMPUTER AIDED POWER SYSTEM ANALYSIS	**EE-14801**	1. Develop per unit system models of synchronous machine, transformer, transmission lineand static loads for power system studies. 2. Construct Bus Admittance Matrix and Bus Impedance Matrix for power system studies. 3. Investigate the state of power system by performing load flow analysis. 4. Compare features of Gauss-Siedel, Newton-Raphson and Fast decoupled methods ofload flow analysis. 5. Analyze the effect of symmetrical and

		unsymmetrical faults on power system. 6. Analyze the effect of small and large disturbances on power system stability.
DIGITAL CONTROL SYSTEMS	**EE- 14802**	1. Create the state models of different physical and electrical systems. 2. Analyze the stability of a given control system. 3. Evaluate discrete time signals analytically and visualize them in the time and frequencydomain. 4. Analyze sampled data control systems by using z transformation. 5. Analyze the nonlinear system behavior by phase plane and describing function methodsand learn about the stability of linear and nonlinear systems by lyapunov method. 6. Design and analyze optimal control schemes.
HIGH VOLTAGE ENGINEERING	**EE-14803**	1. Elucidate breakdown phenomenon and concept of high voltage power apparatus. 2. Understand applications of various insulating materials. 3. Design, generate and measure high voltage & current circuits. 4. Evaluate corona loss and compensation requirement in EHVAC transmission line. 5. Employ concept of insulation coordination, insulating material and radio interference inpower system. 6. Understand the concept of high voltage DC transmission and its merits.
LABORATORY-XIV Computer Aided Power System Analysis	**EE-14804**	1. Acquire the skill of using computer packages with the help of high level programminglanguage and software tools in power system studies. 2. Acquire the skill of using power system related tools for power system studies. 3. Develop computer program for load flow analysis. 4. Understand the procedure and steps needed to perform short circuit analysis. 5. Carry out stability studies of power system. 6. Simulate load frequency control of single area system.
LABORATORY-XV High Voltage Engineering	**EE-14805**	1. Develop ability to estimate and analyze over voltages in power system. 2. Comprehend basic gaseous dielectrics, their properties and behavior under high voltagestresses. 3. Inculcate skill to conduct dielectric tests as per

		standards. 4. Identify high voltage testing equipment and testing procedures as per standards. 5. Aware of high voltage application in power system and industry. 6. Acquire knowledge to inspect high voltage equipment and to detect potential risks frommalfunction of dielectric materials.
SEMINAR	**EE-14806**	1. Explore and analyze new areas of research related to electrical engineering 2. Evaluate the effect of newer technologies to our lives. 3. Create power point presentations. 4. Acquire ability for public speaking and giving lecture/presentation. 5. Analyze various new technologies with existing technologies. 6. Evaluate the environmental effects of introducing new technologies.
MAJOR PROJECT	**PREE-14701**	1. Acquire ability to work in team. 2. Evaluate application of a particular tool/ component for specific application. 3. Acquire ability to apply thinking and problem solving skills. 4. Develop habit of responsibility sharing. 5. Apply knowledge gained for analysis and design of circuits. 6. Learn about their social responsibility
FUZZY LOGICS AND SYSTEMS	**DEEE-14801**	1. Represent the various forms of fuzzy system. 2. Perform fuzzification and defuzzification of a given situation/process. 3. Develop fuzzy rules for a fuzzy system. 4. Understand basic steps involved to design a Fuzzy-Logic controller. 5. Use software tool for designing fuzzy logic based controllers. 6. Apply fuzzy logics for simple managerial and engineering applications.
POWER SYSTEM PLANNING	**DEEE-14802**	1. Understand the objectives of national and regional planning strategies of electric power. 2. Acquire knowledge about the concept of load forecasting. 3. Apply the concept of generation, transmission and distribution planning in powersystem. 4. Evaluate loss of energy indices. 5. Calculate voltage and power loss. 6. Make selection of sizes and location of generating stations and substations
POWER SYSTEM	**DEEE-14803**	1. Understand present scenarios of national and

RESTRUCTURING & DEREGULATION		international power sector regimes. 2. Investigate the challenges of competitive electricity markets. 3. Perform modeling of power system operation in deregulated environment. 4. Apply congestion management methodologies in deregulated power system networks. 5. Evaluate available transfer capability of transmission system. 6. Apply internet technology for power system monitoring and trading.
SYSTEM ENGINEERING AND RELIABILITY	**DEEE-14804**	1. Retrieve basic concept of system engineering and reliability. 2. Comprehend different reliability functions. 3. Analyze the failure data and component reliability. 4. Evaluate the reliability of engineering systems using different techniques. 5. Understand the qualitative concept of availability and maintainability. 6. Analyze improvement of availability and reliability of any system.
ADVANCED MICROPROCESSOR	**DEEE-14805**	1. Retrieve the basic concepts of 8086/8088 microprocessor architectures, pin diagram andassembly language programming. 2. Develop assembly level programs and understanding the basics of the processors. 3. Analyze interfacing of external devices to the processor or according to the userrequirements to create novel products and solutions for the real time problems. 4. Understand RISC based microcontroller and different communication modes 5. Apply embedded systems utilizing microprocessors. 6. Test and evaluate the performance of microprocessor based applications
DIGITAL SIGNAL PROCESSING	**DEEE-14806**	1. Analyze discrete signals and systems. 2. Evaluate discrete Fourier transform using fast Fourier transform algorithms. 3. Create describing equation for digital filter structure. 4. Design and analyze digital filters. 5. Design and analyze filters using pole-zero combination. 6. Design and analyze DSP processor.
SIGNALS AND SYSTEMS	**DEEE 14807**	1. Evaluate continuous and discrete signals. 2. Be able to analyze the response of a system to various test signals.

		3. Evaluate the Laplace transform of various signals. 4. Create signals from samples. 5. Create system models based on equations. 6. Evaluate region of convergence.
FLEXIBLE AC TRANSMISSION SYSTEMS	**DEEE-14808**	1. Retrieve the basics of Power Transmission System. 2. Understand the need and principle of operation of FACTS devices in Power System. 3. Understand the need of Series and Shunt Compensation. 4. Apply FACTS devices for Power System Transmission capability enhancement. 5. Design of AC and DC filters for harmonics mitigation. 6. Understand modeling and control of FACTS controllers
NEURAL NETWORKS	**DEEE-14809**	1. Acquire a thorough knowledge on biological neurons and artificial neurons, comparativeanalysis between human and computer, artificial neural network models, characteristicsof ANN's. 2. Learn different types of activation functions, learning strategies, learning rules,perceptron models, single and multi-layer feed-forward and feed-back Neural Networks. 3. Learn various algorithms including back propagation algorithm, Kolmogorov Theorem. 4. Learn different types of associative memories and basics of Fuzzy Logic. 5. Apply concept of classical and Fuzzy Sets, Fuzzy Logic System componentsfuzzification and defuzzification. 6. Apply the neural network conceptual knowledge to real-world electrical problems andapplications.
ENERGY EFFICIENT MACHINES	**DEEE-14810**	1. Understand importance of energy management and audit. 2. Apply energy conservation measures in industrial and agriculture sector. 3. Understand the concept of maximum demand control. 4. Understand concept of harmonics and performance assessment of capacitors. 5. Evaluate motor efficiency and selection of drive for industrial use. 6. Analyze the payback period of energy efficient motors.

Electronics & Communication Engineering

Program Outcomes

1. Design and synthesize solutions for engineering problems pertaining to signal processing and communication systems using appropriate tools and research methods.

2. Develop relevant solutions using domain Knowledge with respect to Design, Analysis and implementation in the area of software engineering and computer networking.

3. Identify and apply domain specific tools for design, analysis, synthesis and validation of VLSI and embedded systems. PROGRAM OUTCOMES Engineering Graduates will be able to:

   1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

   2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

   3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

   4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

   5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Computer Science & Engineering

Program Outcomes

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

1. Graduates will be able to apply the theoretical and practical knowledge of computer science for developing software solutions to real-time problems.
2. Graduates will be able to demonstrate the acquired knowledge of emerging trends and contemporary technologies in the field of computer science and engineering.

Course Outcome

3rd Semester

Object Oriented Programming (PCCS-101)

CO1 Develop an understanding of object-oriented programming principles and object-oriented design.

CO2 Use of operators, control structures, and data types with their methods.

CO3 Make use of arrays and string handling methods.

CO4 Design user defined functions, modules, and packages.

CO5 Investigate and implement polymorphism, inheritance, dynamic memory management and exception handling techniques to solve problems.

CO6 Create and handle files in object-oriented programming.

Computer Networks (PCCS-102)

CO1 Develop an understanding of modern network architectures from a design and performance.

CO2 Understand the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).

CO3 Analyze various protocols to develop network related applications for future needs.

CO4 Apply the knowledge of different network designs and various logical models of networking to solve problems of communication over different medium.

CO5 Utilize knowledge of routing and congestion control algorithms to overcome various issues over different complex networking structures.

CO6 Discuss algorithms for medium access sub layer to avoid collision and error problems over different types of networks.

Digital Electronics (ESCS-101)

CO1 Understand the relationships between Boolean algebra, combinational logic, and sequential logic.

CO2 Solve combinational logic problem formulation and logic optimization.

CO3 Construct digital logic circuits using gates and state-of-the art MUX, ROM, PLA and PAL units

CO4 Create profound analysis and design of synchronous and asynchronous sequential circuits

CO5 Design and inspect digital circuits to meet desired needs within realistic constraints.

CO6 Develop skills to build and troubleshoot digital circuits.

Mathematics III (BSCS-101)

CO1 Understand Partial Differential Equations and their solutions techniques.

CO2 Understand Analytic functions and evaluation of derivative of functions of complex variable.

CO3 Evaluate integration of functions of complex variables.

CO4 Analyze probability spaces, random variables and different probability distribution.

CO5 Fit the given data into best fit curve.

CO6 Apply statistical methods for analyzing experimental data.

Human values and Professional Ethics (HSMCS-101)

CO1 Discriminate between valuable and superficial in the life.

CO2 Encourages students to discover what they consider valuable.

CO3 Understand the value required to be a good human being and apply these values in real life.

CO4 Evaluate and modify the behavior.

CO5 Understand fundamental and organizational duties and protect individual and social rights.

CO6 Know about professional behavior, values and guiding principles.

Object Oriented Programming Laboratory (LPCCS-101)

CO1 Compare and contrast object-oriented programming paradigm with procedure oriented programming paradigm.

CO2 Design and implement efficient programs to solve computing problems in a high level programming language.

CO3 Utilize knowledge of different object-oriented principles to identify and apply the appropriate techniques in problem solving.

CO4 Apply the knowledge acquired to troubleshoot programming related problems.

CO5 Utilize the knowledge and principles of object- oriented programming while working in multidisciplinary teams.

CO6 Design and develop projects using object-oriented tools and techniques.

Computer Networks Laboratory (LPCCS-102)

CO1 Analyze and configure protocols concerning various network technologies over different mediums and layers.

CO2 Apply the knowledge of different network components, transmission mediums and tools to solve various problems of communication.

CO3 Design and develop different network design and logical models of networking to solve network related problems.

CO4 Utilize knowledge of modern network simulation tools to propose solution for efficient working of networks for real world problems.

CO5 Make use of various troubleshooting methods to overcome networking problems.

CO6 Function in multidisciplinary teams through groups while working in different network environments with the help of resource sharing.

Digital Electronics Laboratory (LESCS-101)

CO1 Identify and apply the knowledge of logic gates and integrated circuits to solve related problems.

CO2 Design and implement combinational & sequential circuits for engineering problems.

CO3 Choose and compare the usage of appropriate techniques and tools to solve digital

circuits problem.

CO4 Apply the knowledge acquired to demonstrate the usage of digit al circuits in computers at large.

CO5 Utilize the knowledge and principles of digital electronics while working in multidisciplinary team formation.

CO6 Design simple digital systems based on these digital abstractions, using the "digital paradigm".

Seminar and Technical Report Writing for Engineers (PRCS-101)

CO1 Understand the basic components of definitions, descriptions, process explanationsand other common forms of technical writing.

CO2 Analyze and critique various speech techniques, content, purpose, strengths and weaknesses.

CO3 Reference and quote correctly, and not infringe copyright.

CO4 Practice the unique qualities of professional rhetoric, writing and presentation style.

CO5 Use a technical report to communicate information.

CO6 Follow the stages of the writing process (prewriting/writing/rewriting) and apply them to technical and workplace writing tasks.

4th Semester

Discrete Mathematics (PCCS-103)

CO1 Apply knowledge of mathematical proofs, techniques and algorithms to solve complex engineering problem.

CO2 Prove elementary properties of modular arithmetic and explain their application in analysis and interpretation of data and synthesis of information to provide valid conclusions.

CO3 Create, select and apply appropriate techniques to model real world problems using graphs.

CO4 Identify and formulate solutions of engineering problems related to counting and

probability theory.

CO5 Utilize the importance of discrete structures towards simulation of problems in multidisciplinary environments.

CO6 Formulate a logical statement in terms of a symbolic expression and evaluate the truth value of compound statement.

Computer Architecture and Microprocessors (PCCS-104)

CO1 Identify computer systems, memory organization, Microprocessor and assembly language programming.

CO2 Clarify instruction formats, RISC and CISC architecture and different addressing modes.

CO3 Solve basic binary math operations by using the instructions of microprocessor.

CO4 Compare between pipelining and parallelism.

CO5 Design structured, well commented, understandable assembly language programs to provide solutions to real-world problems.

CO6 Classify the trends and developments of microprocessor technology.

Operating Systems (PCCS-105)

CO1 Understand the mechanisms of OS to handle processes and threads and their communication.

CO2 Compare and contrast the mechanisms involved in memory management Techniques.

CO3 Use the components of Operating System in OS design.

CO4 Evaluate different scheduling techniques.

CO5 Investigate basic concepts towards process synchronization and related issues.

CO6 Understand the structure and organization of file system.

Data Structures (PCCS-106)

CO1 Apply knowledge of statistics and programming skills to solve complex engineeringproblems related to data structures.

CO2 Make use of Research based knowledge to identify the appropriate data structure and provide better solution to reduce space and time complexity.

CO3 Identify, Formulate and analyse data structure to develop skills and understand their applications to perform operations on it.

CO4 Design appropriate algorithm for autonomous realization of sub-programs to modelcomplex engineering activities.

CO5 Demonstrate various methods of organizing large amounts of data and recognize systematic way to retrieve data and solve problems.

CO6 Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.

Software Engineering (PCCS-107)

CO1 Plan a software engineering process life cycle, including the specification, design, and implementation.

CO2 Elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.

CO3 Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.

CO4 Develop the code from the design and effectively apply relevant standards for quality management and practice.

CO5 Formulate a testing strategy for a software system, employing techniques such as unit testing, test driven development and functional testing.

CO6 Identify modern engineering tools necessary for software reengineering and reverse engineering.

Computer Architecture and Microprocessors Laboratory (LPCCS-103)

CO1 Utilize the concept of binary & hexadecimal number systems including computer arithmetic.

CO2 Demonstrate the error detection & correction mechanism in computer architecture.

CO3 Understand the functional units of the processor such as the register file and arithmetic logical unit.

CO4 Examine the fundamentals of assembly language programming.

CO5 Understand the concept of computer arithmetic instruction set by designing code for arithmetic, logical and data transfer operations.

CO6 Solve basic binary math operations by using the instructions of microprocessor.

Operating Systems Laboratory (LPCCS-104)

CO1 Analyse the services, architectures and principles used in the design of modern operating systems.

CO2 Execute Linux commands for files and directories, creating and viewing files, File comparisons and Disk related commands.

CO3 Utilize the concept of virtualization for creating a virtual machine and installing operating system on virtual machine.

CO4 Demonstrate shell programming by using shell variables and shell keywords for automated system tasks.

CO5 Identify the key characteristics of multiple approaches used for the design and development of the operating system.

CO6 Apply system commands for performing the file manipulation, program execution,and printing text.

Data Structures Laboratory (LPCCS-105)

CO1 Apply knowledge of mathematics and programming skills to implement and analyze different data structures.

CO2 Evaluate and analyze the time and space complexity of linear and non linear data structures.

CO3 Design and implement efficient algorithms to solve computing problems in a high level programming language.

CO4 Utilize knowledge of different data structures to identify and apply the appropriate data structures to solve a real world problem.

CO5 Compare and analyze different solutions of complex engineering activities with an understanding of their advantages and limitations.

CO6 Developing an awareness of the data structure for storing data and handling variousoperations on different applications in the broadest context of technology change.

Environmental Sciences (MCCS-101)

CO1 Measure environmental variables and interpret results.

CO2 Evaluate local, regional and global environment topics related to resource use and management.

CO3 Propose solutions to environmental problems related to resource use and management.

CO4 Interpret the results of scientific studies of environmental problems.

CO5 Describe threats to global biodiversity, their implications and potential solutions.

Information Technology

Programme Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

1. An ability to effectively integrate IT-based solutions into the user environment.
2. Possess professional skill set of software design process using open source technologies.

Subject Code	Subject Name	RBT(Revised Blooms Taxonomy)	CO (Course Outcomes)
Semester 3			

IT-14301	**IT Methodologies**	Understanding	Understanding the basic concepts of Internet model and addressing, different physical media, networking devices and Internet troubleshooting commands, WWW and it's applications
		Applying	Apply the knowledge of basic Internet Technologies and WWW like troubleshooting utilites, FTP, Email to address the Network communication issues and functionalities
		Creating	Design and Create GUI based client side web applications to address diverse application areas using HTML, CSS.
		Creating	Use the technique and skills for developing and integrating client side tools like Javascript to address client side dynamic programming issues in WWW
		Evaluate	Select suitable internet security tools like firewall using knowledge on cryptography and firewall techniques.
		Create	Function on diverse teams through web application designing and client side development
IT-14302	**Social and Professional Aspects of IT**	Apply	Apply knowledge of Organizational culture, Professionalism.
		Understand	Outline social context of computing
		Analyse	Discuss Intellectual property acts, Copyrights and plagiarism
		Analyse	Identify Professional and ethical issues and resposibilities
		Apply	Utilize skills of effective oral presentation and writing skills
		Analyse	Explain Privacy and Civil Liberities using various acts.
IT-14303	**Data Structures and Programming Methodology**	Applying,Analyzing	Apply the knowledge of diverse data structure, complexity analysis to analyze and design of optimal algorithms
		Creating, Evaluating	Create and evaluate new algorithms to solve complex engineering problems.
		Understanding	Illustrate various data structures to solve multi-discplinary projects.
		Applying	Utilize the templates for modularity.
		Analyzing, Applying	Compare and classify various data structures
		Applying	Demonstrate the reusability of data structures for implementing complex

			iterative problems.
CS-14303	**Digital Circuits and Logic Design**	Remembering	Identify concepts and terminology of digital logic circuits.
		Applying	Utilize knowledge of number systems, codes and Boolean algebra to the analysis and design of digital logic circuits.
		Analyzing	Formulate and employ a Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms.
		Applying	Identify, formulate, and solve engineering problems in the area of digital logic circuit design.
		Applying	Use the techniques, skills, and modern engineering tools such as logic works necessary for engineering practice.
		Evaluating	Function on multi-disciplinary teams through digital circuit experiments and projects.
		Creating	Design combinational and sequential circuits using Boolean algebra.
		Understanding	Explain the Memory Organization and its classification.
CS-14305	**Object Oriented Programming using C++**	Understanding	Understanding the concepts of PoP, OOPS and their components
		Analyzing	To identify, formulate and Solve the programming problems in the areas of OOPS
		Applying	Apply the techniques and skills of OOPS paradigm such as Functions, Inheritance, Polymorphism and Excption handling
		Creating	Function on Multi-disciplinary team by using OOPs experiments and Projects.
		Creating	Design of Templates and generic programming.
		Evaluating	To execute the concept of File Handling and Exception handling of Specific Programming Problem.
IT-14304	**IT Methodologies Lab**	Understand	Demonstrate an understanding of basic networking devices
		Apply	Apply the knowledge for Configuring IP Addresses, Troubleshooting Commands to address network communication related issues.
		Applying	Setup and build basic server side environment using Apache and IIS Server

		Creating	Design and Construct Static Web Pages using Basic HTML Tags and CSS for varied application areas
		Creating	Integrate and develop client side modules based on Javascript to provide interactivity and address web based engineering problems
		Creating	Function on diverse teams to identify, formulate and design static web project using HTML, CSS and Javascript in multi-disciplinary environment
IT-14305	**Data Structures and Programming Methodology Lab**	Creating	Improve practical skills in designing and implementing data structure algorithms
		Creating	Compose algorithms to solve complex engineering problems
		Applying	Implement the templates for modularity
		Creating	Design graphical user interface for better human computer interaction.
		Applying	Utilize data structure algorithms in a better way to solve resposibilities relevant to other professional engineering practices
		Applying	Execute projects for individual or team based on data structure algorithms.
CS-14306	**Digital Circuits and Logic Design Lab**	Applying	Demonstrate the logic gates and realization of AND, OR, NOT and XOR functions using universal gates.
		Creating and applying	Design and implement combinational circuits like half adder/ Full adder, half subtractor/ Full subtractor, code converters, comparators, MUX/DEMUX.
		Creating and applying	Design and implement sequential circuits like flip-flops, counters and shift registers
		Analyzing	Compare and contrast the outputs of filpflops ,coumters , registers by using different chips.
		analyzing	Analyze the working of DAC, ADC and examine the data storage in RAM by using IC2114.
		Applying	Execute the various experiments and projects on indiviuals and multidisciplenery teams through various logic designs and circuits.
CS-14308	**Oop's Lab**	Applying	Iimplement programs using Control Structures
		Creating	Create Classes & Objects, Constructors & Destructors

		Applying	Apply the concepts of Function overloading, Type Conversion, Pointers & Memory Management
		Creating	Design of Programs using Inheritance & Polymorphism
		Creating	Creation of Templates
		Applying	Executing File Handling and Exception Handling
Semester 4			
IT-14401	**Database Management Systems**	Apply	Apply knowledge of database system, No Sql database, data mining and SQL structure.
		Creating	Identify, formulate database design, Functional dependencies and recovery techniques
		Creating	Use the techniques, skills and tools such as query handling, normalized relations
		Evaluating	Design Physical and object relational database
		Analyse	Investigate various case studies using NoSql
		Apply	Apply the Applications of spatial and multimedia databases fr real world
CS-14402	**Operating System**	Understanding	Exemplify various types of Operating Systems, deadlocks, Process, File and Memory management.
		Applying	Implement various deadlock scheduling algorithms.
		Analyzing	Analyze and apply various memory and file management mechanisms.
		Applying	Classify various page replacement algorithms for demand paging.
		Applying	Use different disk scheduling algorithm for better utilization of external memory.
		Analyzing	Examine the case studies of different Operating Systems to recapitulate the concepts of Operating System.
IT-14403	**Data Communicationand Computer Networks**	Understanding	Understand Network essentials, Network Architecture, TCP/IP and OSI model.
		Analyzing	Analyze and solve networking problems in the area of guided and unguided transmission media.
		Applying	Illustrate multi - channel access protocols and IEEE 802standards for LAN and MAN.

		Analyzing	Contrast the design issues and working of protocols at different layers of TCP/IP and OSI models.
		Creating	Formulate the various congestion and routing algorithms.
		Applying	Implement the concepts of N/W security and protocols such as HTTP, FTP, Telnet, DNS.
IT-14404	**Web Technologies**	Understand	Understand the basic tools required for Web designing and applications.
		Create	Build HTML5 and CSS3 for designing interactive Webpages.
		Analyze	Analyze the basic operations of an AJAX application.
		Apply	Develop an interactive websites using jQuery.
		Remember	Acquire the basic usage of PHP construct and its integration with database for developing web modules like, login module, session authentication.
		Create	Create and design dynamic web application using contemporary development tools like, MVC framework, WordPress.
IT-14405	**Computer Architecture and Microprocessors**	Remembering	Identify computer systems, memory organization, Microprocessor and assembly language programming
		Understanding	Clarify instruction formats, RISC and CISC architecture and different addressing modes
		Creating	Solve basic binary math operations by using the instructions of microprocessor 8085
		Applying	Compare different types of Microprocessor
		Creating	Design structured, well commented, understandable assembly language programs to provide solutions to real-world problems
		Analyzing	Organize multi-disciplinary settings through assembly language programming and projects
IT-14406	**Database Management Systems Lab**	Apply	Apply knowledge of SQLand create tables, views.
		Creating	Identify, formulate database design using single row function and group function
		Understand	Displaying data from multiple tables

		Evaluating	Design single row and multiple row subqueries, advanced subqueries
		Analyse	Investigate MongoDB using NoSql
		Creating	Design Mini Project in multidiciplinary environment
CS-14406	**Operating System Lab**	Applying	Carry out the installation of UNIX, LINUX and Windows Operating System
		Analyzing	Analyze the concept of Virtual Machine and install Operating System through it.
		Applying	Execute Linux and shell programming commands.
		Applying	Use vi editor for editing the documents.
		Applying	Implement shell programs for automate system tasks and report writing.
		Creating	Design and execute the projects related to operating system concepts on multi-disciplinary teams.
IT-14407	**Data Communicationand Computer Networks lab**	Applying	Demonstrate the hardware components, transmission media and tools used in computer networks.
		Applying	Implement the LAN based on different topologies.
		Applying	Execute various networking commands related to troubleshooting.
		Applying	Implementation of file and printer sharing.
		Applying	Use the Qualnet to visualize the network.
		Creating	Design and execute projects in networking on multi-disciplinary teams.
IT-14408	**Web Technologies Lab**	Apply	Implement HTML5 and CSS3 using Bootstrap Framework.
		Apply	Setting and building the Development environment using XAMP/ WAMP in Windows and Linux.
		Create	Develop an interactive websites using jQuery.
		Create	Develop Web based application using AJAX like, Login Form, dependable Dropdown.
		Create	Creating Web pages integrating with database for developing web modules like, login module, session authentication.
		Apply	Use Codeigniter Framework and WordPress to create a unique theme and/or child theme.
IT-14409	**Computer**	Remembering	Recognize the basic Architecture of

	Architecture and Microprocessors Lab		Computer System and various parts of Motherboard
		Understanding	Illustrate the operation of typical microprocessor: the role of the ALU, registers, stack and the use of interrupts
		Applying	Solve basic binary math operations using the instructions of microprocessor 8085
		Analyzing	Distinguish various types of Microprocessor
		Creating	Construct code and debugs Assembly Language programs to implement simple programs
Semester 5			
IT-14501	**Discrete Mathematics**	Apply	Study and apply the basic concepts of set theory, Inclusion and Exclusion Principle to solve applied problems
		Evaluate	Determine the domain and range functions, identify one-to-one functions, perform the composition of functions, find and/or graph the inverse of a function, and apply the properties of functions to application problems.
		Evaluate	Apply conceptual knowledge of Relation theory for identifying type of relations, finding composition and closure properties of relations and classifying the relations into different types including Equivalence relations, Compatibility relations and Partial Order relations
		Evaluate	Formulate convincing arguments, conceive and/or analyse basic mathematical proofs and discriminate between valid and unreliable arguments.
		Evaluate	Study the various counting principle, permutation, combination and recurrence relation and solve the related problems.
		Create	Identify, formulate and solve the complex engineering problems like shortest path and minimal spanning trees using properties and concept of graphs and trees
		Apply	Ability to discriminate and Identify the basic properties related to various algebraic entities
IT-14502	**Programming in Java**	Applying	Use primitive data types, operators and control statements to write programs.

		Understanding	Discuss methods and arrays along-with basic object oriented principles.
		Applying	Implement Exception handling, multithreading, string handling, event handling, packages and interfaces.
		Creating	Create an event handling techniques for interaction of the user with a GUI.
		Creating	Design client/server applications using socket programming and database connectivity.
		Analyzing	Identify and solve complex problems in the environment of Java programming.
IT-14503	**Theory of Computation**	Remembering	Identify the different concepts in automata theory- deterministic automata, regular expressions, regular languages, context-free grammars, context-free languages and Turing machines.
		Understanding	Illustrate the finite automata, regular expressions and context-free grammars accepting or generating a certain language
		Analyzing	Examine if a certain word belongs to a language
		Creating	Design finite automata, pushdown automata, Turing machines, formal languages, and grammars
		Analyzing	Contrast the computational strengths and weaknesses of these machines
		Creating	Utilize automata concepts and techniques in designing systems that address real world problems.
		Creating	Develop abstract machines that demonstrate the properties of physical machines and be able to specify the possible inputs, processes and outputs of these machines
IT-14504	**Human Computer Interaction**	Applying	Illustrate human psychology, information processing, reasoning and cognition.
		Analyzing	Examine human interaction models and the various factors effecting human performance.
		Analyzing	Relate stress, cognitive workload and human errors.
		Analyzing	Integrate input technologies, sensor-based interactions, User Interface and help systems for an effective human computer interaction.

		Evaluating	Select the evaluation method for human computer interaction systems.
		Evaluating	Judge the consequences of human errors and catastrophic effects by using failures and human factors analyses.
DEIT-14508	**ADVANCED COMPUTER NETWORKS**	Comprehension	Understand internetworking, TCP protocols, switching, network routing and adhoc networks.
		Evaluation	Evaluate the internet layer protocols, host to host layer protocols, application layer protocols, Virtual LAN, Network Routing Protocols, adhoc routing protocols
		Application	Implement the switch administrative configurations, routing between different VLANs, router administrative configurations
		Analysis	Analyze Enhanced IGRP and Open Shortest Path First routing protocols
		Evaluation	Compare adhoc networks with cellular networks.
		Synthesis	Formulate communication between VLANs of different configuration.
DEIT-14509	**Advanced Computer Networks Laboratory**	Comprehension	Illustrate the working of wireshark in different modes.
		Application	Distinguishing the different types of data traffic with the help of wireshark.
		Analysis	Analyze different lower layer protocols
		Synthesis	Synthesize and configure the switches, VLANs, Trunk Ports and Routers with the help of packet tracer.
		Evaluation	Evaluate the working of Network Management Software
		Analysis	Formulate Adhoc Network between different mobile devices
DEIT-14510	**Business Intelligence and its Applications**	Apply	Utilize the concept of data warehouse and data mining for solution to primarily business projects which are enabled using information technology.
		Analyse	Analyze and document the complexity of the business information requirement regarding data marts.
		Create	Design and develop solutions using OLAP tools , classification and clustering methods necessary for real world problems like public health, safety etc.

		Evaluate	Formulate and investigate the complex data mining problem with the help of modern query languages and data mining tools for interpretation of data and valid conclusions.
		Create	Function on multi-disciplinary teams through collection of datasets,experiments and projects.
		Apply	Apply Business intelligence inferences to assess social, health , safety, legal and cultural issues.
DEIT-14511	**Business Intelligence and its Applications Lab**	Application	Conduct Investigation on real world problems using BI tools like Qlikview, google analytics etc.
		Understanding	Exemplify the implementation of data mart.
		Application	Apply data mining algorithms like J48, naïve bayes, Apriori etc. for analysis and prediction of data for health , social , cultural issues etc.
		Analysing	Develop solutions for multi-disciplinary data using WEKA tool of Data Mining
		Remembring	Identify different Business intelligence tools for different applications
		Create	Function effectivelyas individual or as team in multidisciplinary area of engineering practices.
DEIT-14512	**Digital Image Processing (Elective-I)**	Understanding	Apply techniques and principles of image formation, sampling, quantization, spatial and frequency domain which will allow them to investigate specific image processing techniques.
		Applying, Analyzing	Identify, formulate, and design algorithms in the area of digital image processing.
		Analyzing	Use the techniques, skills, and modern engineering tools such as MATLAB and OCTAVE for processing digital images.
		Applying	Function on multi-disciplinary teams through experiments and projects related to imaging techniques.
		Evaluating	Identify potential applications of image processing to advancement of knowledge in sciences and engineering with benefits in, e.g., policing, public safety, and social issues such as privacy.
		Creating	Demonstrate a high level of self-directed

			learning ability, good oral and written communication skills on technical topics of digital image processing.
DEIT-14513	**Digital Image Processing Laboratory (Elective-I)**	Understanding	Apply knowledge of software tools and techniques with hands-on experience for processing digital images.
		Applying	Design solutions for the understanding of the image enhancement, image compression, image segmentation.
		Analyzing	To conduct investigation and develop programming skills in digital image processing related problems.
		Evaluating	Use the modern engineering tools such as Scilab, MATLAB Octave etc. for solving problems related to image processing.
		Evaluating	Function on multi-disciplinary teams through mini projects based on image processing problems.
		Creating	Predict knowledge and skill base necessary to further explore advanced topics of Digital Image Processing.
DEIT-14514	**.Net Technologies**	Apply	Use new types like, enumerations, classes, and structures, reference type and value type and conversion of types in C#.
		Create	Build pattern matching expression, encoding and decoding
		Apply	Use collections and generics and working with graphic
		Apply	Develop .NET framework Web Service-based applications and components
		Analyze	Examine Framework Libraries , inbuilt function, interfaces, exception handling and multi-threading.
		Apply	Apply WCF Security, Application Blocks
DEIT-14515	**.Net Technologies Lab**	Create	Design Console based application
		Create	Create derived classes that inherit from custom- written or .NET Frame work Library classes
		Apply	Use attributes to configure program behavior and efficiently manage resources
		Create	Build exception handling into methods , to create robust ,user-friendly application behavio
		Apply	Use window forms, serialization and installing project for a service.

		Apply	Apply to access Database
DEIT-14516	**Advanced Web Technologies**	Applying	Apply the knowledge of HTML5 based Bootstrap framework for web page designing
		Creating	Create and design web applications using MVC approach and Bootstrap.
		Creating	Develop Responsive web applications using the concept of AngularJS.
		Applying	Demonstrate the understanding of version control and data repository maintenance using Git.
		Analyzing	Identify, formulate and solve engineering problems in the area of dynamic responsive web applications
		Creating	Function on multi-disciplinary teams through web application creation
DEIT-14517	**Advanced Web Technologies Laboratory**	Applying	Deploy and implementation of HTML5 based Bootstrap framework elements.
		Creating	Design and construct web module using CodeIgniter Framework.
		Creating	Installation and Implementation of different AngularJS Framework approaches for designing responsive web applications.
		Creating	Create, setup and preform different operations on git based data repository
		Analyzing	Recognize, contrive and build solutions for engineering problems in the area of contemporary web applications
		Creating	Function on diverse teams through web application designing and development
IT-14505	**Programming in Java Lab**	Applying	Practice primitive data types, variables, various control and decision structures to write programs.
		Applying	Implement classes, methods and arrays in java programs.
		Creating	Create java programs using Exception handling, multithreading, string handling, packages, interfaces and applets.
		Creating	Generate event handling techniques for interaction of the user with a GUI.
		Applying	Apply the concepts of data structures, digital electronics, operating systems and computer networks without using the inbuilt features of Java programming.

		Applying	Design and execute the projects by using Java programming concepts on multi-disciplinary teams.
IT-14506	**Human Computer Interaction Lab**	Creating	Design the human interaction models.
		Creating	Design the system involving the event and its status analysis.
		Creating	Create the user interface which takes into consideration the human cognition and mitigates the predicted human errors.
		Creating	Construct a user support and help system which is capable of enhancing the effectiveness of human decision making during emergency conditions.
		Creating	Generate the simulation that involves the interaction between the human and input sensors.
		Creating	Construct a simulation of a critical system where human computer interaction and cognition effects the safety of human.
Semester 6			
IT-14601	**Information Assurance & Security**	Applying and Analysing	To select appropriate techniques to tackle and solve problems in discipline of information security and assurance.
		Applying	Implemantation of Cryptography algorithms and their typical applications.
		Understanding	To understand the role of key mangement, digital certifcates and how digital signatures are performed.
		Evaluation	Evaluate the working of N/w security system
		Analysing	To study foundation and importance of e-commerce and security management.
		Applying	Ethical implications of IT legal decisions.
IT-14602	**Software Engineering & Testing**	Analyzing	Examine the Software Requirements Engineering and stages of software development.
		Analyzing	Relate the requirements modeling and design techniques to infer the flow and behaviour of the system.
		Analyzing	Examine the design issues and metrics for an effcective software design.
		Analyzing	Differentiate between the testing strategies to verify and validate the developed system.
		Evaluating	Monitor the quality of the software for its

			reliability, availability and safety.
		Analyzing	Relate software manitenance, reengineering and version control.
DEIT-14607	**Advanced Java**	Applying , Analyzing	Apply the knowledge of java to Illustrate and Integrate its application in multidisciplinary areas.
		Creating , Applying	Demonstrate and Create distributed applications using Remote Method Invocation and socket programming to solve complex engineering problems.
		Evaluating, Creating	Create and evaluate multithreading based Concurrenct approach to solve multasking requirements.
		Applying, Creating	Implement Java Beans to Improve software reusability
		Understand, Applying	Outline the use of Swing to create user friendly interfaces for different applications
		Creating	Formulate the use of Servlets in creating dynamic content for the Web
DEIT-14609	**Big Data Analytics**	Understanding	Understand the concept and challenge of big data
		Applying	Demonstrate hands-on experience on large-scale analytics tools to solve some open big data problems
		Analyzing	Examine the impact of big data for business decisions and strategy
		Applying	Apply the novel architectures and platforms like Hadoop introduced for Big data
		Applying	Implement the analytics techniques on a variety of complex applications
		Applying	Apply non-relational databases, for storing and processing large volumes of structured and unstructured data, as well as streaming data
DEIT-14611	**E-Commerce (Elective-II)**	Undertanding	Understanding the Significance and Importance of Electronic Commerce, Its Infrastructure and Legal Framework
		Applying	Apply the Knowledge of Web Software Deveklopment Tools, Multimedia Web Extensions, Firewalls and Transaction Security Considerations for the Analysis and Design of Website
		Analysis	Identify, formulate, analyze and Solve Engineering Problems in the Area of

			Electronic Commerce
		Evaluating	Use the Techniques, skills and Modern Engineering Tools Such as WAP, E-CRM and E-SCM, necessary for Engineering Practice
		Evaluating	Use Research based Knowledge including Design of Experiments, Analysis and Interpretation of Data, and Synthesis of the Information to Provide Valid Conclusions
		Creating	Create Select and Apply Appropriate Resources and Modern Engineering and IT Tools with an Undertanding of Limitations
		Applying	Apply Reasoning Informed by the ContexualKnowldge to Access Legal Issues and the Consequent Responsibilities relavent to the Professional Engineering Practice
DEIT-14615	**Information Storage and Management**	Understandig	To understand the necessity for Information storage technology and value of data to a business.
		Understandig	To understand concepts of Data protection.
		Understandig	To understand the appropriateness of the different networked storage options for different application environments
		Understandig	To understand the architecture of backup/recovery and virtualization technologies
		Understandig	Understanding information storage and security management.
OEIT-14602	**Management Information System**	Understanding	To understand the need of MIS in organization, business process integration with IT
		Understanding	To define SCM, CRM, ESS, DSS, EDI & E-Commerce
		Remebering, Applying	To identify, formulate and implement different strategies for competitive advantage
		Understanding, Analyzing	To study and analyze the Business Intelligence techniques
		Evaluating , Creating	To monitor the challenges and changes in IT in an organization
OEIT-14601	**IT Enabled Services**	Applying	Apply knowledge about Business Strategy with special emphasis on challenges and opportunities of IT.
		Understanding	Identify, formulate, and review literature to define enterprise IT architecture.

		Understanding	Understand the impact of IT enabled services on major areas like medical, legal and ethical.
		Applying, Analyzing	Function on multi-disciplinary teams through various case using AutoCAD and SAP.
		Evaluating	Identify potential applications of IT Enabled Services that can lead to advancement of knowledge in sciences and engineering with benefits in, areas like geography, medical sciences, manufacturing industries etc.
		Creating	Construct knowledge and understanding of Current Trends in IT Enabled Services that can assist in lifelong learning.
IT-14603	**Probability and Statistics**	Applying	Demonstrate the measures of central tendency to analyze the given data set
		Creating	Create the histogram for a given data set
		Evaluating	Verify the predicted data sets using Binomial, Poisson and normal distribution
		Evaluating	Select a critical value from a normal, t, chi - square, and f distribution
		Creating	Predict the linear regression parameters and correlation coefficient.
		Applying	Apply probability theory via Bayes' Rule
		Creating	Formulate the marginal and conditional distributions of bivariate random variables
IT-14604	**Software Engineering & Testing Lab**	Analyzing	Examine the requirements of the required software system.
		Creating	Design use cases for software requirements specifications of the desired system.
		Creating	Construct models for data flow and behaviour of the system.
		Creating	Compose the effective User Interface for an application.
		Creating	Formulate test cases to test the application.
		Applying	Practice the auotmated software testing tools.
DEIT-14608	**Advanced Java Lab**	Analyzing,create	Analyze and design a computer program to solve real world problems based on object-oriented principles
		Applying	Demonstrate the importance and merits of proper comments in source code and API documentations
		Creating	Compose GUI interfaces for a computer

			program to interact with users
		Creating	Design Web based applications for Client Server Architecture to solve complex problems
		Evaluating	Verify relationships among various access specifiers as needed for a specific problem
		Applying	Implement the concepts of polymorphism and inheritance
DEIT-14610	**Big Data Analytics Lab**	Understanding	Understand Big Data and Hadoop ecosystem
		Analyzing	Detect complex problems and synthesise suitable solutions
		Creating	Compile collect, manage, store, query, and analyze various form of big data
		Analyzing	Formulate balance between algorithmic and systems issues
		Creating	Construct the Integration of Big Data with traditional data warehouses
		Applying	Applying machine learning to computing tasks, where designing and programming algorithms with good performance is difficult
DEIT-14612	**E-Commerce Laboratory (Elective-II)**	Remembering	Remebering and Revising the different Front-End and Back-End Languages
		Applying	Apply the Knowledge of Different Web Deleopment Tools and Techniques for the Construction of Personal Web-Page
		Analysis	Identify, formulate, analyze and Solve Engineering Problems in the Area of Electronic Commerce
		Evaluating	Design System Components or Processes that meet the specified needs with appropriate consideration for the website of any organization
		Evaluating	Use Research based Knowledge including Design of Experiments, Analysis and Interpretation of Data, and Synthesis of the Information to Provide Valid Conclusions
		Creating	Create Select and Apply Appropriate Resources and Modern Engineering and IT Tools with an Undertanding of Limitations
		Creating	Function effectively as an individual, and as a member or leader in diverse teams
DEIT-14613	**Embedded System in C**	Understanding	Discuss the concept of embedded system, microprocessors

		Applying	classify and compare the various microcontrollers
		Applying	Illustrate the concept of 8051 microcontroller
		Applying	Use 8051 Assembly language programming for various arithmetic and logical operations
		Analyzing	Analyze the design and architecture of embedded core processors
		Applying	Utilize the basics of RT-Linux as RTOS
DEIT-14614	**Embedded System Lab**	Understanding	Illustrate the functioning of 8051 Microcontroller Kit
		Applying	Use 8051 Assembly language programming for various arithmetic and logical operations
		Understanding	Conceptual description of the Interrupt Structure of 8051/8031 Microcontrollers
		Applying	Utilize knowledge of Interrupt Structure to design codes of programming
		Evaluating	Design, test and critically evaluate embedded solutions to real world situations.
		Evaluating	Function on multi-disciplinary teams through experiments and projects.
		Applying	Apply gained theoretical knowledge in order to design, analyze and implement embedded systems
IT-14605	**IAS Lab**	Analyzing	Examine of various aspects like operational issues, policy, attacks, security domains related to information security
		Remembering	Identify the security related aspects related to client-server authentication.
		Evaluating	Evaluate the working of IDS tool such as snort
		Evaluating	Function on multi-disciplinary teams through mini projects based on various security related issues.
		Application	Distinguish between the different types of algorithms used for information security.
		Applying	Configuration of tool such as Wire shark and OpenVAS necessary to further explore information assurance and security.
Semester 7/8			
IT-14701	**Business Enterprise Application**	Applying	Apply knowledge of Software Engineering Methodologies for the Design and

			Implementation of Enterprise Application
		Analysis	Identify, formulate, and solve engineering problems in the area of Enterprise Application Development
		Evaluating	Use the techniques, skills, and modern engineering tools such as ETL, Business and Use-Case Modeling for Engineering Practice
		Evaluating	Use of Enterprise Architecture Classifications, Construction Plans and Code Profiling for Engineering Practice
		Creating	Function on multi-disciplinary teams through enterprise application development
		Creating	Design and Develop the Enterprise Application to meet desired needs within realistic constraints
IT-14702	**ICT in Agriculture and Rural Development**	Applying	Apply knowledge of Infrastructure, appliances and services to the analysis of ICT in agriculture and rural development.
		Understanding	Identify and study of techniques for increasing productivity through ICT.
		Designing	Develop techniques for agricultural Marketing with ICT.
		Understanding	Use the concepts, skills, necessary for gglobalization of e-agriculture
		Understanding	Learn about the recent applications of ICT and their potential to transform Indian agriculture.
		Designing	Function on multi-disciplinary teams through various case studies related to impact of ICT on the society.
DEIT-14705	**Agile Software Development**	Understanding	Explain the concept of Agile Software Development, Extreme Programming, Scrum, Agile testing and design practices .
		Understanding	Compare Extreme Programming with Scrum.
		Applying	To demonstrate various agile testing scenarios using tools for Test Driven Development.
		Analyzing	Differentiate and analyze various Agile Design Principles.
		Evaluating	Prioritize Agile development based on the current industry trends.
		Creating	Design the software development model based on the given constrains. Creating

DEIT-14706	**Agile Software Development Laboratory**	Remembering	Acquire the generic software development skill through various stages of software life cycle.
		Creating	Design and conduct experiments, as well as to analyze and interpret data.
		Applying	Demonstrate various Software testing tools.
		Understanding	Illustrate manual and automated testing.
		Analyzing	Examine of the factors that affect the development of software.
		Application	Develop, implement, and demonstrate the learning through a project that meets stated specifications.
DEIT-14707	**Bioinformatics**	Understandig	Describe Bioinformatics, Role of bioinformatics in biological sciences, Microarrays and sequence alignment.
		Analyzing	Utilize Central Dogma of Molecular Biology to clarify Transcription and Translation.
		Evaluating	Classify different biological databases.
		Creating	Generate optimal sequence alignment using different algorithms.
		Analyzing	Compile Genome analysis using next generation sequencing.
		Understanding	Illustrate the use of bioinformatics in drug discovery and design.
DEIT-14709	**Simulation and Modeling**	Applying	Implement modeling methodolgies to develop a discrete-event simulation model for a real world problem.
		Analyzing	Examine the cost/benefits of computer simulation, the generation of meaningful results, decision making and risks.
		Analyzing	Compare the various discrete-event techniques for solving a simulation problem.
		Applying	Illustrate alternative system designs using sampling and regression.
		Analyzing	Formulate appropriate inputs for the simulation model.
		Creating	Improve the operation of a dynamic system according to the current simulation results.
DEIT-14710	**Simulation and Modeling Lab**	Creating	Consruct a model for a given set of data and analyze output produced to test the validity of the model.
		Applying	Implement the numerical methods to solve

			simulation problems.
		Creating	Design simulation model for a system that meets industrial requirements.
		Applying	Use the modern simulation tools and resources to measure the performance of different simulation models.
		Analyzing	Examine system design using regression techniques.
		Creating	Construct a network by using network simulator.
DEIT-14711	**Mobile Application Development**	Understand	Understanding the basic mobile platforms and mobile development environments
		Apply	Make use of Android SDK to setup Android Development Environment
		Apply	Apply conceptual knowledge of User Interface Designing to design UI in Android SDK
		Create	Develop Interactivity based Android Applications using Fragment, Intents and Event Processing
		Create	Develop Database oriented Android Applications using Persistent Data Storage
		Evaluate	Improve the Android Application Performance using Android Services and Threads
		Evaluate	Analyze and Solve the bugs using Android Security and Debugging features
DEIT-14712	**Mobile Application Development Lab**	Understand	Demonstrate an understanding of design aspects of different mobile development environments
		Remember	Install, setup and make use of Android SDK 2 to study basic components involved in Android Mobile Application Development
		Create	Study and Design using basic desigining components, different type of layouts for a UI based on XML in Android Studio2
		Create	Develop a basic module using Android development environment involving elements of interactivity
		Create	Develop persistent database oriented application module using Android development environment
		Create	Integrating the concept of mutithreading, resource requests for application performance improvement

		Evaluate	Test and solve the bug related issues using tools like Logcat, Android Debug bridge
		Create	Function on diverse teams to identify, formulate and design static web project using XML oriented Designs, Persistent Data Storage and embedded with features like services, threads and debugging in multi-disciplinary environment
DEIT-14713	**Cloud Infrastructure and Services**	Analyzing	Analyze, explain, and evaluate various cloud computing solutions.
		Understanding	Carryout large data processing in the cloud.
		Understanding	Classify various service models in Cloud Computing.
		Understanding	Explain virtualization and their role in elastic computing.
		Creating	Create resource management techniques in the Cloud.
		Analyzing	Examine the design of task and data parallel distributed algorithms for Clouds.
DEIT-14714	**Cloud Infrastructure and Services Laboratory**	Creating	Design and implement Cloud applications that can scale up on a VM and out across multiple VMs.
		Applying	Investigate into existing simulation techniques for studying large scale distributed systems.
		Understanding	Demonstrate using simulation Cloud computing infrastructures and application services.
		Evaluating	Monitor the modeling of the energy consumed by the data center IT equipment.
		Analyzing	Formulate novel solutions in monitoring, resource allocation, workload scheduling.
		Creating	Build modern web applications on an open cloud platform from google
IT-14703	**Engineering Entrepreneurship**	Understanding	Knowledge base related to the principles of viability of existing as well as new businesses
		Applying	Apply the innovative ideas and skills for the creation of sustainable competitive advantage
		Designing	Design the proforma and plan documents for the different operations of a business
		Understanding	Understand the legal and ethical implications of business decision making and recognize ethical dilemmas

		Investigating	Conduct surveys and case studies to test a business model to ensure its viability
		Analyzing	Analyze the use of software packages and e-commerce for the effective growth of a
DEIT-14717	**Compiler Design**	Understand	explain the concepts and different phases of compiler with compile time error handling
		Analyse	Identify language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language
		Create	Design Top Down and Bottom up parsing Techniques
		Understand	Translate given input to intermediate code
		Create	Design syntax directed translation schemes for a given context free grammar
		Apply	Apply optimization techniques to intermediate code and generate machine code for high level language program
DEIT-14718	**Computer Forensics**	Understanding	Master basic and modern professional skills in computer forensics.
		Analyzing	Identify and apply computer forensics for data recovery, evidence collection and data seizure.
		Investigating	Conduct investigations related to various computer forensics systems.
		Understanding	Understand and apply the ethical standards of the computer forensic specialist.
		Analyzing	Summarize duplication and preservation of digital evidence.
		Investigating	Evaluate the effectiveness of available computer forensics tools.
DEIT-14719	**Optimization Techniques**	Apply	Apply the existence and uniqueness of solutions to a given optimization problem;
		Evaluating	Validate convexity of functions, sets, and optimization problems;
		Creating	Derive necessary and sufficient optimality conditions for a given optimization problem;
		Evaluating	Solve small optimization problems analytically;
		Analyse	Investigate the underlying principles and limitations of modern techniques and algorithms for optimization;
		Apply	Apply optimization algorithms to model problems in engineering and natural

			sciences.
DEIT-14721	**Corporate IT Management**	Understanding	To understand Information Systems and its categorization, Corporate Project Management Process, E-business and its management.
		Understanding	To define End User Computing Services.
		Remembering, Applying	To identify, formulate and implement Software acquisition methods and developing BIS.
		Understanding, Analyzing	To study and analyze E-Business, Information Security & Ethical and Legal Constraints on Information systems.
		Evaluating,Creating	To study and monitor the challenges and changes in Information System environment in an organization.
		Understanding	To know the Information Technology disciplines.
DEIT-14722	**Research Methodologies**	Understand	Develop understanding of the objectives of research, motivation and different types of research
		Apply	Select and define the research problem after evaluating the different techniques involed
		Analyze	Developing a research plan after understanding the need, features and different types of a research design
		Evaluate	Applying and analyzing the different type of sample designs and taking into account the practical consideration
		Analyze	Selecting appropriate data collection methods by analyzing different methods involved
		Evaluate	Processing and analysing the data using various statistical tools
		Understand	Understanding the basics of report writing and the components involved
IT-14704	**Business Enterprise Application Laboratory**	Remembering	Remembering and Revising the different Front-End and Back-End Languages
		Understanding	Understand various issues pertaining to building enterprise application
		Applying	Apply techniques to develop enterprise applications using the different programming languages
		Selecting	Select various advanced technologies used to build applications for the enterprise

		Evaluating	Design to competently use the advanced libraries to build a medium-size application for the enterprise
		Creating	Function effectively as an individual, and as a member or leader in diverse teams
PRIT-14701	**Major Project**	Applying	Apply the engineering knowledge, which are acquired in the area to a given problems.
		Analyzing	Analyze the various problems and choose appropriate methodology to solve the problem.
		Designing	Design sustainable software solutions using relevant programing language for societal and environmental applications.
		Investigating	Investigate on modern programming languages and tools to solve relevant applications..
		Communicating	Communicate effectively on demonstrating the functionalities of various software principles applied to one's own work.
		Designing	Develop professionalism, leadership capability and team work.

Production Engineering

Program Outcomes

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with

appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes

1. Will be able to apply the acquired theoretical and practical skills to solve the industrial and research problems in the major streams of manufacturing, industrial engineering and operation management.

2. Will be able to take up their career in government, public, private sector industrial/research organizations, start enterprises and pursue higher studies with high regard for social and professional ethics.

Applied Science

Course Outcome

Subject Code: BSC-101

Subject Name: Physics

Course outcomes:

1. Solve the problems in the fields of electromagnetism, lasers and fiber optics.
2. Apply the knowledge acquired from the study of semiconductors to identify their use in latest technologies.
3. Recognize the inadequacy of classical mechanics for certain physical problems and thus find the solutions of these problems using principles of quantum physics.
4. Comprehend the concept of oscillations and hence to implement the same in the theory of machines.
5. Understand the basic characteristics of materials relevant to engineering and technological applications.
6. Apply multidisciplinary knowledge of science for reviewing complex problems from different angles/perspectives and to find the best possible solution/model.

Subject Code: BSC-102

Subject Name: Physics Laboratory

Course Outcomes:

1. Understand the importance of least count of instruments and errors in measurements and their propagation in the calculated results.
2. Compare the quality of different lasers and their applications in different optical processes.
3. Find the losses taking place in optical fibers and understand the working of an optical communication system.
4. Control the motion of charged particle in external electric and magnetic fields and use this property for analyzing different ac and dc circuits.
5. Understand the minute details of optical phenomena like interference, diffraction and polarization.

6. Study properties of different electric and magnetic materials viz., dielectric constant, polarizability, change in dimensions in external electric and magnetic fields, resistivity and energy gap in semiconductors.

Subject Code: BSc-103

Subject Name: Mathematics-I

Course outcomes:

1. Analyze the use of calculus and linear algebra to Engineering problems.
2. Apply the concept of improper integrals to study Beta and Gamma functions.
3. Explain utility of Taylor's theorem in error analysis.
4. Apply the concept of rank to solve system of linear equations and diagonalization of matrices.
5. Recognize and solve ordinary and linear differential equations.
6. Infer the convergence of infinite series.

Subject Code: BSC-104

Subject Name: Mathematics-II

Course outcomes:

1. Understand and apply concepts ol' rector calculus, differential equations and calculus of complex functions to engineering problems.
2. Sketch basic Cartesian, parametric and polar curves.
3. Apply the techniques of multiple integrals in engineering problems.
4. Evaluate integrals of vector point functions over line, surfaces and volumes.
5. Substantiate the ability to integrate knowledge and ideas of multivariable calculus to engineering problems.
6. Understand how to decompose the periodic functions in series of sine and cosine.

Subject Code: BSC-105

Subject Name: Chemistry

Course outcomes:

1. Understand important properties of simple and complex molecules and apply it to explain the behaviour of materials.
2. Identification of molecules (simple and complex) based on their excitation in different molecular orbitals.
3. lnterpret the phase diagram and use it in industry.
4. Apply the principles of water chemistry, on characteristic of surface water, drinking water, waste water and in industrial applications.
5. Analyse relationships between different thermodynamic functions with electrochemistry.

6. Understand the basic concept of different types of interactions in molecules and use it to explain their stereochemistry and identify major chemical reactions used in synthesis of molecules.

Subject Code: BSC-106

Subject Name: Chemistry Laboratory

Course outcomes:

1. Synthesize a small molecules(drugs/polymers) .
2. Know to maintain different reaction conditions to get maximum yield of the product, if possible by green chemistry approach.
3. Correlate the impurities with hardness, chloride content and alkalinity of water.
4. Remove hardness of water to make it fit for industrial use.
5. Select a lubricant for particular type of a machine and analyse the importance of temperature for viscosity.
6. Be able to handle sophisticated instruments to interpret the results (pH, conductance, wavelength absorbed) to calculate some important parameters of the sample (conc., redox potentials etc.)

Subject Code: HSMC-101

Subject Name: English

Course outcomes:

1. Grasp the significance of effective communication in English at work places.
2. Acquire effective listening skills and reading skills for academic and professional efficiency.
3. Present their thoughts and ideas in an organized way in written form.
4. Enhance grammatical competence in English through lessons on English language usage.
5. Utilise suitable writing styles while expressing themselves in written form in English.
6. Produce effectively different forms of professional writing.

Subject Code: HSMC-102

Subject Name: English Laboratory

1. Develop a knack for structured public talk.
2. Grasp the nuances of interpersonal skills through conversation and dialogues.
3. Acquire proficiency in skills involved in effective participation in group discussion.
4. Perform satisfactorily in job interviews for career settlement and growth.
5. Demonstrate fluency in speech in acceptable accent.
6. Receive and understand spoken material accurately.

Subject Code: ESC-101

Subject Name: Basic Electrical Engineering

Course outcomes:

1. Analyze the behavior of electrical and magnetic circuits.
2. Inculcate the understanding about the AC fundamentals.
3. Realize the requirement of transformers in transmission and distribution of electric power and other applications.
4. Select the type of generator / motor required for a particular application.
5. Analyze the various electrical networks.
6. Understand the components of low voltage electrical installations

Subject Code: ESC-102

Subject Name: Basic Electrical Engineering Laboratory

Course outcomes:

1. Recognize different electrical components like resistances, inductances, capacitances and their ratings.
2. Verify and interpret basic laws of electric circuits like Ohm's Law and Kirchhoff's Law and same are demonstrated in their field placements.
3. Design electric circuits and utilize electric instruments to perform experiments.
4. Detect ratings of commonly used house hold electrical appliances.
5. Acquire practical knowledge of electric circuit's components and instruments.
6. Understand the basic characteristics of transformers and electrical machines.

Subject Code: ESC-103

Subject Name: Engineering Graphics and Design

Course outcomes:

1. Understand various terms used in engineering drawing and Interpret the drawing in terms of engineering requirement.
2. Conceptualize, and deliver the fundamentals of engineering drawing for any given application.
3. Apply rules and conventions as per International Standards for engineering drawing.
4. Learn and apply orthographic as well as isometric projections as per engineering requirement.
5. Integrate ideas for offering efficient and effective solutions to the engineering problems.
6. Use computer to draw engineering drawings (2D) and basic 3D models.

Subject Code: ESC-104

Subject Name: Programming for Problem Solving

Course outcomes:

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Subject Code: ESC-105

Subject Name: Programming for Problem Solving Laboratory

Course outcomes:

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct syntax errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining differential structures.
8. To be able to create, read and write to and from simple text files.

Subject Code: ESC-106

Subject Name: Manufacturing Practive

Course outcomes:

1. Make various carpentry utility items with use of various joints.
2. Practice of various forging, welding, electric, sheet metal tools and equipments.
3. Make mould and cast product of different shapes.
4. Finish various jobs by using finishing tools.
5. Operate different machines and perform different operations.

Master in Business Administration

Program Outcomes

1. Ability to apply Management fundamentals in practical world.
2. An ability to identify, formulate, and solve Managerial problems.
3. Demonstrate abilities such as initiative taking and innovative thinking in their acts.
4. An ability to function in multi-disciplinary teams.
5. To inculcate zeal of self-learning.
6. Enhancing Entrepreneurship abilities so that the students are induced to undertake independent ventures.
7. An ability to understand professional and ethical responsibility.
8. An ability to communicate effectively.
9. Enhancing knowledge of contemporary issues.
10. Recognition of the need for, and an ability to engage in life-long learning.
11. An ability to understand the impact of Managerial solutions in a global, economic, environmental, and societal context.
12. Ensuring holistic development of students.

PSO

1 An ability to apply conceptual foundations of management to solve practical decision-making problems.

2 An ability to adapt to dynamic changes in an environment with an understanding of societal and ecological issues relevant to professional managerial practice through life-long learning.

3 Excellent adaptability to function in multi-disciplinary work environment, good interpersonal skills as a leader in a team in appreciation of professional ethics and societal responsibilities.

Master in Computer Applications

Program Outcomes (PO's):

a. Ability to design and conduct experiments, as well as to analyze and interpret data.
b. Develop software applications and modules to meet needs of industry within economics, environment and social constraints.
c. Apply knowledge of recent technologies, skills and current tools in computer science.
d. Ability to communicate with industry professionals with subject knowledge and skills.
e. Ability to work in multi-disciplinary and multi cultural environment.
f. An understanding of professional and ethical responsibilities.
g. Knowledge of computing tools to develop applications fast and efficiently.

Program Specific Objectives (PSO's):

1. Practice with an expertise in academics, design and development of Computer Applications, or research in a specialized area of Computer Applications to pursue higher studies.
2. Exhibit analytical, decision making and problem solving skills by applying principals for handling real life problems with realistic constraints.
3. Ability to communicate the findings or express innovative ideas in effective manner with an awareness of professional, social, ethical responsibilities.

Course Outcome

MCA-3rd Semester

MCA- 15301 Database Administrations

1. Critical analysis: Analyze the model requirements and constraints for the purposes of installing, configuring, and tuning a DBMS, and implementing security, back-up and recoverymeasures.

2. Problem solving: Design and implement plans for installing, configuring, and tuning a DBMS, and security, back-up and recovery measures, based on requirementsanalysis/ modeling or a requirementsspecification.
3. Communication: Motivate and explain complex database administration concepts,relevant alternatives and decision recommendations to IT specialists, via technical reports of professionalstandard.

MCA-15302 Computer Based Optimization Techniques

1. Formulation of linear programmingproblems
2. Formulation of linear programmingproblems
3. Formulation of linear programmingproblems
4. Formulation of linear programmingproblems
5. Simple method and dualityprinciple
6. Finding best method for solving linearprogramming
7. Optimization of transport problems and assignmentproblems
8. Applying decision makingstrategies
9. Understanding dynamic programming and its importance in solving businessapplications

MCA-15303 Software Engineering

1. Gain Knowledge on Software Engineering Principles and software processmodels.
2. Identify and define Software requirementspecification.
3. Acquire a detailed understanding of Data design, Architectural Design and Procedural design.
4. Define, formulate and analyze aproblem
5. Describe, contrast and compare different software testing.
6. Understand how to apply Software concepts and Software qualitymanagement.

MCA-15304 Java Programming

1. Identify syntax related concepts of various programminglanguages
2. Demonstrate the programming language design issues related to data types,expressions control structure parameterpassing
3. Apply techniques for interpreted programminglanguage
4. Access the design issues of object orientedlanguage
5. Determine the usage, exposes the logic for programming languages which definethe semantics
6. Constructing the core features of programming languages with principles of objectoriented languages

MCA-15307 System Programming

1. Familiarity with basic UNIX OS concepts such as: process, program, process groups,

signals, running programs, process control, address space, user and kernel modes,system calls, and contextswitching.

2. Master in file I/O (i.e. open, close, read, write, seek)
3. Familiarity of using sockets to implement client-serverenvironment.
4. Familiarity using thread executionmodels.
5. Familiarity to handle signals and exceptions within a process and to controlprocesses.
6. Familiarly with different approaches of concurrentprogramming.
7. Familiarity with different batch processingsystems.
8. Familiarity with remote executiontechniques.

MCA-4th Semester

MCA-15401 Programming Languages

Students who complete this course would be able to perform the following tasks:

1. Identify syntax related concepts of various programminglanguages
2. Demonstrate the programming language design issues related to data types ,expressions control structure parameterpassing
3. Apply techniques for interpreted programminglanguage
4. Access the design issues of object orientedlanguage
5. Determine the usage, exposes the logic for programming languages which definethe semantics
6. Constructing the core features of programming languages with principles of objectoriented languages

MCA-15402 E-Commerce & Web Application Development

1. Demonstrate an understanding of the foundations and importance ofE-commerce
2. Demonstrate an understanding of retailing in E-commerceby:
    a) Analyzing branding and pricingstrategies
    b) Using and determining the effectiveness of marketresearch
    c) Assessing the effects ofdisintermediation.
3. Analyze the impact of E-commerce on business models andstrategy
4. Describe Internet trading relationships including Business to Consumer, Business- To-Business,Intra-organizational
5. Describe the infrastructure forE-commerce
6. Describe the key features of Internet, Intranets andExtranets.
7. Discuss legal issues and privacy inE-Commerce
8. Assess electronic paymentsystems
9. Recognize and discuss global E-commerceissues

DEMCA-15407

1. Design a data mart or data warehouse for anyorganization
2. Develop skills to write queries usingDMQL
3. Extract knowledge using data miningtechniques

4. Adapt to new data miningtools
5. Explore recent trends in data mining such as web mining, spatial-temporalmining

MCA-15 404 Advanced Operating Systems

1. Gain knowledge on distributed operating system concepts that includes general architectureof distributed operatingsystem.
2. Identify and define key terms related to Multi-processor and Distributed operatingsystem.
3. Acquire a detailed understanding of Kernel based model and CPUscheduling.
4. Classify and analyze theory and fundamentals of Cluster and GridComputing.
5. Describe, contrast and compare differing structures for operatingSystems.
6. Understand how to apply Software concepts and design issues of operatingsystems.

MCA-5th /6th Semester

MCA-15501 Interactive Computer Graphics

1. Systematic understanding of embedded systemsknowledge
2. Critical awareness of current problems and/or new insights in the embedded systemsdiscipline
3. Critical appraisal of contributions of contemporaries
4. Critical evaluation of embedded systemsapplications

MCA 502 Network Securities and Administration

1. Undertake routine tasks to secure anetwork.
2. Understand the factors that place an internet-based information system at risk and apply this knowledge to simple casestudies.
3. Evaluate procedures to secure a system against failure, theft, invasion andsabotage.
4. Understand and apply the concepts for administrating a small company'snetwork.

MCA 503 Web Technologies

1. Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript, ASP, PHP and protocols in the workings of the web and webapplications
2. Analyze a web project and identify its elements and attributes in comparison totraditional projects.
3. Understand, analyze and create web pages using HTML, DHTML and Cascading Stylessheets.
4. Understand, analyze and build dynamic web pages using JavaScript and VBScript (clientside programming).
5. Understand, analyze and build interactive web applications using ASP andASP.NET.
6. Understand, analyze and build web applications usingPHP.
7. Understand, analyze and create XML documents and XMLSchema.

8. Understand, analyze and build and consume web services.

MCA 504 Object Oriented Analysis and Design using UML

1. Master the fundamental principles of OOprogramming.
2. Master key principles in OO analysis, design, anddevelopment.
3. Familiarity of the application of the Unified Modeling Language (UML) towards analysisand design.
4. Master common patterns in OO design and implementthem
5. Familiarity with alternative developmentprocesses
6. Familiarity with alternative developmentprocesses
7. Familiarity with group/team projects andpresentations