VILASRAO DESHMUKH FOUNDATION GROUP OF INSTITUTIONS, LATUR

Plot No.165A, Additional MIDC, Near to Manjara Sugar, Barshi Road, Latur, Maharashtra 413531

(Approved by AICTE, New Delhi & recognized by Govt. of Maharashtra and affiliated to DBATU Lonere, Dist. Raigad)

T (02382) 267731/32/33 Email-info.engg@vdf.in Website: www.vdfengineering.co.in(DTE Code: 2254)

# PO CO OF CIVIL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2021-22

## Vision

The vision of the department is the sharing of technical skills and knowledge for the benefit of student education and the development of business, society, and our nation.

## Mission

Our goal is to offer top-notch engineering education that is in step with current scientific and technical advancement.

## Program Educational Objective

Goal of the Civil engineering is to provide students with preparation to become worthy of professional careers in the field and to be motivated for lifelong learning. All prescribed courses have definite objectives and outcomes. Program objectives are expected qualities of engineers as under:

| | |
|---|---|
| PEO1 | **Preparation**: To prepare students to excel in various educational programmes or to succeed in industry / technical profession through further education/training; |
| PEO2 | **Core Competence**: To provide students with a solid foundation in mathematical, scientific fundamentals required to solve Structural problems; |
| PEO3 | **Breadth**: To train students with a breadth of scientific knowledge to comprehend, analyze, design & create novel products and solutions for real life problems; |
| PEO4 | **Professionalism**: To inculcate in students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate engineering issues to a broader context; |
| PEO5 | **Learning Environment:**To provide students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long / productive career. |

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In addition to above DBATU graduate is expected to be

1. Taking pride in their profession and have commitment to highest standards of ethical practices and related technical disciplines;
2. Able to design structural system that is safe, economical and efficient;
3. Capable of using modern tools efficiently in all aspects of professional practices;
4. Dealing successfully with real life civil engineering problems and achieve practical solutions based on a sound science and engineering knowledge;
5. Shall be engage in continuous research, development and exchange of knowledge for professional development;
6. Be honest in their control and performing their duties and promote effective use of resources through open, honest and impartial services to the public;
7. Act in such a manner which will uphold the honour, integrity, or dignity of the engineering profession, and avoid knowingly engaging in business or professional practices of a fraudulent, dishonest or unethical nature;
8. Recognize that the lives, safety, health and welfare of the general public are dependent upon engineering, decision and practices;
9. Continue their professional development throughout their careers and provide opportunities for the professional development;

## Course Outcomes:

### SE (Civil) Part – I

**Mathematics - III**

| | |
|---|---|
| CO1 | student will be able to formulate and solve mathematical model of civilengineering phenomena in field of structures |
| CO2 | student will be able to formulate and solve mathematical model of civil engineering phenomena in field of survey |
| CO3 | student will be able to formulate and solve mathematical model of civil engineering phenomena in field of fluid mechanicsand soil mechanics. |

**Mechanics of Solids**

| | |
|---|---|
| CO1 | Students will be able to perform the stress-strain analysis. |
| CO2 | Students will be able to draw force distribution diagrams for members and determinate beams. |
| CO3 | Students will be able to find deflections in determinant beams. |
| CO4 | Students will be able to visualize force deformation behavior of bodies. |

**Building Construction & Drawing**

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|---|---|
| CO1 | students will be able to understand types of masonry structures. |
| CO2 | students will be able tocomprehend components of building and there purposes. |
| CO3 | students will be able todraw plan, elevation and section of various structures. |
| CO4 | students will be able to apply the principles of planning and by laws used for building planning. |
| CO5 | students will be able toprepare detailed working drawing for doors and windows. |

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**Hydraulics I**

| | |
|---|---|
| CO1 | Student will be able to Calibrate the various flow measuring devices. |
| CO2 | Student will be able toDetermine the properties of fluid and pressure and their measurement. |
| CO3 | Student will be able toUnderstand fundamentals of pipe flow, losses in pipe and analysis of pipe network. |
| CO4 | Student will be able to.Visualize fluid flow phenomena observed in Civil Engineering systems. |

**Surveying**

| | |
|---|---|
| CO1 | Student will be able to perform measurements in linear/angular methods. |
| CO2 | Student will be able to perform plane table surveying in general terrain. |
| CO3 | Student will be able to know the basics of leveling and Theodolite survey in elevation and angular measurements. |

## SE (Civil) Part – II

**Building Planning and Drawing**

| | |
|---|---|
| CO1 | students will beTo plan buildings considering various principles of planning and byelaw of governing body. |
| CO2 | students will beComprehend various utility requirements in buildings |
| CO3 | students will beUnderstand various techniques for good acoustics. |

**Environmental Engineering**

| | |
|---|---|
| CO1 | Students will be able to apply the water treatment concept and methods. |
| CO2 | Students will be able to prepare basic process designs of water and wastewater treatment plants |
| CO3 | Students will be able to apply the wastewater treatment concept and methods. |
| CO4 | Students will be able to apply the solid waste management concepts |

**Structural Mechanics– I**

| | |
|---|---|
| CO1 | Students will be able to describe the concept of structural analysis, degree of indeterminacy. |
| CO2 | Students will be able to calculate slopes and deflection at various locations for different types of beams. |
| CO3 | Students will be able to identify determinate and indeterminate trusses and calculate forces in the members of trusses<br>Perform the distribution of the moments the in continuous beam and frame |

**Water Resources Engineering**

| | |
|---|---|
| CO1 | Students will be able to understand need of Irrigation in India and water requirement as per farming practice in India. |
| CO2 | Students will be able to understand various irrigation structures and schemes. CO3: Develop basis for design of irrigation schemes. |

**Hydraulics-II**

| | |
|---|---|
| CO1 | Students will design open channel sections in a most economical way |
| CO2 | Students will know about the non-uniform flows in open channel and the characteristics of hydraulic jump. |
| CO3 | Students will understand application of momentum principle of impact of jets on plane |

**Engineering Geology**

| | |
|---|---|
| CO1 | Students will be able to recognize the different land forms which are formed by various geological agents. |
| CO2 | Students will be able to identify the origin, texture and structure of various rocks and physical properties of mineral. |
| CO3 | Students will be able to emphasize distinct geological structures which have influence on the civil engineering structure. |
| CO4 | Students will be able to understand how the various geological conditions affect the design parameters of structures. |

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## TE (Civil) Part – I

### Design of Steel Structures

| | |
|---|---|
| CO1 | Students will be able to identify and compute the design loads and the stresses developed in the steel member |
| CO2 | Students will be able to analyze and design the various connections and identify the potential failure modes. |
| CO3 | Students will be able to analyze and design various tension, compression and flexural members. |
| CO4 | Students will be able to understand provisions in relevant BIS Codes. |

### Structural Mechanics-II

| | |
|---|---|
| CO1 | Students will be able to have a basic understanding of matrix method of analysis and will be able to analyze the determinant structure. |
| CO2 | Students will be able to have a basic understanding of the principles and concepts related to finite difference and finite element methods |
| CO3 | Students will be able to have a basic understanding of concept of influence line |

### Soil Mechanics

| | |
|---|---|
| CO1 | Students will be able to understand different soil properties and behavior |
| CO2 | Students will be able tounderstand stresses in soil and permeability and seepage aspects. |
| CO3 | Students will be able to develop ability to take up soil design of various foundations. |

### Environmental Engineering

| | |
|---|---|
| CO1 | Students will be able to apply the water treatment concept and methods |
| CO2 | Students will be able to prepare basic process designs of water and wastewater treatment plants. |
| CO3 | Students will be able to apply the wastewater treatment concept and methods. |
| CO4 | Students will be able to apply the solid waste management concepts. |

**Transportation Engineering**

| | |
|---|---|
| CO1 | Students will be able to comprehend various types of transportation systems and their history of the development |
| CO2 | Students will be able to Comprehend to various types of pavements |
| CO3 | Students will be able to design the pavements by considering various aspects associated with traffic safety measures |

## TE (Civil) Part – II

**Design of Concrete Structures - I**

| | |
|---|---|
| CO1 | Students will be able to comprehend to the various design philosophies used for design of reinforced concrete. |
| CO2 | Students will be able to analyze and design the reinforced concrete slab using limit state and working state method. |
| CO3 | Students will be able to analyze and design the reinforced concrete beam using limit state and working state method. |
| CO4 | Students will be able to analyze and design the reinforced concrete column using limit state and working state method. |

**Foundation Engineering**

| | |
|---|---|
| CO1 | Students will be able toto predict soil behavior under the application of loads and come up with appropriate solutions to foundation design queries. |
| CO2 | Students will be able toanalyze the stability of slope by theoretical and graphical methods. |
| CO3 | Students will be able to analyze the results of in-situ tests and transform measurements and associated uncertainties into relevant design parameters. |
| CO4 | Students will be able to synthesize the concepts of allowable stress design, appropriate factors of safety, margin of safety, and reliability. |

**Concrete Technology**

| | |
|---|---|
| CO1 | students will be able to understand the various types and properties of ingredients of concrete. |

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| | |
|---|---|
| CO2 | students will be able tounderstand effect of admixtures on the behavior of the fresh and hardened concrete. |
| CO3 | students will be able to formulate concrete design mix for various grades of concrete. |

**Project Management**

| | |
|---|---|
| CO1 | the students will be able to Understand various steps in project Management, different types of charts. |
| CO2 | the students will be able to Construct network by using CPM and PERT method. |
| CO3 | the students will be able to Determine the optimum duration of project with the help of various time estimates |
| CO4 | the students will be able to Know the concept of engineering economics, economic comparisons, and linear break even analysis problems. |
| CO5 | Student will be able to Understand the concept of total quality Management including Juran and Deming's philosophy. |

**Building Planning and Design**

| | |
|---|---|
| CO1 | Students will be to plan buildings considering various principles of planning and bye laws of governing body |
| CO2 | Students will be comprehend various utility requirements in buildings |
| CO3 | Students will be understand various techniques for good acoustics. |

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## B. E. (Civil) Part – I

### Irrigation Engineering & Plumbing Techniques

| | |
|---|---|
| CO1 | Students will be able toUnderstand the methods and management of irrigation. |
| CO2 | Students will be able toGain knowledge on Ground water structures. |
| CO3 | Students will be able toUnderstand methods of irrigation & Their Design. |
| CO4 | Students will be able toGet knowledge of plumbing materials and fixtures. |
| CO5 | Students will be able toGet knowledge on water shed management & its need. |

### Advanced Concrete Technology

| | |
|---|---|
| CO1 | Students are able to decide the use of supplement cementatious in concrete, use of different admixture and its application as per requirement. |
| CO2 | Students are capable to understand the special concrete, its properties and application as per requirement. |
| CO3 | Students are able to do concrete mix design for required strength of concrete with different approach. |
| CO4 | Students are able to know details of ready mix concrete plant. |
| CO5 | Students are able to understand the durability of concrete, assessment and inspection of hardened concrete. |

### Architecture and Town Planning

| | |
|---|---|
| CO1 | Students willto learn fundamentals of town planning. |
| CO2 | Students will understanding of application of technology, design of structure involving services & interior & landscape design of the concerned project. |
| CO3 | Students will study of urban structures, urban continuity, movement structure, landscaping, people &vehicular movement's system design, economics, Architectural aesthetics & details. |
| CO4 | Students will the students shall have acquired knowledge of the process involved in addressing a design problem with emphasis on site planning. |
| CO5 | Students will understanding fundamental design principles &architectural expression; appropriate to place &Introduction to time-line to understand the role of resources and emergence of architecture. |
| CO6 | Students will the students would have understood the fundamental concepts and theories of |

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| | |
|---|---|
| | urban design and different applications in design projects. |

**Quantity surveying and Contracts**

| | |
|---|---|
| CO1 | Student will be able toCO- Identify different items of works and their units and specifications. |
| CO2 | Student will be able toCO- Prepare approximate and detailed estimates, estimate of quantities of different items of works |
| CO3 | Students will able to CO- Prepare data sheets for different items of works and abstract estimate. . |
| CO4 | Students will able to CO- Prepare leads statement, and determines the quantity of earth work by various methods. |
| CO5 | Students will able to CO- Prepare detailed estimates of Building, Roads and Culverts. |
| CO6 | Students will able to CO- Prepare detailed estimate for public health engineering works. |
| CO7 | Students will able to CO- Prepare tender documents. |
| CO8 | Students will able to CO- able to do structural health monitoring. |

**Transportation Engineering- II**

| | |
|---|---|
| CO1 | Students will be able toUnderstand the methods of route alignment and design elements in Railway Planning and Constructions. |
| CO2 | Understand the Construction techniques and Maintenance of Track laying and Railway stations. |
| CO3 | Gain an insight on the planning and site selection of Airport Planning and design. |
| CO4 | Analyze and design the elements for orientation of runways and passenger facility systems. |
| CO5 | Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted |

**Interview Skill and Techniques**

| | |
|---|---|
| CO1 | Learners would be familiar with different interview skills and techniques employed in the industrial and the corporate world. |
| CO2 | Students would be able to perform well in interview by developing body language, rationalizing their aptitude and attitude for the interview. |

| | |
|---|---|
| CO3 | They would be able to participate effectively in group discussions, accept leadership and express their ideas effectively. |
| CO4 | Students would be able to draft effective job applications and resume, CVs accurately as per the needs of the industries. |
| CO5 | Students would develop right frame of mind by learning socializing skills, corporate etiquettes, and manners. |

## B. E. (Civil) Part – II

### Design of Hydraulic Structures

| | |
|---|---|
| CO1 | Students will be able toPerform the stability analysis of gravity dams |
| CO2 | Students will be able toExplain the causes of failure of different types of dams and their design criteria |
| CO3 | Students will be able toDesign minor irrigation structures such as regulators, cross drainage works and canal falls |

### Ground Improvement Techniques

| | |
|---|---|
| CO1 | Student will haveAppreciate the need for ground improvement and different mechanical, chemical, static and dynamic techniques |
| CO2 | Student will haveRecognize various chemical stabilization and grouting techniques |
| CO3 | Student will haveUnderstand different ground improvement techniques for cohesionless soils |
| CO4 | Student will haveRecognize different ground improvement techniques for cohesive soils engineering practice |
| CO5 | Student will haveSelection of site specific method of improvement and its design |
| CO6 | Student will haveIdentify miscellaneous techniques of ground improvemen |

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**Construction Management**

| | |
|---|---|
| CO1 | On completion of this course the students will have the knowledge of construction equipment's practices and techniques to be used in the field. |
| CO2 | Be able to apply theoretical and practical aspects of project management techniques to achieve project goals. |
| CO3 | Become familiar with construction equipment and their capabilities |
| CO4 | Learn how to best utilize construction equipment on site work and heavy civil projects |
| CO5 | Properly select heavy equipment based on applications, utilization, productivity, and other factors |

**A- Human Resource Development And OrganisationalBehaviour**

| | |
|---|---|
| CO1 | Students will be aware about the cross cultural environment in the organization |
| CO2 | Students should understand the group behavior for getting work done through and with thepeople. |
| CO3 | Students should able to trace the root cause of conflict and resolve it. |
| CO4 | Students should able to develop time management strategies. |
| CO5 | Able to manage and develop Human Resource of the organization |
| CO6 | Should strengthen the organizational communication. |

**B - Sustainable Engineering &Technology**

| | |
|---|---|
| CO1 | Able to understand the different types of environmental pollution problems and their sustainable solutions |
| CO2 | Able to work in the area of sustainability for research and education |
| CO3 | Having a broader perspective in thinking for sustainable practices by utilizing the engineering knowledge and principles gained from this course |
| CO4 | Learn how to best utilize construction equipment on site work and heavy civil projects |
| CO5 | Properly select heavy equipment based on applications, utilization, productivity, and other factors |

IQAC Coordinator

H.O.D.

Principal

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4. Dealing successfully with real life civil engineering problems and achieve practical solutions based on a sound science and engineering knowledge;
5. Shall be engage in continuous research, development and exchange of knowledge for professional development;
6. Be honest in their control and performing their duties and promote effective use of resources through open, honest and impartial services to the public;
7. Act in such a manner which will uphold the honour, integrity, or dignity of the engineering profession, and avoid knowingly engaging in business or professional practices of a fraudulent, dishonest or unethical nature;
8. Recognize that the lives, safety, health and welfare of the general public are dependent upon engineering, decision and practices;
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## Course Outcomes:

### SE (Civil) Part – I

**Mathematics - III**

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|---|---|
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**Mechanics of Solids**

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**Structural Mechanics– I**

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|---|---|
| CO1 | Students will be able to describe the concept of structural analysis, degree of indeterminacy. |
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**Water Resources Engineering**

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|---|---|
| CO1 | Students will be able to understand need of Irrigation in India and water requirement as per farming practice in India. |
| CO2 | Students will be able to understand various irrigation structures and schemes. CO3: Develop basis for design of irrigation schemes. |

**Hydraulics-II**

| | |
|---|---|
| CO1 | Students will design open channel sections in a most economical way |
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| CO3 | Students will understand application of momentum principle of impact of jets on plane |

**Engineering Geology**

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|---|---|
| CO1 | Students will be able to recognize the different land forms which are formed by various geological agents. |
| CO2 | Students will be able to identify the origin, texture and structure of various rocks and physical properties of mineral. |
| CO3 | Students will be able to emphasize distinct geological structures which have influence on the civil engineering structure. |
| CO4 | Students will be able to understand how the various geological conditions affect the design parameters of structures. |

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## TE (Civil) Part – I

### Structural Analysis-I

| | |
|---|---|
| CO1 | an ability to apply knowledge of mathematics, science, and engineering |
| CO2 | an ability to design a system, component, or process to meet desired needs |
| CO3 | an ability to identify, formulate, and solve engineering problems |
| CO4 | Understand the basic concept of static and kinematic indeterminacy, slope and deflection of determinate and indeterminate beams for analysis of structures. |
| CO5 | Evaluate determinate and indeterminate trusses and its application in the field |
| CO6 | Analyze two and three hinged arches and its application |
| CO7 | Apply influence line diagrams for the analysis of structures under moving load. |

### Water Resources Engineering-I

| | |
|---|---|
| CO1 | Understand the interaction among various processes in the hydrologic cycle |
| CO2 | Apply the application of fluid mechanics and use of computers in solving a host of problems in hydraulic engineering |
| CO3 | Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood flows for design of hydraulic structures |
| CO4 | Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions |



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| | |
|---|---|
| CO5 | Understand application of systems concept, advanced optimization techniques to cover the socio-technical aspects in the field of water resources |
| CO6 | Apply the principles and applications of remote sensing, GPS and GIS in the context to hydrological extreme flood and drought events in water resources engineering |

**Foundation Engineering**

| | |
|---|---|
| CO1 | To predict soil behavior under the application of loads and come up with appropriate solutions to foundation design queries |
| CO2 | Analyze the stability of slope by theoretical and graphical methods. |
| CO3 | Analyze the results of in-situ tests and transform measurements and associated uncertainties into relevant design parameters. |
| | Synthesize the concepts of allowable stress design, appropriate factors of safety, margin of safety, and reliability |

**Environmental Engineering**

| | |
|---|---|
| CO1 | Prepare basic process designs of water and wastewater treatment plants. |
| CO2 | Understand the impact of humans on environment and environment on humans |
| CO3 | Be able to plan strategies to control, reduce and monitor pollution. |
| CO4 | Apply the water treatment process and concept |
| CO5 | Describe methods of disposal ,sources and types of solid waste. |
| CO6 | Be able to select the most appropriate technique for the water treatment and waste water. |

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**Transportation Engineering-I**

| | |
|---|---|
| CO1 | Design various geometric elements of a highway |
| CO2 | Determine the characteristics of pavement materials and design flexible pavements |
| CO3 | Conduct traffic engineering studies and analyze data for efficient management of roadway facilities, Plan and design basic airport facilities |

**Structural Engineering-I (STEEL)**

| | |
|---|---|
| CO1 | Identify and compute the design loads and the stresses developed in the steel member. |
| CO2 | Analyze and design the various connections and identify the potential failure modes. |
| CO3 | Analyze and design various tension, compression and flexural members |
| CO4 | Understand provisions in relevant BIS Codes |
| CO5 | Design of structural systems such as roof trusses, gantry girders |

**Constitution of India/ Essence ofIndian TraditionalKnowledge**

| | |
|---|---|
| CO1 | Design various geometric elements of a highway |
| CO2 | Explain the historical origins, philosophical foundations, and core principles of the Indian Constitution |
| CO3 | Trace the sources and development of Indian intellectual traditions and cultural institutions. |
| CO4 | Understand the principles of constitutional government as practiced in the India. |

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## TE (Civil) Part – II

### Structural Engineering-II (RCC)

| | |
|---|---|
| CO1 | Students will be able to comprehend to the various design philosophies used for design of reinforced concrete. |
| CO2 | They will possess the skills to solve problems dealing with different loads and Concrete and Steel |
| CO3 | They will have knowledge in Structural Engineering |

### Engineering Economics, Estimation & Costing

| | |
|---|---|
| CO1 | Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses |
| CO2 | Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives |
| CO3 | Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives |
| CO4 | Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure |
| CO5 | Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure. |
| CO6 | Be able to understand how competitive bidding works and how to submit a competitive bid proposal. |

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**Structural Analysis-II**

| | |
|---|---|
| CO1 | Describe the concept of structural analysis, degree of indeterminacy. |
| CO2 | Identify determinate and indeterminate trusses and calculate forces in the members of trusses perform the distribution of the moments the in continuous beam and frame |
| CO3 | Calculate SF and BM by slopes and deflection method and MDMfor different types of beams. |
| CO4 | Analyze of beams and frames by Kani"s method. |
| CO5 | Calculate SF and BM of suspension bridges and cables. |

**Water Resources Engineering-II**

| | |
|---|---|
| CO1 | the students will be able to estimate irrigation water requirements |
| CO2 | the students will be able to design irrigation canals and canal network |
| CO3 | the students will be able to plan an irrigation system |
| CO4 | the students will be able to design irrigation canal structures |
| CO5 | Student will be able to plan and design diversion head works , analyse stability of gravity and earth dams design ogee spillways and energy dissipation works |

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**Elective-I Materials, Testing & Evaluation**

| | |
|---|---|
| **CO1** | Calibrate electronic sensors. |
| **CO2** | Operate a data acquisition system |
| **CO3** | Operate various types of testing machines |

**Open Elective-II** (Humanities) **Soft skills and interpersonal**

| | |
|---|---|
| **CO1** | Know yourself and Know your world |
| **CO2** | Presonality development and soft skills |

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## B. E. (Civil) Part – I

### Environmental Engineering –II

| | |
|---|---|
| CO1 | Students understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water |
| CO2 | Students understood industrial waste water quantity and quality for achieving better sanitation in society |

### Design of Structure – III

| | |
|---|---|
| CO1 | On the successful completion of course the students will be able to understand the difference between prestressed construction and RCC construction. |
| CO2 | Also able to design the flat slab,combined footings, earth retaining structures and liquid retaining structures |

### Water Resources Engineering – II

| | |
|---|---|
| CO1 | Students understood all type of dams and reservoirs. |
| CO2 | Students understood Spillways, Gates & Energy dissipators. |
| CO3 | students understood various canal structures, river training works etc. |

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| | |
|---|---|
| CO3 | They would be able to participate effectively in group discussions, accept leadership and express their ideas effectively. |
| CO4 | Students would be able to draft effective job applications and resume, CVs accurately as per the needs of the industries. |
| CO5 | Students would develop right frame of mind by learning socializing skills, corporate etiquettes, and manners. |

## B. E. (Civil) Part – II

### Design of Hydraulic Structures

| | |
|---|---|
| CO1 | Students will be able toPerform the stability analysis of gravity dams |
| CO2 | Students will be able toExplain the causes of failure of different types of dams and their design criteria |
| CO3 | Students will be able toDesign minor irrigation structures such as regulators, cross drainage works and canal falls |

### Ground Improvement Techniques

| | |
|---|---|
| CO1 | Student will haveAppreciate the need for ground improvement and different mechanical, chemical, static and dynamic techniques |
| CO2 | Student will haveRecognize various chemical stabilization and grouting techniques |
| CO3 | Student will haveUnderstand different ground improvement techniques for cohesionless soils |
| CO4 | Student will haveRecognize different ground improvement techniques for cohesive soils engineering practice |
| CO5 | Student will haveSelection of site specific method of improvement and its design |
| CO6 | Student will haveIdentify miscellaneous techniques of ground improvemen |

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## Elective- III HYDROPOWER ENGINEERING

| | |
|---|---|
| CO1 | It is desired that students after undergoing academic study sessions as cited this above shall be competent and able to work as Engineers in the field of **Hydropower Engineering** with confidence and success. |

**IQAC Coordinator** **H.O.D.** **Principal**

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# PO CO OF CIVIL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2019-20

## Vision

The vision of the department is the sharing of technical skills and knowledge for the benefit of student education and the development of business, society, and our nation.

## Mission

Our goal is to offer top-notch engineering education that is in step with current scientific and technical advancement...

## Program Educational Objective

| | |
|---|---|
| PEO1 | **Preparation:** To prepare students to excel in various educational programmes or to succeed in industry / technical profession through further education/training;. |
| PEO2 | **Core Competence:** To provide students with a solid foundation in mathematical, scientific fundamentals required to solve Structural problems; |
| PEO3 | **Breadth:** To train students with a breadth of scientific knowledge to comprehend, analyze, design & create novel products and solutions for real life problems; |
| PEO4 | **Professionalism:** To inculcate in students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate engineering issues to a broader context; |
| PEO5 | **Learning Environment**: To provide students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long / productive career. |

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## Course Outcomes:

### SE (CIVIL) Part – I

**PCCCE301 Solid Mechanics**

| | |
|---|---|
| CO1 | Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems |
| CO2 | Apply basic knowledge of maths and physics to solve real-world problems |
| CO3 | Understand measurement error, and propagation of error in processed data |

**PCCCE302 Fluid Mechanics-I**

| | |
|---|---|
| CO1 | The objective of this course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications |
| CO2 | The course provides a first level exposure to the students to fluid statics, kinematics and dynamic |
| CO3 | Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems |
| CO4 | The topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters |

**PCCCE304 Electronics & Sensor**

| | |
|---|---|
| CO1 | The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the electronics devices. |
| CO2 | Know broadly the concepts and functionalities of the electronic devices and switches. |
| CO3 | use, general specifications and deploy abilities of the analog electronic devices, and assemblies. |
| CO4 | Confidence in handling and usage of digital electronic devices, tools an |

**PCCCE305 Mechanical Engineering**

| | |
|---|---|
| CO1 | Ability to apply mathematics, science, and engineering |
| CO2 | Ability to design and conduct experiments, as well as to analyze and interpret data |
| CO3 | Ability to identify, formulate, and solve engineering problems |

### SE (CIVIL) Part – II

**PCC CE 401 Geotechnical Engineering**

| | |
|---|---|
| CO1 | Understand the different types of soil, various phase diagrams and derive various phase relationships of the soil |
| CO2 | Apply principles of phase diagram for soil properties and perform basic weightvolume calculation |
| CO3 | Plot various stress distribution diagrams along the depth of the soil mass. |
| CO4 | Understand variation in compaction curve with compaction effort and soil type. |
| CO5 | Determine graphically and analytically the stress state in any plane of the soil mass. |

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**PCC CE 402 Engineering Geology & Disaster Management**

| | |
|---|---|
| CO1 | Student will be familiar with different ingredients of concrete. |
| CO2 | Student will be familiar with properties of different ingredients of concrete. |
| CO3 | Student will be familiar with different admixtures. |
| CO4 | Student will be familiar with properties of fresh and harden concrete. |
| CO5 | Student will be familiar with special concretes. |
| CO6 | Student will be able to prepare concrete mix design. |

**PCC CE 403 Fluid Mechanics - II**

| | |
|---|---|
| CO1 | Students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels. |
| CO2 | Student will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady conditions. |
| CO3 | Problems pertain to design, construction as well as efficient working of various types of hydraulics structures and machines is considerably simplified by using dimensional analysis and model studies |
| CO4 | Impact Of Jet on vanes which is a base for analysis and design of turbo machines. |
| CO5 | They will have knowledge in hydraulic machines( pumps and turbines) |

**PCC CE 404 Strength of Material**

| | |
|---|---|
| CO1 | Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components; (BT1 and BT2) |
| CO2 | Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods; (BT1 and BT4 |
| CO3 | Analyse various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress; locate the shear center of thin wall beams; (BT4) |
| CO4 | Calculate the deflection at any point on a beam subjected to a combination of loadY |

**PCC CE 405 Surveying & Geometrics**

| | |
|---|---|
| CO1 | Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities (BT1 abd BT3) |
| CO2 | Apply the knowledge, techniques, skills, and applicable tools for setting out curves. (BT1 abd BT3) |
| CO3 | Translate the knowledge gained for the implementation of Civil infrastructure facilities (BT1 and BT2) |

**PCC CE 406 Concrete Technology**

| | |
|---|---|
| CO1 | Familiar with different ingredients of concrete. (BT1 |
| CO2 | Familiar with properties of different ingredients of concrete. (BT1) |
| CO3 | Familiar with different admixtures. (BT1 and BT2) |



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## TE (CIVIL) Part – I

### CE 301 Engineering Geology

| | |
|---|---|
| CO1 | The students will be able to understand the details about Rock mechanics, Geoinformatics |
| CO2 | The students will be able to study the geology. |
| CO3 | The students will be able to **select the suitability of site for different Construction Development work.**. |

### CE 302 Geotechnical Engineering - I

| | |
|---|---|
| CO1 | The students will be able to classify soils and know how water with soil affecting. |
| CO2 | The students will get the idea about the shear strength parameters of soil |

### CE 303 Theory Of Structures - II

| | |
|---|---|
| CO1 | The student will have the knowledge on advanced methods of analysis of structures |

### CE 304 Design Of Structures-I (Steel) LSM

| | |
|---|---|
| CO1 | This course covers the design of structural steel members subjected to compressive, tensile and **bending loads, as per current codal provisions (IS 800 - 2007) including connections.** |
| CO2 | Design of structural systems such as roof trusses, gantry girders is included.. |

### CE 305 Transportation Engineering-I

| | |
|---|---|
| CO1 | To understand Basic concept about Highway Engineering. |
| CO2 | To understand the principles of Highway geometrics design as per IRC standards |
| CO3 | Perform geometric design for the Highway& Basic concept of Pavement design |
| CO4 | To understand Types of pavements & Materials required for highway construction. |
| CO5 | To understand Construction procedure for different type of pavements |
| CO6 | To understand maintenance procedure for different type of pavements |
| CO7 | To understand the Traffic engineering& different types of traffic control device |
| CO8 | To understand Basic idea about the Bridge engineering & Components parts of a bridge. |

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## TE (CIVIL) Part – II

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**CE 306 Geotechnical Engineering - II**

| | |
|---|---|
| CO1 | To get the knowledge of classical theories of earth pressure & stress distribution, |
| CO2 | To get the knowledge of how to improve the soil for stability of structure |
| CO3 | Students get the knowledge of various techniques with which we will know how to improve weak soil by grouting or geosynthetics. |
| CO4 | Student will solve actual problems of stability with various material, they will apply various theories and predict the risk factor. |

**CE 307 Environmental Engineering –I**

| | |
|---|---|
| CO1 | Student will be able to Plan and design water supply systems for a rural/urban area |
| CO2 | Student will be able to Use population forecasting methods. |
| CO3 | Student will be able to Design various water treatment units and plan their operations on the basis of raw water quality and water demand. |
| CO4 | Student will be able to Apply knowledge of advanced water treatment processes for individual water purification units. |

**CE 308 Design Of Structures- II(RCC) LSM**

| | |
|---|---|
| CO1 | Students have explored the stream "Limit State Method of Design for R.C. Structures" and are equipped with knowledge of different methods of design and its classifications. |
| CO2 | Students have been introduced to Limit State Analysis as well which has opened their wisdom for redistribution of moments. |
| CO3 | Students are now competent to Design the structures for Limit Sate of Collapse for Flexure (i.e. Singly, Doubly, Fanged beam sections, Slabs, Staircase and Footing etc), Compression (i.e. Column), Bon, Torsion and for Shear |
| CO4 | Students are competent to Design the structures for Limit Sate of Serviceability for Deflection and Cracking. |

**CE 309 Transportation Engineering-II**

| | |
|---|---|
| CO1 | In Airport Engineering students will get knowledge of Airport planning, layout and runway and taxiway components.. |
| CO2 | Students will get the feel of fundamentals of railway engineering from the syllabus. under railway Engineering students get knowledge of railway geometrics, Signalling & interlocking Points, crossing and turnouts etc. |
| CO3 | Students get knowledge regarding fundamentals of tunnel its excavation methods, support systems, and executional aspects of tunnel.. |

**CE 310 Water Resources Engineering - I**

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| | |
|---|---|
| CO1 | Student will know the different terminologies related with hydrology. |
| CO2 | Students will analyze hydrological parameters required for water resource management. |
| CO3 | Student will assess ground water potential . |
| CO4 | Students will identify suitable method of irrigation and drainage of waterlogged area |

**CE 311 d) Advanced Concrete Technology (Elective-I)**

| | |
|---|---|
| CO1 | Students are able to decide the use of supplement cementatious in concrete, use of different admixture and its application as per requirement. |
| CO2 | Students are capable to understand the special concrete, its properties and application as per requirement |
| CO3 | Students are able to do concrete mix design for required strength of concrete with different approach.. |
| CO4 | Students are able to know details of ready mix concrete plant |
| CO5 | Students are able to understand the durability of concrete, assessment and inspection of hardened concrete. |

## B. E. (CIVIL) Part – I

**CE 401 Environmental Engineering –II**

| | |
|---|---|
| CO1 | Students understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water. |
| CO2 | Students understood industrial waste water quantity and quality for achieving better sanitation in society. |

**CE 402 Design of Structure – III**

| | |
|---|---|
| CO1 | Students will be able to understand the difference between prestressed construction and RCC construction. |
| CO2 | Students also able to design the flat slab, combined footings, earth retaining structures and liquid retaining structures. |

**CE 403 Water Resources Engineering – II**

| | |
|---|---|
| CO1 | Students understood all type of dams and reservoirs. |
| CO2 | Students understood Spillways, Gates & Energy dissipaters |
| CO3 | students understood various canal structures, river training works etc. |

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| PEO1 | Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices. |
| PEO2 | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| PEO3 | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| PEO4 | Graduates are expected to continue personal development through professional study and self-learning. |
| PEO5 | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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| | |
|---|---|
| CO5 | The course will inculcate the managerial skills among the students which will be helpful for them in future during actual execution of projects. |
| CO6 | students will know different legal aspect and its provisions for construction project |
| CO7 | The students will be able to carry out the Human resource Management efficiently |
| CO8 | The students will be able to plan for Equipment's and material requirements. |
| CO9 | Students will know the various management techniques for successful completion of construction projects. |

**CE 411 b) Hydropower Engineering**

| | |
|---|---|
| CO1 | It is desired that students after undergoing academic study sessions as cited this above shall be competent and able to work as Engineers in the field of Hydropower Engineering with confidence and success.. |

IQAC Coordinator

H.O.D.

Principal

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# PO CO OF CIVIL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2018-19

## Vision

The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students.

## Mission

Imparting quality education, looking after holistic development of students and conducting need based research and extension.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| PEO1 | Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices. |
| PEO2 | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| PEO3 | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| PEO4 | Graduates are expected to continue personal development through professional study and self-learning. |
| PEO5 | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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## Course Outcomes:

### SE (Civil) Part – I

**Mathematics - III**

| | |
|---|---|
| CO1 | student will be able to formulate and solve mathematical model of **civilengineering phenomena in field of structures** |
| CO2 | student will be able to formulate and solve mathematical model of **civil engineering phenomena in field of survey** |
| CO3 | student will be able to formulate and solve mathematical model of **civil engineering phenomena in field of fluid mechanicsand soil mechanics.** |

| | **Mechanics of Solids** |
|---|---|
| CO1 | Students will be able **to perform the stress-strain analysis.** |
| CO2 | Students will be able **to draw force distribution diagrams for members and determinate bear** |
| CO3 | Students will be able **to find deflections in determinant beams.** |
| CO4 | Students will be able **to visualize force deformation behavior of bodies.** |

**Building Construction & Drawing**

| | |
|---|---|
| CO1 | Students will be able to understand types of masonry structures. |
| CO2 | Students will be able tocomprehend components of building and there purposes. |
| CO3 | Students will be able todraw plan, elevation and section of various structures. |
| CO4 | Students **will be able to apply the principles of planning and by laws used for building planning.** |
| CO5 | Students will be able toprepare detailed working drawing for doors and windows. |
| | |

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**Hydraulics I**

| | |
|---|---|
| CO1 | Student will be able to **Calibrate the various flow measuring devices.** |
| CO2 | Student will be able toDetermine the properties of fluid and pressure and their measurement. |
| CO3 | Student will be able toUnderstand fundamentals of pipe flow, losses in pipe and analysis of pipe network. |
| CO4 | Student will be able to.**Visualize fluid flow phenomena observed in Civil Engineering systems.** |

**Surveying**

| | |
|---|---|
| CO1 | Student will be able to **perform measurements in linear/angular methods.** |
| CO2 | Student will be able to perform plane table surveying in general terrain. |
| CO3 | Student will be able to know the basics of leveling and Theodolite survey in elevation and angular measurements. |

## SE (Civil) Part – II

**Building Planning and Drawing**

| | |
|---|---|
| CO1 | students will beTo plan buildings considering various principles of planning and byelaw of **governing body.** |
| CO2 | students will beComprehend various utility requirements in buildings |
| CO3 | students will beUnderstand various techniques for good acoustics. |

**Environmental Engineering**

| | |
|---|---|
| CO1 | Students will be able to apply the water treatment concept and methods. |
| CO2 | Students will be able to **prepare basic process designs of water and wastewater treatment plants** |
| CO3 | Students will be able to apply the wastewater treatment concept and methods. |
| CO4 | Students will be able to apply the solid waste management concepts |

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**Structural Mechanics– I**

| | |
|---|---|
| CO1 | Students will be able to describe the concept of structural analysis, degree of indeterminacy. |
| CO2 | Students will be able to **calculate slopes and deflection at various locations for different types of beams.** |
| CO3 | Students will be able to **identify determinate and indeterminate trusses and calculate forces in the members of trusses**<br>**Perform the distribution of the moments the in continuous beam and frame** |

**Water Resources Engineering**

| | |
|---|---|
| CO1 | Students will be able to **understand need of Irrigation in India and water requirement as per farming practice in India.** |
| CO2 | Students will be able to **understand various irrigation structures and schemes. CO3: Develop basis for design of irrigation schemes.** |

**Hydraulics-II**

| | |
|---|---|
| CO1 | Students will design open channel sections in a most economical way |
| CO2 | Students will know about the non-uniform flows in open channel and the characteristics of hydraulic jump. |
| CO3 | Students will understand application of momentum principle of impact of jets on plane |

**Engineering Geology**

| | |
|---|---|
| CO1 | Students will be able to **recognize the different land forms which are formed by various geological agents.** |
| CO2 | Students will be able to **identify the origin, texture and structure of various rocks and physical properties of mineral.** |
| CO3 | Students will be able to **emphasize distinct geological structures which have influence on the civil engineering structure.** |
| CO4 | Students will be able to understand how the various geological conditions affect the design parameters of structures. |

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## TE (Civil) Part – I

### Engineering Geology

| | |
|---|---|
| CO1 | Understand weathering process and mass movement |
| CO2 | Distinguish geological formations |
| CO3 | Identify geological structures and processes for rock mass quality |
| CO4 | Identify subsurface information and groundwater potential sites through geophysical investigations |
| CO5 | Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels |

### Geotechnical Engineering-I

| | |
|---|---|
| CO1 | Understanding and determination of Index properties of soil. |
| CO2 | To study the permeability, compaction, shear strength and consolidation of soil and its evaluation. |
| CO3 | Analysis of slopes and calculation of earth pressure for different soil under various conditions. Determination of effective stress. |
| CO4 | Classifying the soil. Study of different methods of soil exploration and preparation of soil profile. |
| CO5 | Experimental determination of different properties of soil. |

### Theory of Structure -II

| | |
|---|---|
| CO1 | Study of basic theorems of structural mechanics |
| CO2 | Study and analysis of structures by slope deflection method and moment distribution method |
| CO3 | Study and analysis of structures by Kani's method |
| CO4 | Understand the behaviour of arches and analyse it |
| CO5 | Study and apply the basic concepts of matrix methods in structural analysis |

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**Design of Structure-I (Steel) LSM**

| | |
|---|---|
| CO1 | Study of rolled steel sections. Apply the IS code practice for the design of steel structural elements. |
| CO2 | Analysis and design of compression and tension members including built-up sections |
| CO3 | Analysis and design of column and beam. Design of column bases for column. |
| CO4 | Analysis and design of the various members of the truss. |
| CO5 | Design of plate girder and its components. |

**Transportation Engineering-I**

| | |
|---|---|
| CO1 | Basic concept about Highway Engineering |
| CO2 | To understand the principles of Highway geometrics design as per IRC standards |
| CO3 | Perform geometric design for the Highway& Basic concept of Pavement design |
| CO4 | To understand Types of pavements & Materials required for highway construction. |
| CO5 | To understand Construction procedure for different type of pavements. |
| CO6 | To understand maintenance procedure for different type of pavements. |
| CO7 | To understand the Traffic engineering& different types of traffic control device. |

## TE (Civil) Part – II

**Geotechnical Engineering-II**

| | |
|---|---|
| CO1 | Student will solve actual problems of stability with various material, they will apply various theories and predict the risk factor. |
| CO2 | To understand the concept of slope stability. |
| CO3 | To appreciate the use of modern technology in the field of geotechnical engineering. |

**Environmental Engineering-I**

| | |
|---|---|
| CO1 | Plan and design water supply systems for a rural/urban area |
| CO2 | Use population forecasting methods. |
| CO3 | Design various water treatment units and plan their operations on the basis of raw water quality and water demand. |
| CO4 | Apply knowledge of advanced water treatment processes for individual water purification units. |

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**Design of Structure-II (RCC) LSM**

| | |
|---|---|
| CO1 | Students have explored the stream "Limit State Method of Design for R.C. Structures" and equipped with knowledge of different methods of design and its classifications. |
| CO2 | Students have been introduced to Limit State Analysis as well which has opened their Wisdom for redistribution of moments. |
| CO3 | Students are now competent to Design the structures for Limit Sate of Collapse for Flexure (i.e. Singly, Doubly, Fanged beam sections, Slabs, Staircase and Footing etc), Compression (i.e. Column), Bon, Torsion and for Shear.. |
| CO4 | Students are competent to Design the structures for Limit Sate of Serviceability for Deflection and Cracking. |

**Transportation Engineering-II**

| | |
|---|---|
| CO1 | To study the basic elements of aircraft components and airport engineering. |
| CO2 | To study about airport layout and geometric design of airport. |
| CO3 | To learn about air traffic movements and control. |
| CO4 | To study about airport capacity and drainage. |
| CO5 | To study the basic elements of railway engineering & their component parts railways. |
| CO6 | To study about geometric design of railway engineering |
| CO7 | To learn about basic concepts of tunnel engineering and components parts and types. |
| CO8 | To study about tunnel methods in soft rock and hard rock. |
| CO9 | To study about drillings, explosives used in tunnels |

**Water Resources Engineering -I**

| | |
|---|---|
| CO1 | Student will know the different terminologies related with hydrology |
| CO2 | Students will analyse hydrological parameters required for water resource management. |
| CO3 | Student will assess ground water potential |
| CO4 | Students will identify suitable method of irrigation and drainage of waterlogged Area. |

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**Elective –I/Solid Waste Management**

| | |
|---|---|
| CO1 | Explain municipal solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies. |
| CO2 | Outline sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste. |
| CO3 | Select the appropriate method for solid waste collection, transportation, redistribution anddisposal. |
| CO4 | Describe methods of disposal of solid waste. |

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## B. E. (Civil) Part – I

### Environmental Engineering - II

| | |
|---|---|
| CO1 | Students understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water |
| CO2 | Students understood industrial waste water quantity and quality for achieving better sanitation in society. |

### Design of structure-III

| | |
|---|---|
| CO1 | On the successful completion of course the students will be able to understand the difference between prestressed construction and RCC construction. |
| CO2 | Also able to design the flat slab, combined footings, earth retaining structures and liquid retaining structures. |

### Water Resources Engineering -II

| | |
|---|---|
| CO1 | Students understood all type of dams and reservoirs. |
| CO2 | Students understood Spillways, Gates & Energy dissipaters. |
| CO3 | students understood various canal structures, river training works etc. |

### Professional Ethics

| | |
|---|---|
| CO1 | To provide basic overview of functioning of different civil engineering related industries / firms. |
| CO2 | To provide awareness on application of different drawings, contract documents in civil engineering. |
| CO3 | To provide insight of code of ethics, duties and responsibilities as a Civil Engineer. |

### Elective –II/ Ground Water Engineering

| | |
|---|---|
| CO1 | Students will be able to understood ground water characteristics flow. |
| CO2 | Students will be able toGround Water exploration using different methods. |
| CO3 | It is desired that students after undergoing academic study sessions as cited this above shall be competent and able to work as Engineers in the field of Ground Water Engineering with confidence and success. |

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## B. E. (Civil) Part – II

**Professional Practice**

| | |
|---|---|
| CO1 | Recall the fundamentals of building construction, building planning and computer aided drawing and environmental engineering |
| CO2 | Understand the process to be followed for submission of any contract for government, semi government and private project. |
| CO3 | Apply the basic knowledge acquired through subject for submission of any contract and its execution. |
| CO4 | Analysis different type of contract in connection with estimation, specification, valuation and quantity surveying. |
| CO5 | Propose the bill of quantities using different techniques of preliminary & detailed estimation of buildings & other structures. |

**Foundation Engineering**

| | |
|---|---|
| CO1 | Recall the fundamentals of building construction and geotechnical engineering. |
| CO2 | Identifying the applicability of different foundation design applicable to various types of soil. |
| CO3 | Apply the different design philosophy of foundation applicable to soil. |
| CO4 | Analysis various types of shallow and deep foundations. |
| CO5 | Create understanding applicability of foundation design for different types of soil. |

**Project Planning & Management**

| | |
|---|---|
| CO1 | The students will be able to understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects. |
| CO2 | The students will be able to demonstrate their capability for preparing the project networks to work out best possible time for completing the project. |
| CO3 | The students will be able to understand and exercise the time- cost relationship in practices. |
| CO4 | The students will be able to implement the safety aspects during the execution of civil engineering project. |
| CO5 | The course will inculcate the managerial skills among the students which will be helpful for them in future during actual execution of projects. |
| CO6 | On completion of this course the students will know different legal aspect and its provisions for construction project |

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CO7 The students will be able to carry out the Human resource Management efficiently.

CO8 The students will be able to plan for Equipment's and material requirements.

CO9 On completion of this course the students will know the various management techniques for successful completion of construction projects.

**Elective –III/Hydropower Engineering**

| | |
|---|---|
| CO1 | Record the fundamentals of fluid mechanics, water resource engineering and environmental engineering |
| CO2 | Understand the significance of water power and hydraulic structures related to water power engineering |
| CO3 | Apply the knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes |
| CO4 | Analyse and design complete unit of hydroelectric power station & its components. |

IQAC Coordinator H.O.D. Principal

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# PO CO OF CIVIL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2017-18

## Vision

The vision of the department is the sharing of technical skills and knowledge for the benefit of student education and the development of business, society, and our nation.

## Mission

Our goal is to offer top-notch engineering education that is in step with current scientific and technical advancement..

## Program Educational Objective

| | |
|---|---|
| PEO1 | **Preparation:** To prepare students to excel in various educational programmes or to succeed in industry / technical profession through further education/training;. |
| PEO2 | **Core Competence:** To provide students with a solid foundation in mathematical, scientific fundamentals required to solve Structural problems; |
| PEO3 | **Breadth:** To train students with a breadth of scientific knowledge to comprehend, analyze, design & create novel products and solutions for real life problems; |
| PEO4 | **Professionalism:** To inculcate in students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate engineering issues to a broader context; |
| PEO5 | **Learning Environment**: To provide students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long / productive career. |

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## Course Outcomes:

### SE (CIVIL) Part – I

**Engineering Mathematics - III**

| | |
|---|---|
| CO1 | Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector& F.T |
| CO2 | Student will show the understanding of impact of Engg. Mathematics on CIVIL |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

**CE 202- Strength Of Materials**

| | |
|---|---|
| CO1 | Students will be able to perform the stress-strain analysis. |
| CO2 | Students will be able to draw force distribution diagrams for members and determinate beams |
| CO3 | Students will be able to find deflections in determinant beams |
| CO4 | Students will be able to visualize force deformation behavior of bodies |

**CE 203- Fluid Mechanics-I**

| | |
|---|---|
| CO1 | Student will be able to Calibrate the various flow measuring devices. |
| CO2 | Student will be able to Determine the properties of fluid and pressure and their measurement. |
| CO3 | Student will be able to Understand fundamentals of pipe flow, losses in pipe and analysis of pipe network. |
| CO4 | Student will be able to Visualize fluid flow phenomena observed in Civil Engineering systems. |

CE 204- **Surveying**

| | |
|---|---|
| CO1 | Student will be able to perform measurements in linear/angular methods. |
| CO2 | Student will be able to perform plane table surveying in general terrain |
| CO3 | Student will be able to know the basics of leveling and Theodolite survey in elevation and angular measurements. |

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**CE 205- Building Construction**

| | |
|---|---|
| CO1 | Student will be able to identify various components of building (foundation, Lintel, stairs case, roofs & floors), their functions and methods of construction so as to achieve good knowledge about building construction |
| CO2 | Will be able to identify the materials such as paints and distemper used for treatment of the surfaces so as to achieve good knowledge about the building material |
| CO3 | Students will be learn various building components & their construction method. |

## SE (CIVIL) Part – II

**CE 206- Fluid Mechanics –II**

| | |
|---|---|
| CO1 | Students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels. |
| CO2 | Student will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady conditions. |
| CO3 | Problems pertain to design, construction as well as efficient working of various types of hydraulics structures and machines is considerably simplified by using dimensional analysis and model studies |
| CO4 | Impact Of Jet on vanes which is a base for analysis and design of turbo machines. |
| CO5 | They will have knowledge in hydraulic machines( pumps and turbines) |

**CE 208- Concrete Technology**

| | |
|---|---|
| CO1 | Student will be familiar with different ingredients of concrete. |
| CO2 | Student will be familiar with properties of different ingredients of concrete. |
| CO3 | Student will be familiar with different admixtures. |
| CO4 | Student will be familiar with properties of fresh and harden concrete. |
| CO5 | Student will be familiar with special concretes. |
| CO6 | Student will be able to prepare concrete mix design. |

**CE 207- Advanced Surveying**

| | |
|---|---|
| CO1 | Student will be familiar with various basic concepts in Surveying through theory and series of practical's based on theory. |
| CO2 | Student will be familiar with hydrographic surveying & Trigonometrical Leveling. |
| CO3 | Students will be learn about Remote Sensing & its application |

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**CE 209- Theory Of Structures - I**

| | |
|---|---|
| CO1 | Student will be able to analyze Fixed and continuous beams. |
| CO2 | Student will be able to analyze moving loads and will be able to draw influence line diagrams for simply supported beams. |
| CO3 | Student will also be able to analyze columns. |
| CO4 | Student will also be able to analyze three hinge arches and three hinge suspension bridges. |

**CE 210- Building Planning And Drawing**

| | |
|---|---|
| CO1 | Students will able to understand basic principles of building design and planning. |
| CO2 | Students will explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings |
| CO3 | The student develops basic drawing skills; create multilayer architectural and working drawing drawings. |

**CE 211- Professional Communication Skill**

| | |
|---|---|
| CO1 | Students would understand the concept, process and importance of Professional Communication |
| CO2 | Students would acquire English Speaking and Writing Skills |
| CO3 | Students would develop Presentation Skills |

## TE (CIVIL) Part – I

**CE 301 Engineering Geology**

| | |
|---|---|
| CO1 | The students will be able to understand the details about Rock mechanics, Geoinformatics |
| CO2 | The students will be able to study the geology. |
| CO3 | The students will be able to select the suitability of site for different Construction Development work.. |

**CE 302 Geotechnical Engineering - I**

| | |
|---|---|
| CO1 | The students will be able to classify soils and know how water with soil affecting. |
| CO2 | The students will get the idea about the shear strength parameters of soil |

**CE 303 Theory Of Structures - II**

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| | |
|---|---|
| CO1 | The student will have the knowledge on advanced methods of analysis of structures |

**CE 304 Design Of Structures-I (Steel) LSM**

| | |
|---|---|
| CO1 | This course covers the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions (IS 800 - 2007) including connections. |
| CO2 | Design of structural systems such as roof trusses, gantry girders is included.. |

**CE 305 Transportation Engineering-I**

| | |
|---|---|
| CO1 | To understand Basic concept about Highway Engineering. |
| CO2 | To understand the principles of Highway geometrics design as per IRC standards |
| CO3 | Perform geometric design for the Highway& Basic concept of Pavement design |
| CO4 | To understand Types of pavements & Materials required for highway construction. |
| CO5 | To understand Construction procedure for different type of pavements |
| CO6 | To understand maintenance procedure for different type of pavements |
| CO7 | To understand the Traffic engineering& different types of traffic control device |
| CO8 | To understand Basic idea about the Bridge engineering & Components parts of a bridge. |

## TE (CIVIL) Part – II

**CE 306 Geotechnical Engineering - II**

| | |
|---|---|
| CO1 | To get the knowledge of classical theories of earth pressure & stress distribution. |
| CO2 | To get the knowledge of how to improve the soil for stability of structure |
| CO3 | Students get the knowledge of various techniques with which we will know how to improve weak soil by grouting or geosynthetics. |
| CO4 | Student will solve actual problems of stability with various material, they will apply various theories and predict the risk factor. |

**CE 307 Environmental Engineering –I**

| | |
|---|---|
| CO1 | Student will be able to Plan and design water supply systems for a rural/urban area |
| CO2 | Student will be able to Use population forecasting methods. |
| CO3 | Student will be able to Design various water treatment units and plan their operations on the basis of raw water quality and water demand. |

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| | |
|---|---|
| CO4 | Student will be able to Apply knowledge of advanced water treatment processes for individual water purification units. |

**CE 308 Design Of Structures- II(RCC) LSM**

| | |
|---|---|
| CO1 | Students have explored the stream "Limit State Method of Design for R.C. Structures" and are equipped with knowledge of different methods of design and its classifications. |
| CO2 | Students have been introduced to Limit State Analysis as well which has opened their wisdom for redistribution of moments. |
| CO3 | Students are now competent to Design the structures for Limit Sate of Collapse for Flexure (i.e. Singly, Doubly, Fanged beam sections, Slabs, Staircase and Footing etc), Compression (i.e. Column), Bon, Torsion and for Shear |
| CO4 | Students are competent to Design the structures for Limit Sate of Serviceability for Deflection and Cracking. |

**CE 309 Transportation Engineering-II**

| | |
|---|---|
| CO1 | In Airport Engineering students will get knowledge of Airport planning, layout and runway and taxiway components.. |
| CO2 | Students will get the feel of fundamentals of railway engineering from the syllabus. under railway Engineering students get knowledge of railway geometrics, Signalling & interlocking Points, crossing and turnouts etc. |
| CO3 | Students get knowledge regarding fundamentals of tunnel its excavation methods, support systems, and executional aspects of tunnel.. |

**CE 310 Water Resources Engineering –I**

| | |
|---|---|
| CO1 | Student will know the different terminologies related with hydrology. |
| CO2 | Students will analyze hydrological parameters required for water resource management. |
| CO3 | Student will assess ground water potential . |
| CO4 | Students will identify suitable method of irrigation and drainage of waterlogged area |

**CE 311 d) Advanced Concrete Technology (Elective-I)**

| | |
|---|---|
| CO1 | Students are able to decide the use of supplement cementatious in concrete, use of different admixture and its application as per requirement. |
| CO2 | Students are capable to understand the special concrete, its properties and application as per requirement |
| CO3 | Students are able to do concrete mix design for required strength of concrete with different approach.. |
| CO4 | Students are able to know details of ready mix concrete plant |

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| | |
|---|---|
| CO5 | Students are able to understand the durability of concrete, assessment and inspection of hardened concrete. |

## B. E. (CIVIL) Part – I

**CE 401 Environmental Engineering –II**

| | |
|---|---|
| CO1 | Students understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water. |
| CO2 | Students understood industrial waste water quantity and quality for achieving better sanitation in society. |

**CE 402 Design of Structure – III**

| | |
|---|---|
| CO1 | Students will be able to understand the difference between prestressed construction and RCC construction. |
| CO2 | Students also able to design the flat slab, combined footings, earth retaining structures and liquid retaining structures. |

**CE 403 Water Resources Engineering – II**

| | |
|---|---|
| CO1 | Students understood all type of dams and reservoirs. |
| CO2 | Students understood Spillways, Gates & Energy dissipaters |
| CO3 | students understood various canal structures, river training works etc. |

**CE-404 Professional Ethics**

| | |
|---|---|
| CO1 | Students understood basic overview of functioning of different civil engineering related industries / firms. |
| CO2 | Students understood awareness on application of different drawings, contract documents in civil engineering. |
| CO3 | Students understood insight of code of ethics, duties and responsibilities as a Civil Engineer |

**CE 405 c) Ground Water Engineering**

| | |
|---|---|
| CO1 | Students will able to work as Engineers in the field of Ground Water Engineering with confidence and success. |

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## B. E. (CIVIL) Part – II

### Ce 408 Professional Practice

| | |
|---|---|
| CO1 | Students will be got Scope for the students to pick up diverse aspects of the subject Professional Practice. |
| CO2 | Student shall be able to serve in different organizations carrying out different project works and infrastructure activities. |
| CO3 | student shall start his career as a consultant in this field . |

### CE 409 Foundation Engineering

| | |
|---|---|
| CO1 | The study of Foundation engineering .subject develops the knowledge & confidence level of the students to select the proper type of foundation & its safe & economic design |

### CE 410 Project Planning And Management

| | |
|---|---|
| CO1 | The students will be able to understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects. |
| CO2 | The students will be able to demonstrate their capability for preparing the project networks to work out best possible time for completing the project. |
| CO3 | The students will be able to understand and exercise the time- cost relationship in¬ practices. |
| CO4 | The students will be able to implement the safety aspects during the execution of civil engineering project |
| CO5 | The course will inculcate the managerial skills among the students which will be helpful for them in future during actual execution of projects. |
| CO6 | students will know different legal aspect and its provisions for construction project |
| CO7 | The students will be able to carry out the Human resource Management efficiently |
| CO8 | The students will be able to plan for Equipment's and material requirements. |
| CO9 | Students will know the various management techniques for successful completion of construction projects. |

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**CE 411 b) Hydropower Engineering**

| | |
|---|---|
| CO1 | It is desired that students after undergoing academic study sessions as cited this above shall be competent and able to work as Engineers in the field of Hydropower Engineering with confidence and success.. |

IQAC Coordinator

H.O.D.

Principal

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# PO CO OF DEPARTMENT OF COMPUTER ENGINEERING
# ACADEMIC YEAR 2021-22

## Vision

The department is committed to achieve academic excellence through education and research in the emerging and established areas of Computer Engineering

## Mission

Building the capacities of young students to realize their professional and academic dreams.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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

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**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.

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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.

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**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 Educational Objective**

| | |
|---|---|
| **PEO1** | To provide sound knowledge of mathematical principles underlying various programming concepts. |
| **PEO2** | To develop an ability to understand complex issues in the analysis, design, implementation and operation of information systems. |
| **PEO3** | To provide knowledge of mechanisms for building large-scale computer-basedsystems. |
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| **PEO5** | To impart skills necessary for adapting to rapid changes taking place in the field of information and communication technologies. |

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## Course Outcomes:

### SY (CE) Part – I

**Engineering Mathematics – III (BTBS301)**

| | |
|---|---|
| CO1 | Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector& F.T |
| CO2 | Student will show the understanding of impact of Engg.Mathematics on computer |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

**Discrete Mathematics (BTCOC302)**

| | |
|---|---|
| CO1 | Understand sets, relations, functions and discrete structures. Apply Propositional logic and First order logic to solve problems. |
| CO2 | Express and solve number theoretic problems using algebraic properties of groups, Rings and fields. |
| CO3 | To design and develop real time application using graph theory. |
| CO4 | Students would be able to model and analyze computational processes using analytic And combinatorial methods. |
| CO5 | Students will be able to use the methods learnt as part of this subject in subsequent Courses in the design and analysis of algorithms, theory of computation, and compilers. |
| CO6 | Develop a discrete model for a given computational problem and solve. |

**Data Structure(BTCOC303)**

| | |
|---|---|
| CO1 | Student should able to know fundamentals of data structures like array, list, linked list, stack, queue, tree, graph, hashing. |
| CO2 | Student should able to identify suitable data structure for application. |
| CO3 | Student should able to use data structure to solve problems. |
| CO4 | Student should able to implement various data structures and algorithm essential for implementing computer based solutions. |

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**Computer Architecture & Organization (BTCOC304)**

| | |
|---|---|
| CO1 | To understand the basic hardware and software issues of computer organization. |
| CO2 | Identify functional units, bus structure and addressing modes. |
| CO3 | Students will be able to identify where, when and how enhancements of computer Performance can be accomplished. |
| CO4 | Students will also be introduced to more recent applications of computer organization In advanced digital systems. |
| CO5 | Identify memory hierarchy and performance. |

**Object - Oriented Programming in C++ (BTCOC305A)**

| | |
|---|---|
| CO1 | Appreciation and understanding of object oriented concepts and their utility. |
| CO2 | Apply Object oriented approach to design software. |
| CO3 | Ability to formulate the problem, come up with object oriented design. |
| CO4 | Practicing use of different features of Object Oriented Methodology like templates, exception handling, reflection etc. |
| CO5 | Study different systems and apply different design methodologies based on the problem specification and objectives. |

**Object Oriented Programming in Java (BTCOC305B)**

| | |
|---|---|
| CO1 | Appreciation and understanding of object oriented concepts and their utility. |
| CO2 | Apply Object oriented approach to design software. |
| CO3 | Ability to formulate the problem, come up with object oriented design. |
| CO4 | Practicing use of different features of Object Oriented Methodology like templates, exception handling, reflection etc. |
| CO5 | Study different systems and apply different design methodologies based on the problem specification and objectives. |

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## Course Outcomes:

### SY (CE) Part – II

**Design & Analysis of Algorithms (BTCOC401)**

| | |
|---|---|
| CO1 | Analyzing the amortized time complexity of a given algorithm and data structure operations. |
| CO2 | Decide the appropriate design methodology for a given problem from among the paradigms of Divide and Conquer, Dynamic Programming, Greedy, Branch and Bound. |
| CO3 | Design algorithms for network flows. |
| CO4 | Distinguish between P and NP classes of problems. |

**Operating Systems (BTCOC402)**

| | |
|---|---|
| CO1 | Understand functional architecture of an operating system. |
| CO2 | To provide a detailed discussion of the various memory management techniques. |
| CO3 | Learn about and understand theoretical concepts and programming constructs used for the operation of modern operating systems. |
| CO4 | Gain practical experience with software tools available in modern operating systems such as semaphores, system calls, sockets and threads. |

**Basic Human Rights (BTHM403)**

| | |
|---|---|
| CO1 | Be familiar with the major universal and regional systems of human rights law, their relationships to each other, and the legal value and authority of declarations, decisions, Judgments and other materials generated by them. |
| CO2 | Develop an awareness of the primary areas of concern within the field of human rights law and other relevant branches of law, and the ways in which human rights are promoted and protected. |

**Probability Theory and Random Processes (BTBS404)**

| | |
|---|---|
| CO1 | Develop appropriate probabilistic model for a given problem of algorithmic nature and computation of its statistical parameters. |
| CO2 | Learning of different methods of statistics for data analysis. |
| CO3 | Modeling of various real life problems of operation research. |
| CO4 | Determine service time and waiting time in a queue. |
| CO5 | To understand elementary queuing concepts and apply elsewhere in computer science. |

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**Digital Logic Design & Microprocessors (BTES405)**

| | |
|---|---|
| **CO1** | Perform the conversion among different number systems. |
| **CO2** | Design digital components including – decoders, multiplexers, arithmetic circuits. |
| **CO3** | Design of synchronous sequential circuits. |
| **CO4** | Describe design methodology for different combinational logic circuit. |
| **CO5** | Analyze digital systems and improve the performance by reducing complexities. |
| **CO6** | Test digital systems and analyze faults. |

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## Course Outcomes:

### TY (CE) Part – I

**Database Systems (BTCOC501)**

| | |
|---|---|
| CO1 | Model, design and normalize databases for real life applications. |
| CO2 | To learn data models, conceptualize and depict a database system using ER diagram. |
| CO3 | Query Database applications using Query Languages like SQL. |
| CO4 | Understand validation framework like integrity constraints, triggers and assertions. |
| CO5 | Understand various storage structures and query optimization. |

**Theory of Computations (BTCOC502)**

| | |
|---|---|
| CO1 | Design finite state machines, regular expressions and grammars for given languages. |
| CO2 | Understand formal machines, languages and computations |
| CO3 | Develop analytical thinking and intuition for problem solving situations in related areas of theory of computation. |
| CO4 | To know the limitations of computation, i.e. the unsolvability of problems. |

**Machine Learning (BTCOC503)**

| | |
|---|---|
| CO1 | Understand big data challenges in different domains including social media, transportation, finance and medicine. |
| CO2 | Use data analytics to explore and gain a broad understanding of a dataset. |
| CO3 | Use data analytics methods to make predictions for a dataset. |
| CO4 | Predict outcomes with supervised machine learning techniques. |
| CO5 | Apply basic machine learning algorithms Linear Regression, k-Nearest Neighbors (k-NN), k means, Naive Bayes for predictive modeling to solve various real-life examples. |

**Cyber Laws (BTCOE504B)**

| | |
|---|---|
| CO1 | Critically evaluate ongoing developments in law relating to Information Technologies. |
| CO2 | Display an understanding of how these developments relate to one another. |
| CO3 | Examine areas of doctrinal and political debate surrounding rules and theories. |
| CO4 | Evaluate those rules and theories in terms of internal coherence and practical outcomes. |
| CO5 | Draw on the analysis and evaluation contained in primary and secondary sources. |

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**Business Communication (BTCOE505B)**

| | |
|---|---|
| CO1 | Cultivate an ability to identify self-identity, attitude and motivate them to express effectively in small and larger groups of people. |
| CO2 | Participate, collaborate, manage and communicate effectively, influentially by enhancing Llistening, S-speaking, R-reading and W-writing skills amongst the learners. |
| CO3 | Emerge as an outstanding personality and learn to express, convey their own ideas, principles, concepts, philosophy through elegant expressions and manners by participating in group discussion and team projects. |

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## Course Outcomes:

### TY (CE) Part – II

**Compiler Design (BTCOC601)**

| | |
|---|---|
| CO1 | To inform students about different parsing techniques, techniques to generate intermediate code and different optimization techniques. |
| CO2 | To enrich the knowledge in various phases of compiler and its use. |
| CO3 | To introduce the concepts underlying the design and implementation of language processors. |
| CO4 | To provide practical programming skills necessary for constructing a compiler. |

**Computer Networks (BTCOC602)**

| | |
|---|---|
| CO1 | To develop an understanding of modern network architectures from a design and performance perspective. |
| CO2 | Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies. |
| CO3 | To study protocols, network standards, the OSI model, IP addressing, cabling, networking components, and basic LAN design. |
| CO4 | Ability to write program using socket programming. |

**Artificial Intelligence (BTCOE603B)**

| | |
|---|---|
| CO1 | To understand the notions of rational behavior and intelligent agents. |
| CO2 | To develop a general appreciation of the goals, subareas, achievements and difficulties of AI. |
| CO3 | To provide the knowledge of methods of blind as well as informed search and ability to practically apply the corresponding techniques. |
| CO4 | To develop general understanding of major concepts and approaches in knowledge Representation, planning, learning, robotics and other AI areas. |
| CO5 | To developing programming skills for AI applications & exposure to logic Programming with Prolog. |

**Geographical Information System (BTCOE604A)**

| | |
|---|---|
| CO1 | To understand geographical information system |
| CO2 | To develop a general appreciation of the goals, subareas, achievements and difficulties of Digital Elevation Model (DEM) |

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**National Social Service (BTCOE605)**

| | |
|---|---|
| **CO1** | To understand history of NSS |
| **CO2** | To inform students about different Youth Development Programmes in India |

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# Course Outcomes:

## BE (CSE) Part – I

### Cloud Computing (PEC 701 (A))

| | |
|---|---|
| CO1 | Compare various cloud computing providers / Software. |
| CO2 | Understand and familiarize with the basic concepts of cloud computing. |
| CO3 | Understand how to build large scale distributed systems and cloud applications. |
| CO4 | Comprehend the importance of cloud security. |

### Distributed Systems (PEC 702 (A))

| | |
|---|---|
| CO1 | Understand key features of the Distributed Systems such as Communications, Processes, Synchronization, Fault Tolerance, Consistency and Replications. |
| CO2 | Use and apply important methods in distributed systems to support scalability and fault Tolerance. |
| CO3 | Design and implement distributed applications of Distributed Systems. |

### Cyber Law and Ethics (OEC 703 (A))

| | |
|---|---|
| CO1 | Understand cyber-attack |
| CO2 | Understand types of cybercrimes, cyber laws |
| CO3 | Learn how to protect them self and ultimately society from such attacks |

### Biology (BSC 704)

| | |
|---|---|
| CO1 | Describe how biological observations of 18th Century that lead to major discoveries. |
| CO2 | Convey that classification *per se* is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological |
| CO3 | Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine |
| CO4 | Classify enzymes and distinguish between different mechanisms of enzyme action. |
| CO5 | Identify DNA as a genetic material in the molecular basis of information transfer. Analyse biological processes at the reductionistic level |
| CO6 | Apply thermodynamic principles to biological systems. |
| CO7 | Identify and classify microorganisms. |

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## Course Outcomes:

### BE (CSE) Part – II

**Image Processing (PEC 801 (A))**

| | |
|---|---|
| **CO1** | Understand the need for image transforms different types of image transforms and their properties. |
| **CO2** | Develop any image processing application |
| **CO3** | Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression. |

**Python Programming (OEC 802 (A))**

| | |
|---|---|
| **CO1** | To understand why Python is a useful scripting language for developers. |
| **CO2** | To learn how to design and program Python applications. |
| **CO3** | To learn how to use lists, tuples, and dictionaries in Python programs. |
| **CO4** | To learn how to identify Python object types. |

**Internet of Things (OEC 803 (A))**

| | |
|---|---|
| **CO1** | Able to understand the application areas of IOT. |
| **CO2** | Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks |
| **CO3** | Able to understand building blocks of Internet of Things and characteristics. |

**IQAC Coordinator** **H.O.D.** **Principal**

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# PO CO OF DEPARTMENT OF COMPUTER ENGINEERING
# ACADEMIC YEAR 2020-21

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## Course Outcomes:

### SY (CE) Part – I

**Engineering Mathematics – III (BTBSC301)**

| | |
|---|---|
| CO1 | Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector& F.T |
| CO2 | Student will show the understanding of impact of Engg.Mathematics on computer |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

**Discrete Mathematics (BTCOC302)**

| | |
|---|---|
| CO1 | Understand sets, relations, functions and discrete structures. Apply Propositional logic and First order logic to solve problems. |
| CO2 | Express and solve number theoretic problems using algebraic properties of groups, Rings and fields. |
| CO3 | To design and develop real time application using graph theory. |
| CO4 | Students would be able to model and analyze computational processes using analytic And combinatorial methods. |
| CO5 | Students will be able to use the methods learnt as part of this subject in subsequent Courses in the design and analysis of algorithms, theory of computation, and compilers. |
| CO6 | Develop a discrete model for a given computational problem and solve. |

**Data Structure(BTCOC303)**

| | |
|---|---|
| CO1 | Student should able to know fundamentals of data structures like array, list, linked list, stack, queue, tree, graph, hashing. |
| CO2 | Student should able to identify suitable data structure for application. |
| CO3 | Student should able to use data structure to solve problems. |
| CO4 | Student should able to implement various data structures and algorithm essential for implementing computer based solutions. |

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**Computer Architecture & Organization (BTCOC304)**

| | |
|---|---|
| CO1 | To understand the basic hardware and software issues of computer organization. |
| CO2 | Identify functional units, bus structure and addressing modes. |
| CO3 | Students will be able to identify where, when and how enhancements of computer Performance can be accomplished. |
| CO4 | Students will also be introduced to more recent applications of computer organization In advanced digital systems. |
| CO5 | Identify memory hierarchy and performance. |

**Digital Electronics & Microprocessors (BTCOC305)**

| | |
|---|---|
| CO1 | Perform the conversion among different number systems. |
| CO2 | Design digital components including – decoders, multiplexers, arithmetic circuits. |
| CO3 | Design of synchronous sequential circuits. |
| CO4 | Describe design methodology for different combinational logic circuit. |
| CO5 | Analyze digital systems and improve the performance by reducing complexities. |
| CO6 | Test digital systems and analyze faults. |

**Basic Human Rights (BTHM3401)**

| | |
|---|---|
| CO1 | Be familiar with the major universal and regional systems of human rights law, their relationships to each other, and the legal value and authority of declarations, decisions, Judgments and other materials generated by them. |
| CO2 | Develop an awareness of the primary areas of concern within the field of human rights law and other relevant branches of law, and the ways in which human rights are promoted and protected. |

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## Course Outcomes:

### SY (CE) Part – II

**Design & Analysis of Algorithms (BTCOC401)**

| | |
|---|---|
| CO1 | Analyzing the amortized time complexity of a given algorithm and data structure operations. |
| CO2 | Decide the appropriate design methodology for a given problem from among the paradigms of Divide and Conquer, Dynamic Programming, Greedy, Branch and Bound. |
| CO3 | Design algorithms for network flows. |
| CO4 | Distinguish between P and NP classes of problems. |

**Probability and Statistics (BTCOC402)**

| | |
|---|---|
| CO1 | Develop appropriate probabilistic model for a given problem of algorithmic nature and computation of its statistical parameters. |
| CO2 | Learning of different methods of statistics for data analysis. |
| CO3 | Modeling of various real life problems of operation research. |
| CO4 | Determine service time and waiting time in a queue. |
| CO5 | To understand elementary queuing concepts and apply elsewhere in computer science. |

**Operating Systems (BTCOC403)**

| | |
|---|---|
| CO1 | Understand functional architecture of an operating system. |
| CO2 | To provide a detailed discussion of the various memory management techniques. |
| CO3 | Learn about and understand theoretical concepts and programming constructs used for the operation of modern operating systems. |
| CO4 | Gain practical experience with software tools available in modern operating systems such as semaphores, system calls, sockets and threads. |

**Object Oriented Programming in Java (BTCOE404A)**

| | |
|---|---|
| CO1 | Appreciation and understanding of object oriented concepts and their utility. |
| CO2 | Apply Object oriented approach to design software. |
| CO3 | Ability to formulate the problem, come up with object oriented design. |
| CO4 | Practicing use of different features of Object Oriented Methodology like templates, exception handling, reflection etc. |
| CO5 | Study different systems and apply different design methodologies based on the problem specification and objectives. |

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**Object - Oriented Programming in C++ (BTCOE404B)**

| | |
|---|---|
| **CO1** | Appreciation and understanding of object oriented concepts and their utility. |
| **CO2** | Apply Object oriented approach to design software. |
| **CO3** | Ability to formulate the problem, come up with object oriented design. |
| **CO4** | Practicing use of different features of Object Oriented Methodology like templates, exception handling, reflection etc. |
| **CO5** | Study different systems and apply different design methodologies based on the problem specification and objectives. |

**Numerical Methods (BTCOE406B)**

| | |
|---|---|
| **CO1** | Determine an interpolating function for data. |
| **CO2** | Solve initial value problems. |
| **CO3** | Aware of the use of numerical methods in modern scientific computing. |
| **CO4** | Students would be able to assess the approximation techniques to formulate and apply appropriate strategy to solve real world problems. |

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# Course Outcomes:

## TE (CSE) Part – I

### Signals & Systems (ESC 501)

| | |
|---|---|
| CO1 | Understand the concepts of continuous time and discrete time systems. |
| CO2 | Analyze systems in complex frequency domain. |
| CO3 | Understand sampling theorem and its implications. |

### Database Management System (PCC-CS 502)

| | |
|---|---|
| CO1 | To understand the different issues involved in the design and implementation of a database system. |
| CO2 | To study the physical and logical database designs, database modelling, relational, hierarchical, and network models. |
| CO3 | To understand and use data manipulation language to query, update, and manage a database. |
| CO4 | To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing. |
| CO5 | To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS. |

### Formal Language & Automata Theory (PCC-CS 503)

| | |
|---|---|
| CO1 | Design finite state machines, regular expressions and grammars for given languages. |
| CO2 | Understand formal machines, languages and computations |
| CO3 | Develop analytical thinking and intuition for problem solving situations in related areas of theory of computation. |
| CO4 | To know the limitations of computation, i.e. the unsolvability of problems. |

### Object Oriented Programming (PCC-CS 504)

| | |
|---|---|
| CO1 | To demonstrate the use of various oops concept with the help of program. |
| CO2 | Describe the procedural and object oriented paradigm. |
| CO3 | To demonstrate and implement real world problem. |
| CO4 | Define classes modeling techniques and instances. |
| CO5 | Design object oriented solutions for small systems involving multiple objects. |
| CO6 | Apply virtual and pure virtual function & complex programming situation. |

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**Software Engineering (PEC 505)**

| | |
|---|---|
| **CO1** | Define various software application domains and process models used in software development. |
| **CO2** | Need of software specification and requirement and their gathering techniques. |
| **CO3** | Demonstrate use of software and user interface design principles. |
| **CO4** | Classify different testing strategies and statistics and compare them. |
| **CO5** | Generate project schedule and organize different activities of project as per risk impact factor. |

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## Course Outcomes:

### TE (CSE) Part – II

**Compiler Design (PCC-CS 601)**

| | |
|---|---|
| CO1 | To inform students about different parsing techniques, techniques to generate intermediate code and different optimization techniques. |
| CO2 | To enrich the knowledge in various phases of compiler and its use. |
| CO3 | To introduce the concepts underlying the design and implementation of language processors. |
| CO4 | To provide practical programming skills necessary for constructing a compiler. |

**Computer Networks (PCC-CS 602)**

| | |
|---|---|
| CO1 | To develop an understanding of modern network architectures from a design and performance perspective. |
| CO2 | Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies. |
| CO3 | To study protocols, network standards, the OSI model, IP addressing, cabling, networking components, and basic LAN design. |
| CO4 | Ability to write program using socket programming. |

**Advanced Operating Systems (PEC 603)**

| | |
|---|---|
| CO1 | Understand functional architecture of an operating system. |
| CO2 | To provide a detailed discussion of the various memory management techniques. |
| CO3 | Learn about and understand theoretical concepts and programming constructs used for the operation of modern operating systems. |
| CO4 | Gain practical experience with software tools available in modern operating systems such as semaphores, system calls, sockets and threads. |

**Data Mining (PEC 604)**

| | |
|---|---|
| CO1 | Interpret the contribution of data warehousing and data mining to the decision support level of organizations. |
| CO2 | Evaluate different models used for OLAP and data pre-processing. |
| CO3 | Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis. |
| CO4 | Design and implement systems for data mining and evaluate the performance of |



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| | |
|---|---|
| | different data mining algorithms. |

| | **Soft Skills and Interpersonal Communication (OEC 605)** |
|---|---|
| CO1 | Cultivate an ability to identify self-identity, attitude and motivate them to express effectively in small and larger groups of people. |
| CO2 | Participate, collaborate, manage and communicate effectively, influentially by enhancing Llistening, S-speaking, R-reading and W-writing skills amongst the learners. |
| CO3 | Emerge as an outstanding personality and learn to express, convey their own ideas, principles, concepts, philosophy through elegant expressions and manners by participating in group discussion and team projects. |

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## Course Outcomes:

### BE (CSE) Part – I

**Computer Networks (CS401)**

| | |
|---|---|
| CO1 | Learn various concepts of computer networks and TCP/IP protocols. |
| CO2 | Be able to evaluate the topological and routing strategies for a network. |
| CO3 | Be familiar with the different application layer protocols. |

**Advanced Database Management Systems (CS402)**

| | |
|---|---|
| CO1 | Understand how transaction processes and how to implement and control concurrency in transaction processing. |
| CO2 | Understand the data recovery after failure. |
| CO3 | Be able to apply tuning to get better performance and migration of database |

**Data Mining (CS403)**

| | |
|---|---|
| CO1 | Interpret the contribution of data warehousing and data mining to the decision support level of organizations. |
| CO2 | Evaluate different models used for OLAP and data pre-processing. |
| CO3 | Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis. |
| CO4 | Design and implement systems for data mining and evaluate the performance of different data mining algorithms. |

**Software Testing and Quality Assurance (CS407)**

| | |
|---|---|
| CO1 | Formulate problem by following Software Testing Life Cycle |
| CO2 | Design Manual Test cases for Software Project. |
| CO3 | Follow the process related activity and testing techniques to work as team member. |

**Programming Lab VI (CS412)**

| | |
|---|---|
| CO1 | Analyze the basic structure of a C# application. |
| CO2 | Be able to develop Window based live applications on .NET. |
| CO3 | Understand process of executing a web application on a webserver. |
| CO4 | Be able to design and develop Web based applications on .NET. |
| CO5 | Understand the syntax and functions available to deal with file processing for files. |



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## Course Outcomes:

### BE (CSE) Part – II

**Mobile Computing (CS415)**

| | |
|---|---|
| CO1 | Understand the infrastructure to develop mobile communication system (cellular theory) and the characteristics of different multiple access techniques in mobile communication. |
| CO2 | Analyze the different inter-networking challenges and solutions in wireless mobile network. |
| CO3 | The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile communication context. |

**Cryptography and Network Security (CS416)**

| | |
|---|---|
| CO1 | Implement various concepts of cryptography and network security. |
| CO2 | Analyze the security requirements of communication systems & networks. |
| CO3 | Design cryptographic protocols to secure a system, networks or application. |

**Cloud Computing (CS 420)**

| | |
|---|---|
| CO1 | Compare various cloud computing providers / Software. |
| CO2 | Understand and familiarize with the basic concepts of cloud computing. |
| CO3 | Understand how to build large scale distributed systems and cloud applications. |
| CO4 | Comprehend the importance of cloud security. |

**Cyber Security (CS 421)**

| | |
|---|---|
| CO1 | Understand cyber-attack |
| CO2 | Understand types of cybercrimes, cyber laws |
| CO3 | Learn how to protect them self and ultimately society from such attacks |

**Open Source Technology Lab (CS425)**

| | |
|---|---|
| CO1 | Understand process of executing a PHP-based script on a webserver. |
| CO2 | Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script. |
| CO3 | Understand the syntax and functions available to deal with file processing for files on the server as well as processing web URLs. |
| CO4 | Understand the syntax and use of PHP object-oriented classes. |

IQAC Coordinator H.O.D. Principal

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Vilasrao Deshmukh Foundation

# PO CO OF DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING ACADEMIC YEAR 2019-20

## Vision

The department is committed to achieve academic excellence through education and research in the emerging and established areas of Computer Engineering

## Mission

Building the capacities of young students to realize their professional and academic dreams.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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, 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.

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| **PEO1** | To provide sound knowledge of mathematical principles underlying various programming concepts. |
| **PEO2** | To develop an ability to understand complex issues in the analysis, design, implementation and operation of information systems. |
| **PEO3** | To provide knowledge of mechanisms for building large-scale computer-basedsystems. |
| **PEO4** | To develop an ability to provide computer-based solutions to problems from other disciplines of science and engineering. |
| **PEO5** | To impart skills necessary for adapting to rapid changes taking place in the field of information and communication technologies. |

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## Course Outcomes:

### SE (CSE) Part – I

**Analog Electronic Circuits (ESC 301)**

| | |
|---|---|
| CO1 | Understand the characteristics of transistors.(BT-1) |
| CO2 | Remembering and understanding the functioning of OP-AMP (BT-2) |
| CO3 | Design and analyze various rectifier and amplifier circuits.(BT-4) |
| CO4 | Design sinusoidal and non-sinusoidal oscillators. (BT-5) |
| CO5 | Design OP-AMP based circuits.(BT-5) |

**Data structure & Algorithms (PCC- CS 302)**

| | |
|---|---|
| CO1 | For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness. ( BT1 and BT2) |
| CO2 | For a given Search problem (Linear Search and Binary Search) student will able to implement it. ( BT2 and BT3) |
| CO3 | For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.(BT3 and BT4) |
| CO4 | For a given problem of Qu e u e s student will able to implement it and analyze the same to determine the time and computation complexity. (BT4) |
| CO5 | For a given problem of linked list student will able to implement it and analyze the same to determine the time and computation complexity. (BT4 and BT5) |
| CO6 | Student will able to implement Tree and tree traversal algorithms and determine the time and computation complexity. |
| CO7 | Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, and Heap Sort and compare their performance in term of Space and Time complexity. (BT2 and BT3) |
| CO8 | Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity. (BT3) |

**Digital Electronics (ESC 303)**

| | |
|---|---|
| CO1 | Understand working of logic families and logic gates.(BT-2) |
| CO2 | Design and implement Combinational and Sequential logic circuits.(BT-3) |
| CO3 | Understand the process of Analog to Digital conversion and Digital to Analog conversion.(BT-3) |
| CO4 | Be able to use PLDs to implement the given logical problem.(BT-4) |
| CO5 | Work in a design team that can propose, design successfully implement and report on a digital system projects.(BT-4) |

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**IT Workshop (Sci Lab/MATLAB) PCC-CS 304**

| | |
|---|---|
| CO1 | Understand the main features of the MATLAB development environment. |
| CO2 | Use the MATLAB GUI effectively. |
| CO3 | Design simple algorithms to solve problems. |
| CO4 | Write simple programs in MATLAB to solve scientific and mathematical problems. |
| CO5 | Know where to find help |

**Discrete Mathematics (PCC-CS 305)**

| | |
|---|---|
| CO1 | Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. |
| CO2 | Ability to reason logically. |
| CO3 | Ability to understand relations, Diagraph and lattice. |
| CO4 | Ability to understand use of functions, graphs and their use in programming applications. 5. Understand use of groups and codes in Encoding-Decoding |
| CO5 | Apply discrete structures into other computing problems such as formal specification, verification, artificial intelligence, cryptography, Data Analysis and Data Mining etc. |

**Humanities-I (Effective Technical Communication) (HSMC 306)**

| | |
|---|---|
| CO1 | Accumulate, review, mediate accurate information and transmit technical ideas, policies with greater clarity & precision. |
| CO2 | Draft, revise and edit technical drafts, letters, proposals, applications, with effective linguistic skills and abilities by eliminating grammatical errors in the same. |
| CO3 | Absorb, inculcate and practice an industrial ethics, professional work culture and collaborate effectively in organizational communication system. |
| CO4 | Lead, present and communicate business strategies persuasively and convincingly through result oriented endeavors both verbally and non-verbally within and outside organizations. |

**Seminar I (HSMC 307)**

| | |
|---|---|
| CO1 | Use multiple thinking strategies to examine real-world issues through self-learning. |
| CO2 | Explore creative avenues of expression, solve problems, and make consequential decisions. |
| CO3 | Developing stage courage and confidence |
| CO4 | Apply innovative thinking for best presentation. |

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## Course Outcomes:

### SE (CSE) Part – II

**Computer Organization (PCC-CS401)**

| | |
|---|---|
| CO1 | Instruction Level Architecture and Instruction execution. ( BT1) |
| CO2 | The current state of art in memory system design. (BT2) |
| CO3 | How I/O devices are accessed and its principles. (BT1 and BT2) |
| CO4 | To provide the knowledge on Instruction Level Parallelism.(BT 2) |
| CO5 | To impart the knowledge on micro programming.(BT4 and BT5 ) |

**Operating Systems (PCC-CS402)**

| | |
|---|---|
| CO1 | To learn the mechanisms of OS to handle processes and threads and their communication. (BT1 and BT2). |
| CO2 | To learn the mechanisms involved in memory management in contemporary OS.( BT12and BT3). |
| CO3 | To gain knowledge on distributed operating system concepts that includes architecture, mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.(BT2 and BT4) |
| CO4 | To know the components and management aspects of concurrency management.(BT1) |
| CO5 | Study and understand the File management and Disk management.(BT2) |

**Design $ Analysis of Algorithms (PCC-CS403)**

| | |
|---|---|
| CO1 | Analyze the asymptotic performance of algorithms.(BT3) |
| CO2 | Write rigorous correctness proofs for algorithms. (BT4 and BT5) |
| CO3 | Demonstrate a familiarity with major algorithms and data structures.(BT2) |
| CO4 | Analyze and implement nonlinear data structures (BT1 and BT2). |
| CO5 | Apply important algorithmic design paradigms and methods of analysis.(BT3) |
| CO6 | Synthesize efficient algorithms in common engineering design situations.(BT5) |

**Management 1(Organizational Behavior/ Finance & Accounting) (HSMC 404)**

| | |
|---|---|
| CO1 | This course is to acquaint the students with the basic nature of management, its process, tasks and responsibilities of a professional manager as well as organizational behavioral dynamics governing an organization. |
| CO2 | The basic purpose of this course is to develop an insight of postulates, principles and techniques of accounting and utilization of financial and managerial accounting |
| CO3 | Information for planning, decision-making and control. |

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**Mathematics-III (differential Calculus) (BSC-405)**

| | |
|---|---|
| **CO1** | Apply the concept of Linear & Non-Linear Programming Problem to the engineering problems. |
| **CO2** | Demonstrate the ability of using Transforms (Laplace, Fourier, Z, and Wavelet) in solving the Ordinary Differential Equations and Partial Differential Equations. |
| **CO3** | Solve the Ordinary and Partial Differential Equations using Transformation. |
| **CO4** | Identify the applicability of statistics and distribution of data. |
| **CO5** | Apply the concept of probability distribution to engineering problems. |
| **CO6** | Illustrate basic theory of correlations and regression and sampling theory. |

**Environmental Sciences (MC 406)**

| | |
|---|---|
| **CO1** | Students will understand the basics of environmental science. |
| **CO2** | Students will learn about causes of different pollution and their remedies. |
| **CO3** | The students will learn about social issues that are connected to environment |
| **CO4** | Students learning can be applicable for protection of environment |

**Interpersonal Skills and Personality development (HSMC 407)**

| | |
|---|---|
| **CO1** | Cultivate an ability to identify self-identity, attitude and motivate them to express effectively in small and larger groups of people. |
| **CO2** | Participate, collaborate, manage and communicate effectively, influentially by enhancing Llistening, S-speaking, R-reading and W-writing skills amongst the learners. |
| **CO3** | Emerge as an outstanding personality and learn to express, convey their own ideas, principles, concepts, philosophy through elegant expressions and manners by participating in group discussion and team projects. |

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## Course Outcomes:

### TE (CSE) Part – I

**Operating System (CS301)**

| | |
|---|---|
| CO1 | Understand Operating System Structure, Operations and Services, Process Concept, Multithreaded Programming, Process Scheduling and Synchronization. |
| CO2 | Apply the Concepts of Virtual Memory Management and File Systems. |
| CO3 | Analyze the Secondary Storage and I/O Systems. |
| CO4 | Implement CPU Scheduling and Page Replacement Algorithms. |

**Automata Theory (CS302)**

| | |
|---|---|
| CO1 | Understand the concepts of automata, formal grammars and languages. |
| CO2 | Identify the capabilities and limitations of computing machine. |
| CO3 | Model various kinds of real-time problems. |

**Database Management System (CS303)**

| | |
|---|---|
| CO1 | Evaluate business information problem and find the requirements of a problem in terms of data. |
| CO2 | Understand the uses the database schema and need for normalization. |
| CO3 | Design the database schema with the use of appropriate data types for storage of data in database. |

**Computer Organization & Architecture (CS304)**

| | |
|---|---|
| CO1 | Understand how arithmetic and logical operations are performed by computers. |
| CO2 | Make himself familiar with organizational and architectural principles and issues of a Digital Computer and to get a thorough understanding of working of various Organizational units. |
| CO3 | Evaluate the performance of CPU, memory and I/O operations. |

**JAVA Programming (CS306)**

| | |
|---|---|
| CO1 | Understand the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements. |
| CO2 | Competence to design, writes, compile, test and execute straightforward programs to address various software problems. |
| CO3 | Be aware of the need and importance for a professional approach to design and good |



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to Manjara Sugar, Barshi Road

| | |
|---|---|
| | documentation to the finished programs. |

**Computer Hardware & Maintenance (CS310)**

| | |
|---|---|
| **CO1** | Should be able to assemble and configure computer hardware. |
| **CO2** | Troubleshoot problems related to hardware. |

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## Course Outcomes:

### TE (CSE) Part – II

**Software Engineering (CS311)**

| | |
|---|---|
| CO1 | Investigate and improve the specification of a software system. |
| CO2 | Design system, component of process to meet desired needs within realistic constraints. |
| CO3 | Identify, formulate and solve engineering problems. |
| CO4 | Conduct standard tests and measurements. |

**Compiler Design (CS312)**

| | |
|---|---|
| CO1 | Acquire knowledge in different phases and specifying different types of tokens by lexical analyzer and also able to use the compiler tools like Lex, YACC etc. |
| CO2 | Acquire the knowledge of modern compiler and its features. |
| CO3 | Learn the code optimization techniques to improve the performance of a program in terms of speed & space. |

**Data Communication (CS312)**

| | |
|---|---|
| CO1 | Basics data communication and two lower layers i.e. physical and data link layers. |
| CO2 | Networking building blocks such as Ethernet, Cables and modems. |
| CO3 | The conflicting issues and resolution techniques in data transmission. |
| CO4 | The setting up of a network environment with all the necessary data communication components, procedure and techniques that make it functional |
| CO5 | The different types of network topologies and protocols. |

**UNIX Operating System (CS314)**

| | |
|---|---|
| CO1 | Learn UNIX structure, commands, and utilities. |
| CO2 | Describe and understand the UNIX file system. |
| CO3 | Write shell scripts in order to perform shell programming. |
| CO4 | Acquire knowledge about text processing utilities, process management and system operation of UNIX. |

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**Python Programming (CS316)**

| | |
|---|---|
| CO1 | Understand the Python program development environment. |
| CO2 | Understand the principles of Object-oriented programming with well-written modular code. |
| CO3 | Solve problems with well-documented programs in the Python language, including the use of the logical constructs of that language. |

**Professional Aptitude & Logical Reasoning (CS319)**

| | |
|---|---|
| CO1 | Identify, construct and compute numerical situations by work with numbers |
| CO2 | Conceive and develop a methodology for analyzing and solving a problem |
| CO3 | Analyze and interpret data |
| CO4 | Develop and modify attention to detail |
| CO5 | Define, modify and apply critical thinking to real time situations |
| CO6 | Construct and design a structured approach to solving a given analytical situation. |

**Programming Lab IV (CS320)**

| | |
|---|---|
| CO1 | Document and package a Java application |
| CO2 | Use many of the new enhancements added to the Java API |
| CO3 | Use assertions to write robust Java code. |
| CO4 | Write TCP/IP Client Server applications using sockets. |
| CO5 | Execute methods on a remote object using RMI. |
| CO6 | Perform database queries and updates using JDBC. |
| CO7 | Reuse of classes using JAVA Beans. |

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## Course Outcomes:

### BE (CSE) Part – I

**Computer Networks (CS401)**

| | |
|---|---|
| CO1 | Learn various concepts of computer networks and TCP/IP protocols. |
| CO2 | Be able to evaluate the topological and routing strategies for a network. |
| CO3 | Be familiar with the different application layer protocols. |

**Advanced Database Management Systems (CS402)**

| | |
|---|---|
| CO1 | Understand how transaction processes and how to implement and control concurrency in transaction processing. |
| CO2 | Understand the data recovery after failure. |
| CO3 | Be able to apply tuning to get better performance and migration of database |

**Data Mining (CS403)**

| | |
|---|---|
| CO1 | Interpret the contribution of data warehousing and data mining to the decision support level of organizations. |
| CO2 | Evaluate different models used for OLAP and data pre-processing. |
| CO3 | Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis. |
| CO4 | Design and implement systems for data mining and evaluate the performance of different data mining algorithms. |

**Software Testing and Quality Assurance (CS407)**

| | |
|---|---|
| CO1 | Formulate problem by following Software Testing Life Cycle |
| CO2 | Design Manual Test cases for Software Project. |
| CO3 | Follow the process related activity and testing techniques to work as team member. |

**Programming Lab VI (CS412)**

| | |
|---|---|
| CO1 | Analyze the basic structure of a C# application. |
| CO2 | Be able to develop Window based live applications on .NET. |
| CO3 | Understand process of executing a web application on a webserver. |
| CO4 | Be able to design and develop Web based applications on .NET. |
| CO5 | Understand the syntax and functions available to deal with file processing for files. |

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## Course Outcomes:

### BE (CSE) Part – II

**Mobile Computing (CS415)**

| | |
|---|---|
| CO1 | Understand the infrastructure to develop mobile communication system (cellular theory) and the characteristics of different multiple access techniques in mobile communication. |
| CO2 | Analyze the different inter-networking challenges and solutions in wireless mobile network. |
| CO3 | The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile communication context. |

**Cryptography and Network Security (CS416)**

| | |
|---|---|
| CO1 | Implement various concepts of cryptography and network security. |
| CO2 | Analyze the security requirements of communication systems & networks. |
| CO3 | Design cryptographic protocols to secure a system, networks or application. |

**Cloud Computing (CS 420)**

| | |
|---|---|
| CO1 | Compare various cloud computing providers / Software. |
| CO2 | Understand and familiarize with the basic concepts of cloud computing. |
| CO3 | Understand how to build large scale distributed systems and cloud applications. |
| CO4 | Comprehend the importance of cloud security. |

**Cyber Security (CS 421)**

| | |
|---|---|
| CO1 | Understand cyber-attack |
| CO2 | Understand types of cybercrimes, cyber laws |
| CO3 | Learn how to protect them self and ultimately society from such attacks |

**Open Source Technology Lab (CS425)**

| | |
|---|---|
| CO1 | Understand process of executing a PHP-based script on a webserver. |
| CO2 | Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script. |
| CO3 | Understand the syntax and functions available to deal with file processing for files on the server as well as processing web URLs. |
| CO4 | Understand the syntax and use of PHP object-oriented classes. |

IQAC Coordinator H.O.D. Principal



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# PO CO OF DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING ACADEMIC YEAR 2018-19

## Vision

The department is committed to achieve academic excellence through education and research in the emerging and established areas of Computer Engineering

## Mission

Building the capacities of young students to realize their professional and academic dreams.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| **PEO1** | To provide sound knowledge of mathematical principles underlying various programming concepts. |
| **PEO2** | To develop an ability to understand complex issues in the analysis, design, implementation and operation of information systems. |
| **PEO3** | To provide knowledge of mechanisms for building large-scale computer-basedsystems. |
| **PEO4** | To develop an ability to provide computer-based solutions to problems from other disciplines of science and engineering. |
| **PEO5** | To impart skills necessary for adapting to rapid changes taking place in the field of information and communication technologies. |

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## Course Outcomes:

### SE (CSE) Part – I

**Engineering Mathematics III (CI 201))**

| | |
|---|---|
| CO1 | Interpret the mathematical results in physical and other forms. |
| CO2 | Identify, formulate and solve the linear differential equations. |
| CO3 | Classify and solve the contour integration of complex functions. |

**Discrete Mathematics (CI 202)**

| | |
|---|---|
| CO1 | Construct mathematical arguments using logical connectives and quantifiers. |
| CO2 | Use logical notation to define and reason about fundamental concepts such as sets, relations, functions, and integers. |
| CO3 | Synthesize induction hypotheses and simple induction proofs. |
| CO4 | Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems. |

**Data Structure (CI 203)**

| | |
|---|---|
| CO1 | Choose the appropriate data structure for modeling a given problem. |
| CO2 | Understand and implement various data structures along with their application. |

**Digital System (CI 204)**

| | |
|---|---|
| CO1 | Understand several fundamental concepts that can be applied to a wide variety of digital design problems. |
| CO2 | Apply knowledge of hardware description language in designing. |

**Engineering Economics (CI 205)**

| | |
|---|---|
| CO1 | Understand various concepts of economics. |
| CO2 | Economically plan for their own project. |
| CO3 | Get accustomed to the tax structure prevalent in the Indian economy. |

**Programming Lab I (CI 206)**

| | |
|---|---|
| CO1 | Write programs using advance concepts of C language. |
| CO2 | Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems. |
| CO3 | Design graphics programs using C. |



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**Professional Communication Skill (CI 207)**

| | |
|---|---|
| CO1 | Understand the concept, process and importance of professional communication |
| CO2 | Acquire English speaking and writing skills |
| CO3 | Develop presentation skills |

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## Course Outcomes:

### SE (CSE) Part – II

| | Microprocessors & Microcontrollers (CI 208) |
|---|---|
| CO1 | Learn the internal organization of some popular microprocessors/microcontrollers and design of microprocessors/microcontrollers-based systems. |
| CO2 | Write assembly language and C programs for microprocessors and microcontrollers. |
| CO3 | Perform hands-on with various interfaces: LCD, Keyboard, ADC, DAC and other peripherals using 8051. |

| | Computer Algorithms (CI 209) |
|---|---|
| CO1 | Analyze any algorithms and able to calculate their theoretical complexity. |
| CO2 | Understand the problem solving methods such as recurrences, dynamic programming and greedy method. |
| CO3 | Understand NP - hard and NP - complete concepts. |

| | System Programming (CI 210) |
|---|---|
| CO1 | Understand different components of system software. |
| CO2 | Learn intermediate code generation in context of language designing. |
| CO3 | Know operating system functions such as memory management as pertaining to run time storage management. |

| | Object Oriented Programming with C++ (CI 211) |
|---|---|
| CO1 | Understand key features of the object-oriented programming language such as encapsulation (abstraction), inheritance and polymorphism. |
| CO2 | Apply an object oriented approach to programming and identify potential benefits of object-oriented programming over other approaches. |
| CO3 | Apply object-oriented concepts in real world applications. |

| | Numerical Methods & Scientific Computing (CI 212) |
|---|---|
| CO1 | Understand the mathematical background of the different numerical methods and probability distributions introduced in the course. |
| CO2 | Learn the different numerical methods to solve the algebraic equations and a system of linear and nonlinear equations. |
| CO3 | Understand the different numerical methods for interpolation, differentiation, integration and solving a set of ordinary differential equations. |



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## Course Outcomes:

### TE (CSE) Part – I

**Operating System (CS301)**

| | |
|---|---|
| CO1 | Understand Operating System Structure, Operations and Services, Process Concept, Multithreaded Programming, Process Scheduling and Synchronization. |
| CO2 | Apply the Concepts of Virtual Memory Management and File Systems. |
| CO3 | Analyze the Secondary Storage and I/O Systems. |
| CO4 | Implement CPU Scheduling and Page Replacement Algorithms. |

**Automata Theory (CS302)**

| | |
|---|---|
| CO1 | Understand the concepts of automata, formal grammars and languages. |
| CO2 | Identify the capabilities and limitations of computing machine. |
| CO3 | Model various kinds of real-time problems. |

**Database Management System (CS303)**

| | |
|---|---|
| CO1 | Evaluate business information problem and find the requirements of a problem in terms of data. |
| CO2 | Understand the uses the database schema and need for normalization. |
| CO3 | Design the database schema with the use of appropriate data types for storage of data in database. |

**Computer Organization & Architecture (CS304)**

| | |
|---|---|
| CO1 | Understand how arithmetic and logical operations are performed by computers. |
| CO2 | Make himself familiar with organizational and architectural principles and issues of a Digital Computer and to get a thorough understanding of working of various Organizational units. |
| CO3 | Evaluate the performance of CPU, memory and I/O operations. |

**JAVA Programming (CS306)**

| | |
|---|---|
| CO1 | Understand the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements. |
| CO2 | Competence to design, writes, compile, test and execute straightforward programs to address various software problems. |
| CO3 | Be aware of the need and importance for a professional approach to design and good |



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| | |
|---|---|
| | documentation to the finished programs. |

**Computer Hardware & Maintenance (CS310)**

| | |
|---|---|
| **CO1** | Should be able to assemble and configure computer hardware. |
| **CO2** | Troubleshoot problems related to hardware. |

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## Course Outcomes:

### TE (CSE) Part – II

**Software Engineering (CS311)**

| | |
|---|---|
| CO1 | Investigate and improve the specification of a software system. |
| CO2 | Design system, component of process to meet desired needs within realistic constraints. |
| CO3 | Identify, formulate and solve engineering problems. |
| CO4 | Conduct standard tests and measurements. |

**Compiler Design (CS312)**

| | |
|---|---|
| CO1 | Acquire knowledge in different phases and specifying different types of tokens by lexical analyzer and also able to use the compiler tools like Lex, YACC etc. |
| CO2 | Acquire the knowledge of modern compiler and its features. |
| CO3 | Learn the code optimization techniques to improve the performance of a program in terms of speed & space. |

**Data Communication (CS312)**

| | |
|---|---|
| CO1 | Basics data communication and two lower layers i.e. physical and data link layers. |
| CO2 | Networking building blocks such as Ethernet, Cables and modems. |
| CO3 | The conflicting issues and resolution techniques in data transmission. |
| CO4 | The setting up of a network environment with all the necessary data communication components, procedure and techniques that make it functional |
| CO5 | The different types of network topologies and protocols. |

**UNIX Operating System (CS314)**

| | |
|---|---|
| CO1 | Learn UNIX structure, commands, and utilities. |
| CO2 | Describe and understand the UNIX file system. |
| CO3 | Write shell scripts in order to perform shell programming. |
| CO4 | Acquire knowledge about text processing utilities, process management and system operation of UNIX. |

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**Python Programming (CS316)**

| | |
|---|---|
| **CO1** | Understand the Python program development environment. |
| **CO2** | Understand the principles of Object-oriented programming with well-written modular code. |
| **CO3** | Solve problems with well-documented programs in the Python language, including the use of the logical constructs of that language. |

**Professional Aptitude & Logical Reasoning (CS319)**

| | |
|---|---|
| **CO1** | Identify, construct and compute numerical situations by work with numbers |
| **CO2** | Conceive and develop a methodology for analyzing and solving a problem |
| **CO3** | Analyze and interpret data |
| **CO4** | Develop and modify attention to detail |
| **CO5** | Define, modify and apply critical thinking to real time situations |
| **CO6** | Construct and design a structured approach to solving a given analytical situation. |

**Programming Lab IV (CS320)**

| | |
|---|---|
| **CO1** | Document and package a Java application |
| **CO2** | Use many of the new enhancements added to the Java API |
| **CO3** | Use assertions to write robust Java code. |
| **CO4** | Write TCP/IP Client Server applications using sockets. |
| **CO5** | Execute methods on a remote object using RMI. |
| **CO6** | Perform database queries and updates using JDBC. |
| **CO7** | Reuse of classes using JAVA Beans. |

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## Course Outcomes:

### BE (CSE) Part – I

**Computer Networks (CS401)**

| | |
|---|---|
| CO1 | Learn various concepts of computer networks and TCP/IP protocols. |
| CO2 | Be able to evaluate the topological and routing strategies for a network. |
| CO3 | Be familiar with the different application layer protocols. |

**Advanced Database Management Systems (CS402)**

| | |
|---|---|
| **CO1** | Understand how transaction processes and how to implement and control concurrency in transaction processing. |
| **CO2** | Understand the data recovery after failure. |
| **CO3** | Be able to apply tuning to get better performance and migration of database |

**Data Mining (CS403)**

| | |
|---|---|
| **CO1** | Interpret the contribution of data warehousing and data mining to the decision support level of organizations. |
| **CO2** | Evaluate different models used for OLAP and data pre-processing. |
| **CO3** | Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis. |
| **CO4** | Design and implement systems for data mining and evaluate the performance of different data mining algorithms. |

**Software Testing and Quality Assurance (CS407)**

| | |
|---|---|
| **CO1** | Formulate problem by following Software Testing Life Cycle |
| **CO2** | Design Manual Test cases for Software Project. |
| **CO3** | Follow the process related activity and testing techniques to work as team member. |

**Programming Lab VI (CS412)**

| | |
|---|---|
| **CO1** | Analyze the basic structure of a C# application. |
| **CO2** | Be able to develop Window based live applications on .NET. |
| **CO3** | Understand process of executing a web application on a webserver. |
| **CO4** | Be able to design and develop Web based applications on .NET. |
| **CO5** | Understand the syntax and functions available to deal with file processing for files. |

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## Course Outcomes:

### BE (CSE) Part – II

**Mobile Computing (CS415)**

| | |
|---|---|
| CO1 | Understand the infrastructure to develop mobile communication system (cellular theory) and the characteristics of different multiple access techniques in mobile communication. |
| CO2 | Analyze the different inter-networking challenges and solutions in wireless mobile network. |
| CO3 | The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile communication context. |

**Cryptography and Network Security (CS416)**

| | |
|---|---|
| CO1 | Implement various concepts of cryptography and network security. |
| CO2 | Analyze the security requirements of communication systems & networks. |
| CO3 | Design cryptographic protocols to secure a system, networks or application. |

**Cloud Computing (CS 420)**

| | |
|---|---|
| CO1 | Compare various cloud computing providers / Software. |
| CO2 | Understand and familiarize with the basic concepts of cloud computing. |
| CO3 | Understand how to build large scale distributed systems and cloud applications. |
| CO4 | Comprehend the importance of cloud security. |

**Cyber Security (CS 421)**

| | |
|---|---|
| CO1 | Understand cyber-attack |
| CO2 | Understand types of cybercrimes, cyber laws |
| CO3 | Learn how to protect them self and ultimately society from such attacks |

**Open Source Technology Lab (CS425)**

| | |
|---|---|
| CO1 | Understand process of executing a PHP-based script on a webserver. |
| CO2 | Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script. |
| CO3 | Understand the syntax and functions available to deal with file processing for files on the server as well as processing web URLs. |
| CO4 | Understand the syntax and use of PHP object-oriented classes. |

IQAC Coordinator

H.O.D.

Principal

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# PO CO OF DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING ACADEMIC YEAR 2017-18

**Vision**

The department is committed to achieve academic excellence through education and research in the emerging and established areas of Computer Engineering

**Mission**

Building the capacities of young students to realize their professional and academic dreams.

**Graduate Attributes**

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| **PEO1** | To provide sound knowledge of mathematical principles underlying various programming concepts. |
| **PEO2** | To develop an ability to understand complex issues in the analysis, design, implementation and operation of information systems. |
| **PEO3** | To provide knowledge of mechanisms for building large-scale computer-basedsystems. |
| **PEO4** | To develop an ability to provide computer-based solutions to problems from other disciplines of science and engineering. |
| **PEO5** | To impart skills necessary for adapting to rapid changes taking place in the field of information and communication technologies. |

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## Course Outcomes:

### SE (CSE) Part – I

**Engineering Mathematics III (CI 201))**

| | |
|---|---|
| CO1 | Interpret the mathematical results in physical and other forms. |
| CO2 | Identify, formulate and solve the linear differential equations. |
| CO3 | Classify and solve the contour integration of complex functions. |

**Discrete Mathematics (CI 202)**

| | |
|---|---|
| CO1 | Construct mathematical arguments using logical connectives and quantifiers. |
| CO2 | Use logical notation to define and reason about fundamental concepts such as sets, relations, functions, and integers. |
| CO3 | Synthesize induction hypotheses and simple induction proofs. |
| CO4 | Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems. |

**Data Structure (CI 203)**

| | |
|---|---|
| CO1 | Choose the appropriate data structure for modeling a given problem. |
| CO2 | Understand and implement various data structures along with their application. |

**Digital System (CI 204)**

| | |
|---|---|
| CO1 | Understand several fundamental concepts that can be applied to a wide variety of digital design problems. |
| CO2 | Apply knowledge of hardware description language in designing. |

**Engineering Economics (CI 205)**

| | |
|---|---|
| CO1 | Understand various concepts of economics. |
| CO2 | Economically plan for their own project. |
| CO3 | Get accustomed to the tax structure prevalent in the Indian economy. |

**Programming Lab I (CI 206)**

| | |
|---|---|
| CO1 | Write programs using advance concepts of C language. |
| CO2 | Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems. |
| CO3 | Design graphics programs using C. |

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**Professional Communication Skill (CI 207)**

| | |
|---|---|
| CO1 | Understand the concept, process and importance of professional communication |
| CO2 | Acquire English speaking and writing skills |
| CO3 | Develop presentation skills |

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## Course Outcomes:

### SE (CSE) Part – II

**Microprocessors & Microcontrollers (CI 208)**

| | |
|---|---|
| CO1 | Learn the internal organization of some popular microprocessors/microcontrollers and design of microprocessors/microcontrollers-based systems. |
| CO2 | Write assembly language and C programs for microprocessors and microcontrollers. |
| CO3 | Perform hands-on with various interfaces: LCD, Keyboard, ADC, DAC and other peripherals using 8051. |

**Computer Algorithms (CI 209)**

| | |
|---|---|
| CO1 | Analyze any algorithms and able to calculate their theoretical complexity. |
| CO2 | Understand the problem solving methods such as recurrences, dynamic programming and greedy method. |
| CO3 | Understand NP - hard and NP - complete concepts. |

**System Programming (CI 210)**

| | |
|---|---|
| CO1 | Understand different components of system software. |
| CO2 | Learn intermediate code generation in context of language designing. |
| CO3 | Know operating system functions such as memory management as pertaining to run time storage management. |

**Object Oriented Programming with C++ (CI 211)**

| | |
|---|---|
| CO1 | Understand key features of the object-oriented programming language such as encapsulation (abstraction), inheritance and polymorphism. |
| CO2 | Apply an object oriented approach to programming and identify potential benefits of object-oriented programming over other approaches. |
| CO3 | Apply object-oriented concepts in real world applications. |

**Numerical Methods & Scientific Computing (CI 212)**

| | |
|---|---|
| CO1 | Understand the mathematical background of the different numerical methods and probability distributions introduced in the course. |
| CO2 | Learn the different numerical methods to solve the algebraic equations and a system of linear and nonlinear equations. |
| CO3 | Understand the different numerical methods for interpolation, differentiation, integration and solving a set of ordinary differential equations. |

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## Course Outcomes:

### TE (CSE) Part – I

**Operating System (CS301)**

| | |
|---|---|
| CO1 | Understand Operating System Structure, Operations and Services, Process Concept, Multithreaded Programming, Process Scheduling and Synchronization. |
| CO2 | Apply the Concepts of Virtual Memory Management and File Systems. |
| CO3 | Analyze the Secondary Storage and I/O Systems. |
| CO4 | Implement CPU Scheduling and Page Replacement Algorithms. |

**Automata Theory (CS302)**

| | |
|---|---|
| CO1 | Understand the concepts of automata, formal grammars and languages. |
| CO2 | Identify the capabilities and limitations of computing machine. |
| CO3 | Model various kinds of real-time problems. |

**Database Management System (CS303)**

| | |
|---|---|
| CO1 | Evaluate business information problem and find the requirements of a problem in terms of data. |
| CO2 | Understand the uses the database schema and need for normalization. |
| CO3 | Design the database schema with the use of appropriate data types for storage of data in database. |

**Computer Organization & Architecture (CS304)**

| | |
|---|---|
| CO1 | Understand how arithmetic and logical operations are performed by computers. |
| CO2 | Make himself familiar with organizational and architectural principles and issues of a Digital Computer and to get a thorough understanding of working of various Organizational units. |
| CO3 | Evaluate the performance of CPU, memory and I/O operations. |

**JAVA Programming (CS306)**

| | |
|---|---|
| CO1 | Understand the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements. |
| CO2 | Competence to design, writes, compile, test and execute straightforward programs to address various software problems. |
| CO3 | Be aware of the need and importance for a professional approach to design and good |



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| | |
|---|---|
| | documentation to the finished programs. |

**Computer Hardware & Maintenance (CS310)**

| | |
|---|---|
| CO1 | Should be able to assemble and configure computer hardware. |
| CO2 | Troubleshoot problems related to hardware. |

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## Course Outcomes:

### TE (CSE) Part – II

**Software Engineering (CS311)**

| | |
|---|---|
| CO1 | Investigate and improve the specification of a software system. |
| CO2 | Design system, component of process to meet desired needs within realistic constraints. |
| CO3 | Identify, formulate and solve engineering problems. |
| CO4 | Conduct standard tests and measurements. |

**Compiler Design (CS312)**

| | |
|---|---|
| CO1 | Acquire knowledge in different phases and specifying different types of tokens by lexical analyzer and also able to use the compiler tools like Lex, YACC etc. |
| CO2 | Acquire the knowledge of modern compiler and its features. |
| CO3 | Learn the code optimization techniques to improve the performance of a program in terms of speed & space. |

**Data Communication (CS312)**

| | |
|---|---|
| CO1 | Basics data communication and two lower layers i.e. physical and data link layers. |
| CO2 | Networking building blocks such as Ethernet, Cables and modems. |
| CO3 | The conflicting issues and resolution techniques in data transmission. |
| CO4 | The setting up of a network environment with all the necessary data communication components, procedure and techniques that make it functional |
| CO5 | The different types of network topologies and protocols. |

**UNIX Operating System (CS314)**

| | |
|---|---|
| CO1 | Learn UNIX structure, commands, and utilities. |
| CO2 | Describe and understand the UNIX file system. |
| CO3 | Write shell scripts in order to perform shell programming. |
| CO4 | Acquire knowledge about text processing utilities, process management and system operation of UNIX. |

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**Python Programming (CS316)**

| | |
|---|---|
| CO1 | Understand the Python program development environment. |
| CO2 | Understand the principles of Object-oriented programming with well-written modular code. |
| CO3 | Solve problems with well-documented programs in the Python language, including the use of the logical constructs of that language. |

**Professional Aptitude & Logical Reasoning (CS319)**

| | |
|---|---|
| CO1 | Identify, construct and compute numerical situations by work with numbers |
| CO2 | Conceive and develop a methodology for analyzing and solving a problem |
| CO3 | Analyze and interpret data |
| CO4 | Develop and modify attention to detail |
| CO5 | Define, modify and apply critical thinking to real time situations |
| CO6 | Construct and design a structured approach to solving a given analytical situation. |

**Programming Lab IV (CS320)**

| | |
|---|---|
| CO1 | Document and package a Java application |
| CO2 | Use many of the new enhancements added to the Java API |
| CO3 | Use assertions to write robust Java code. |
| CO4 | Write TCP/IP Client Server applications using sockets. |
| CO5 | Execute methods on a remote object using RMI. |
| CO6 | Perform database queries and updates using JDBC. |
| CO7 | Reuse of classes using JAVA Beans. |

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## Course Outcomes:

### BE (CSE) Part – I

**Computer Networks (CS401)**

| | |
|---|---|
| CO1 | Learn various concepts of computer networks and TCP/IP protocols. |
| CO2 | Be able to evaluate the topological and routing strategies for a network. |
| CO3 | Be familiar with the different application layer protocols. |

**Advanced Database Management Systems (CS402)**

| | |
|---|---|
| CO1 | Understand how transaction processes and how to implement and control concurrency in transaction processing. |
| CO2 | Understand the data recovery after failure. |
| CO3 | Be able to apply tuning to get better performance and migration of database |

**Data Mining (CS403)**

| | |
|---|---|
| CO1 | Interpret the contribution of data warehousing and data mining to the decision support level of organizations. |
| CO2 | Evaluate different models used for OLAP and data pre-processing. |
| CO3 | Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis. |
| CO4 | Design and implement systems for data mining and evaluate the performance of different data mining algorithms. |

**Software Testing and Quality Assurance (CS407)**

| | |
|---|---|
| CO1 | Formulate problem by following Software Testing Life Cycle |
| CO2 | Design Manual Test cases for Software Project. |
| CO3 | Follow the process related activity and testing techniques to work as team member. |

**Programming Lab VI (CS412)**

| | |
|---|---|
| CO1 | Analyze the basic structure of a C# application. |
| CO2 | Be able to develop Window based live applications on .NET. |
| CO3 | Understand process of executing a web application on a webserver. |
| CO4 | Be able to design and develop Web based applications on .NET. |
| CO5 | Understand the syntax and functions available to deal with file processing for files. |



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## Course Outcomes:

### BE (CSE) Part – II

**Mobile Computing (CS415)**

| | |
|---|---|
| CO1 | Understand the infrastructure to develop mobile communication system (cellular theory) and the characteristics of different multiple access techniques in mobile communication. |
| CO2 | Analyze the different inter-networking challenges and solutions in wireless mobile network. |
| CO3 | The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile communication context. |

**Cryptography and Network Security (CS416)**

| | |
|---|---|
| CO1 | Implement various concepts of cryptography and network security. |
| CO2 | Analyze the security requirements of communication systems & networks. |
| CO3 | Design cryptographic protocols to secure a system, networks or application. |

**Cloud Computing (CS 420)**

| | |
|---|---|
| CO1 | Compare various cloud computing providers / Software. |
| CO2 | Understand and familiarize with the basic concepts of cloud computing. |
| CO3 | Understand how to build large scale distributed systems and cloud applications. |
| CO4 | Comprehend the importance of cloud security. |

**Cyber Security (CS 421)**

| | |
|---|---|
| CO1 | Understand cyber-attack |
| CO2 | Understand types of cybercrimes, cyber laws |
| CO3 | Learn how to protect them self and ultimately society from such attacks |

**Open Source Technology Lab (CS425)**

| | |
|---|---|
| CO1 | Understand process of executing a PHP-based script on a webserver. |
| CO2 | Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script. |
| CO3 | Understand the syntax and functions available to deal with file processing for files on the server as well as processing web URLs. |
| CO4 | Understand the syntax and use of PHP object-oriented classes. |

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# CO's OF ELECTRICAL ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2021-22

### Vision

To provide quality education to produce world leading, highly skilled, dynamic & innovative electrical engineers with best human values to contribute the knowledge for the betterment of society

### Mission

- To provide high quality and effective education in the field of electrical engineering
- To create effective interface with industries and communities.
- To impart quality and value based education enabling the students to meet the growing challenges in the industry
- To develop students to cope up with modern technology to meet industry needs
- To provide extension services to rural society, industry professionals, and higher learning in the field of Electrical Engineering.
- To make the students aware of the impact of Electrical Engineering in the global scenario and the challenges of Electrical based industries and organizations.
- To provide knowledge-based services and technologies to meet the needs of Society

### Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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**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 Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective

| | |
|---|---|
| **PEO1** | To equip graduates with a strong foundation in engineering science and Electrical Engineering fundamentals to become effective collaborates, researchers and real-time problem solver with technical competencies. |
| **PEO2** | Perceive the limitation and impact of engineering solutions in social, legal, environmental, Economical and multidisciplinary contexts. |

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| | |
|---|---|
| PEO3 | Excel in industry/ technical profession, higher studies, and entrepreneurship exhibiting global competitiveness. |

## Course Outcomes:

### SE- PART– I

#### ENGINEERING MATHEMATICS - III

| | |
|---|---|
| CO1 | Apply basic mathematical tools for solving engineering problems. |
| CO2 | Provide skills in vector calculus & linear differential equations which would enable them to devise engineering solutions for given situations they may encounter in their Profession. |
| CO3 | Deploy skills effectively in the solution of problems, principally in the area of Engineering Student will demonstrate basic knowledge of L.D.E., P.D.E., Vector & F.T |

#### NETWORK ANALYSIS AND SYNTHESIS.

| | |
|---|---|
| CO1 | To review basic components of electric network. |
| CO2 | To design and develop network equations and their solutions. |
| CO3 | To apply Laplace theorem for electric network analyses |
| CO3 | To analyze AC circuit. |

#### FLUID MECHANICS AND THERMAL ENGINEERING.

| | |
|---|---|
| CO1 | To introduce properties of fluid and hydraulic measurement To understand dynamics of fluid flow |
| CO2 | To understand basic concepts of IC engines To understand concept of refrigeration and air conditioning |

#### MEASUREMENT AND INSTRUMENTATION

| | |
|---|---|
| CO1 | To understand philosophy of measurement |



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| | |
|---|---|
| CO2 | To understand different methods analog and digital measurement. |
| CO3 | To study principle of construction and operation of different transducer and dismay methods. |

**BASIC HUMAN RIGHTS**

| | |
|---|---|
| CO1 | To study concept of time value of money |
| CO2 | To study about demand in detail |
| CO3 | To understand Meaning of Production and factors of production, |
| CO4 | To understand dif. Concept about market |

**ENGINEERING ECONOMICS**

| | |
|---|---|
| CO1 | To study concept of time value of money |
| CO2 | To study about demand in detail |
| CO3 | To understand Meaning of Production and factors of production, |
| CO4 | To understand dif. Concept about market |

**ELECTRICAL ENGINEERING MATERIALS**

| | |
|---|---|
| CO1 | To study about crystal structure |
| CO2 | To understand magnetic material structure |
| CO3 | To study about conducting and superconducting materials |
| CO4 | To study dielectric and nano materials. |

## SE- PART – II

**ELECTRICAL MACHINES – I**

| | |
|---|---|
| CO1 | To study diff. types, construction and operating principle of diff. types of electrical machines |



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## POWER SYSTEM-I

| | |
|---|---|
| CO1 | To understand basic operation of power system, power system components and their characteristics. |

## ELECTRICAL INSTALLATION AND ESTIMATION

| | |
|---|---|
| CO1 | To prepare estimates and costing of electrical installations of power system |
| CO2 | To understand procedures of contracting and purchase. |

## NUMERICAL METHODS AND PROGRAMMING

| | |
|---|---|
| CO1 | To study and understand MATLAB programming. |
| CO2 | To review mathematical concepts . |
| CO3 | To develop computer program for linear and nonlinear equations. |

## PRODUCT DESIGN ENGINEERING

| | |
|---|---|
| CO1 | Create simple mechanical or other designs |
| CO2 | Create design documents for knowledge sharing |
| CO3 | Manage own work to meet design requirements |
| CO4 | Work effectively with colleagues |

## SOLID STATE DEVICES

| | |
|---|---|
| CO1 | To study construction and characteristics of solid state devices. |
| CO2 | To apply operational amplifier models in circuits employing negative feedback. |
| CO3 | To design electronics circuit using Timer IC and voltage regulators. |
| CO4 | To perform analysis of amplifiers using small signal models for the circuit elements. |
| CO5 | To calculate the frequency response of circuits containing BJT, Op-Amp etc |

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## TE- PART – I

### POWER SYSTEM-I

| | |
|---|---|
| CO1 | Understand concepts of HVDC power transmission and renewable energy generation. |
| CO2 | Understand the concepts of power systems. |
| CO3 | Understand the various power system components. |
| CO4 | Evaluate fault currents for different types of faults. |
| CO5 | Understand the generation of over-voltages and insulation coordination. |

### CONTROL SYSTEM

| | |
|---|---|
| CO1 | Solve liner and non-liner control problems |
| CO2 | Characterize a system and find its study state behavior |
| CO3 | Investigate stability of a system using different tests |
| CO4 | Design various controllers |

### MICROPROCESSOR & MICROCONTROLLER

| | |
|---|---|
| CO1 | Write assembly language programs and download the machine code that will provide solutions real-world control problems such as fluid level control, temperature control, and batch processes. |
| CO2 | Differentiate between microprocessor and microcontroller. |
| CO3 | Describe the architecture and features of various types of microcontroller. |
| CO4 | Demonstrate programming proficiency using the various addressing modes and all types of instructions of the target microcontroller. |
| CO5 | Program using the capabilities of the stack, the program counter the internal and external memory, timer and interrupts and show how these are used to execute a programme. |
| CO6 | Write assemble assembly language programs on PC and download and run their program on the training boards. |
| CO7 | Design electrical circuitry to the Microcontroller I/O ports in order to interface with external devices. |



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### ELECTRICAL MACHINE DESIGN

| | |
|---|---|
| CO1 | Students will be able to analyze and represent the control system mathematically. |
| CO2 | Students will be able to analyze the control system in time and frequency domain. |

### MICROCONTROLLER AND MICROPROCESSORS

| | |
|---|---|
| CO1 | Use software tools to do design calculations. |
| CO2 | Understand the construction and performance characteristics of electrical machines. |
| CO3 | Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines |
| CO4 | Understand the principles of electrical machine design and carry out a basic design of an AC machine. |

### ELECTRICAL MACHINE DESIGN

| | |
|---|---|
| CO1 | Use software tools to do design calculations. |
| CO2 | Understand the construction and performance characteristics of electrical machines. |
| CO3 | Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines |
| CO4 | Understand the principles of electrical machine design and carry out a basic design of an AC machine. |

### DIGITAL CONTROL SYSTEM

| | |
|---|---|
| CO1 | Design and analyse digital controllers. |
| CO2 | Obtain discrete representation of LTI systems. |
| CO3 | Analyse stability of open loop and closed loop discrete-time systems. |
| CO4 | Design state feedback and output feedback controllers. |

### MANAGEMENT

| | |
|---|---|
| CO1 | Analyze the internal/external factors affecting a business/organization to evaluate business opportunities. |

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| | |
|---|---|
| CO2 | Manage people, processes, and resources within a diverse organization. |
| CO3 | Apply knowledge of leadership concepts in an integrated manner. |

**SOFT SKILLS PERSONALITY DEVELOPMENT**

| | |
|---|---|
| CO1 | Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality. |
| CO2 | Effectively communicate through verbal/oral communication and improve the listening skills Write precise briefs or reports and technical documents |
| CO3 | Actively participate in group discussion / meetings / interviews and prepare & deliver presentations |
| CO4 | Become more effective individual through goal/target setting, self motivation and practicing creative thinking. |

## TE- PART – II

**POWER SYSTEM-II**

| | |
|---|---|
| CO1 | Understand the basics of power system economics. |
| CO2 | Use numerical methods to analyses a power system in steady state. |
| CO3 | Understand stability constraints in a synchronous grid. |
| CO4 | Understand methods to control the voltage, frequency and power flow. |
| CO5 | Understand the monitoring and control of a power system. |

**ELECTROMAGNETIC FIELDS**

| | |
|---|---|
| CO1 | To understand the propagation of EM waves. |
| CO2 | To understand the basic laws of electromagnetism. |
| CO3 | To obtain the electric and magnetic fields for simple configurations under static conditions. |
| CO4 | To analyse time varying electric and magnetic fields. |
| CO5 | To understand Maxwell's equation in different forms and different media. |

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## INDUSTRIAL ELECTRICAL SYSTEM

| | |
|---|---|
| CO1 | Analyze and select the proper size of various electrical system components. |
| CO2 | Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD. |
| CO3 | Understand various components of industrial electrical systems. |

## PLC&SCADA APPLICATION

| | |
|---|---|
| CO1 | To apply knowledge gained about PLCs and SCADA systems to identify few real-life industrial applications. |
| CO2 | To develop architecture of SCADA explaining each unit in detail. |
| CO3 | To develop a software program using modern engineering tools and technique for PLC and SCADA. |

## HIGH VOLTAGE ENGINEERING

| | |
|---|---|
| CO1 | Knowledge of how over-voltages arise in a power system, and protection against these over voltages. |
| CO2 | Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials. |
| CO3 | Knowledge of generation and measurement of D. C., A.C., & Impulse voltages. |
| CO4 | Knowledge of tests on H. V. equipment and on insulating materials, as per the standards. |

## POWER PLANT ENGINEERING

| | |
|---|---|
| CO1 | Student will able to classify different types of sub-stations. |
| CO2 | Student will able to understand power generation scheme. |
| CO3 | Student will able to design Mechanical and electrical parameters of transmission lines and problems. |
| CO4 | Student can suggest economical aspect in power supply system. |
| CO5 | Student will identify problems with tariff system. |

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## THERMAL & FLUID ENGINEERING

| | |
|---|---|
| CO1 | Apply the concept of Entropy, Calculate heat, work and other important thermodynamic Properties for various ideal gas processes. |
| CO2 | Develop basic knowledge on Fluid Statistics, Dynamics. |
| CO3 | Apply principles of fluid mechanics to the operation, design, and selection of Machinery and their components. |
| CO4 | Understand and apply various laws of thermodynamics to various processes and real Systems. |
| CO5 | Apply the concept of Entropy, Calculate heat, work and other important thermodynamic Properties for various ideal gas processes. |

## BE- PART – I

## INDUSTRIAL MANAGEMENT & ECONOMICS

| | |
|---|---|
| CO1 | An ability to function on multidisciplinary teams |
| CO2 | An ability to identify, formulate, and solve engineering problems |
| CO3 | An understanding of professional and ethical responsibility |
| CO4 | An ability to communicate effectively |
| CO5 | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |
| CO6 | A recognition of the need for, and an ability to engage in life-long learning |
| CO7 | A knowledge of contemporary issues |

## ELECTRICAL DRIVES

| | |
|---|---|
| CO1 | Analyze the operation of the converter, chopper fed dc drive. |
| CO2 | Analyze the operation of both classical and modern induction motor drives. |
| CO3 | Design the current and speed controllers for a closed loop solid-state d.c motor drive. |

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| | |
|---|---|
| CO4 | Select the drives for any particular application . |

## POWER SYSTEM OPERATION AND CONTROL

| | |
|---|---|
| CO1 | Calculate the economic load dispatch for a given generator and load specifications. |
| CO2 | Model the governor system. |
| CO3 | Identify the blocks in a load frequency control system. |
| CO4 | Calculate the amount of reactive power to be compensated in a transmission system. |

## SWITCH GEAR AND PROTECTION

| | |
|---|---|
| CO1 | Students will able to use mathematical tools and engineering knowledge to study the importance of protection needs. |
| CO2 | Students will able to design protection controls as per requirement. |
| CO3 | Students will understand their responsibility in designing protective schemes. |
| CO4 | Learner will able to design and use protection equipment's economically and understands its impact on environment. |
| CO5 | Students will have an ability to use technical skills, and modern engineering tools necessary for engineering practice. |

## SMART ELECTRIC GRID

| | |
|---|---|
| CO1 | Acquire in-depth understanding on recent development of power grids, i.e. smart grid |
| CO2 | Apply advanced analysis tools in planning and operation of smart grids |
| CO3 | Acquire skills in presentation and interpretation of results in written form. |

## EHV A.C. TRANSMISSION SYSTEM

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| | |
|---|---|
| CO1 | Highlight need for EHV ac transmission. |
| CO2 | Calculate line and ground parameters. |
| CO3 | Enlist problems encountered in EHV transmission. |
| CO4 | Express issues related to UHV transmission discussed. |

## BE- PART – II

### HIGH VOLTAGE ENGINEERING

| | |
|---|---|
| CO1 | Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid, liquid and gaseous materials along with various causes of overvoltage and protection from them. |
| CO2 | List and reproduce various methods of generation and measurement of DC, AC and impulse high voltage. |
| CO3 | Demonstrate an ability to carry various DC. AC and impulse testing on high voltage equipments and materials. |
| CO4 | Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory |

### POWER QUALITY AND HARMONICS

| | |
|---|---|
| CO1 | Characterize power quality events. |
| CO2 | Reproduce causes of voltage sag and estimate magnitude of voltage sag. |
| CO3 | Carry out harmonic analysis and calculate total harmonic distortion. |
| CO4 | Calculate parameters for passive harmonic filter. |

### INDUSTRIAL AUTOMATION

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| | |
|---|---|
| CO1 | Describe working of various blocks of basic industrial automation system. |
| CO2 | Connect the peripherals with the PLC. |
| CO3 | Use various PLC functions and develop small PLC programs. |
| CO4 | Summarize Distributed control system and SCADA system. |
| CO5 | Use various industrial motor drives for the Industrial Automation |

**HVDC AND FACTS**

| | |
|---|---|
| CO1 | Understand the operations of different FACTS devices. |
| CO2 | Select the controllers for different Contingencies. |
| CO3 | Analyze the different FACTS devices in different stability conditions. |
| CO4 | Select an appropriate FACTS device for a particular application. |
| CO5 | Understand the importance of Transmission power through HVDC. |
| CO6 | Calculate power conversion between AC to DC and DC to AC |

**SPECIAL TOPICS IN ELECTRICAL ENGINEERING**

| | |
|---|---|
| CO1 | Describe the process of restructuring of power system. |
| CO2 | Identify various operation of restructured power system. |
| CO3 | Knowledge of power sector in India. |
| CO4 | Learn the preparation of energy audit report & conservation in different electrical system |

IQAC Co-ordinator

HOD-Electrical Engi.

Principal

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# CO's OF ELECTRICAL ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2020-21

### Vision

To provide quality education to produce world leading, highly skilled, dynamic & innovative electrical engineers with best human values to contribute the knowledge for the betterment of society

### Mission

- To provide high quality and effective education in the field of electrical engineering
- To create effective interface with industries and communities.
- To impart quality and value based education enabling the students to meet the growing challenges in the industry
- To develop students to cope up with modern technology to meet industry needs
- To provide extension services to rural society, industry professionals, and higher learning in the field of Electrical Engineering.
- To make the students aware of the impact of Electrical Engineering in the global scenario and the challenges of Electrical based industries and organizations.
- To provide knowledge-based services and technologies to meet the needs of Society

### Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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**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 Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| **PEO1** | To equip graduates with a strong foundation in engineering science and Electrical Engineering fundamentals to become effective collaborates, researchers and real-time problem solver with technical competencies. |
| **PEO2** | Perceive the limitation and impact of engineering solutions in social, legal, environmental, Economical and multidisciplinary contexts. |

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| | |
|---|---|
| PEO3 | Excel in industry/ technical profession, higher studies, and entrepreneurship exhibiting global competitiveness. |

## Course Outcomes:

### SE- PART– I

#### ENGINEERING MATHEMATICS - III

| | |
|---|---|
| CO1 | Apply basic mathematical tools for solving engineering problems. |
| CO2 | Provide skills in vector calculus & linear differential equations which would enable them to devise engineering solutions for given situations they may encounter in their Profession. |
| CO3 | Deploy skills effectively in the solution of problems, principally in the area of Engineering Student will demonstrate basic knowledge of L.D.E., P.D.E., Vector & F.T |

#### NETWORK ANALYSIS AND SYNTHESIS.

| | |
|---|---|
| CO1 | To review basic components of electric network. |
| CO2 | To design and develop network equations and their solutions. |
| CO3 | To apply Laplace theorem for electric network analyses |
| CO3 | To analyze AC circuit. |

#### FLUID MECHANICS AND THERMAL ENGINEERING

| | |
|---|---|
| CO1 | To introduce properties of fluid and hydraulic measurement To understand dynamics of fluid flow |
| CO2 | To understand basic concepts of IC engines To understand concept of refrigeration and air conditioning |

#### MEASUREMENT AND INSTRUMENTATION

| | |
|---|---|
| CO1 | To understand philosophy of measurement. |

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| | |
|---|---|
| CO2 | To understand different methods analog and digital measurement. |
| CO3 | To study principle of construction and operation of different transducer and dismay methods. |

**BASIC HUMAN RIGHTS**

| | |
|---|---|
| CO1 | To study concept of time value of money |
| CO2 | To study about demand in detail |
| CO3 | To understand Meaning of Production and factors of production, |
| CO4 | To understand dif. Concept about market |

**ENGINEERING ECONOMICS**

| | |
|---|---|
| CO1 | To study concept of time value of money |
| CO2 | To study about demand in detail |
| CO3 | To understand Meaning of Production and factors of production, |
| CO4 | To understand dif. Concept about market |

**ELECTRICAL ENGINEERING MATERIALS**

| | |
|---|---|
| CO1 | To study about crystal structure |
| CO2 | To understand magnetic material structure |
| CO3 | To study about conducting and superconducting materials |
| CO4 | To study dielectric and nano materials. |

**SE- PART – II**

**ELECTRICAL MACHINES – I**

| | |
|---|---|
| CO1 | To study diff. types, construction and operating principle of diff. types of electrical machines |



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## POWER SYSTEM-I

| | |
|---|---|
| CO1 | To understand basic operation of power system, power system components and their characteristics. |

## ELECTRICAL INSTALLATION AND ESTIMATION

| | |
|---|---|
| CO1 | To prepare estimates and costing of electrical installations of power system |
| CO2 | To understand procedures of contracting and purchase. |

## NUMERICAL METHODS AND PROGRAMMING

| | |
|---|---|
| CO1 | To study and understand MATLAB programming. |
| CO2 | To review mathematical concepts . |
| CO3 | To develop computer program for linear and nonlinear equations. |

## PRODUCT DESIGN ENGINEERING

| | |
|---|---|
| CO1 | Create simple mechanical or other designs |
| CO2 | Create design documents for knowledge sharing |
| CO3 | Manage own work to meet design requirements |
| CO4 | Work effectively with colleagues |

## SOLID STATE DEVICES

| | |
|---|---|
| CO1 | To study construction and characteristics of solid state devices. |
| CO2 | To apply operational amplifier models in circuits employing negative feedback. |
| CO3 | To design electronics circuit using Timer IC and voltage regulators. |
| CO4 | To perform analysis of amplifiers using small signal models for the circuit elements. |
| CO5 | To calculate the frequency response of circuits containing BJT, Op-Amp etc |



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## TE- PART – I

### ELECTRICAL MACHINE-II

| | |
|---|---|
| CO1 | To study different methods of speed control of AC and DC motor |
| CO2 | To study importance and procedure of different performance test on AC and DC motor. |
| CO3 | To determine different operating characteristics of AC and DC machines |

### POWER SYSTEM-II

| | |
|---|---|
| CO1 | To study different parameters of power system operation and control |
| CO2 | To study load flow and Diff. methods of reactive power control. |
| CO3 | To understand diff. methods of fault analysis and stability study |

### MICROPROCESSOR AND MICRO CONTROLLER

| | |
|---|---|
| CO1 | To know the architecture of 8085 and 8051. |
| CO2 | To understand interfacing and interrupt features of 8085 and 8051. |
| CO3 | To develop program for basic applications. |

### VALUE EDUCATION, HUMAN RIGHTS AND LEGISLATIVE PROCEDURES

| | |
|---|---|
| CO1 | To understand value of education and self-development |
| CO2 | To develop good values and character |
| CO3 | To know Human right and legislative procedure |

### ILLUMINATION ENGINEERING

| | |
|---|---|
| CO1 | To get the detailed information about modern lamps and their accessories. |
| CO2 | To get detailed insight of indoor and outdoor illumination system components, its controls and design aspects. |
| CO3 | To introduce the modern trends in the lighting |
| CO4 | To know the requirements of energy efficient lighting. |

### ADVANCES IN RENEWABLE ENERGY SYSTEMS

| | |
|---|---|
| CO1 | To know the principle of energy conversion technique from biomass, geothermal and |

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| | |
|---|---|
| | hybrid energy systems. |
| CO2 | To understand effects of air pollution and ecosystems |

**POWER PLANT ENGINEERING.**

| | |
|---|---|
| CO1 | To review basic components of power system, energy sources. |
| CO2 | To understand principle of construction and operation of different conventional power plants. |

**DESIGN AND ANALYSIS OF ALGORITHMS**

| | |
|---|---|
| CO1 | To know fundamental characteristic of an algorithm. |
| CO2 | To understand strategy of algorithm formation. |
| CO3 | To develop different algorithm. |

**TE- PART – II**

**CONTROL SYSTEM**

| | |
|---|---|
| CO1 | To understand the behavior of nonlinear control system. |
| CO2 | To design and analyze PID controller. |
| CO3 | To understand and analyze state variable technique. |
| CO4 | To design and analyze suitable control system for engineering application. |

**PRINCIPLES OF ELECTRICAL MACHINE DESIGN**

| | |
|---|---|
| CO1 | To understand principles of electric machine design. |
| CO2 | To design different components of electric machine. |
| CO3 | To design Transformer |
| CO4 | To understand CAD and use it for transformer design |

**POWER ELECTRONICS**

| | |
|---|---|
| CO1 | To review principle of construction, operation and characteristics of basic semiconductor devices. |
| CO2 | To understand and analyze performance of controlled and uncontrolled converters. |

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| | |
|---|---|
| CO3 | To understand and analyze performance of DC to DC converters and DC to AC converters. |
| CO4 | To understand and analyze performance of AC voltage controllers |

**INDUSTRIAL AUTOMATION AND CONTROL**

| | |
|---|---|
| CO1 | To understand construction and working principle of different industrial measurement systems. |
| CO2 | To understand new trends in industrial process control. |

**ARTIFICIAL NEURAL NETWORK**

| | |
|---|---|
| CO1 | To review basic principles of neuron structure. |
| CO2 | To understand building blocks artificial neural network. |
| CO3 | To understand different networks of ANN |
| CO4 | To develop different algorithm for learning. |
| CO5 | To study and understand Fuzzy neural networks. |

**SWITCH GEAR AND PROTECTION**

| | |
|---|---|
| CO1 | To understand principles of protective relaying. |
| CO2 | To understand principle of construction, operation and selection of different type of circuit breaker used in power system. |
| CO3 | To understand different protection schemes used in power system operation |

**COMPUTER AIDED ANALYSIS AND DESIGN**

| | |
|---|---|
| CO1 | To study different computer aided tools in engineering application. |
| CO2 | To understand the functionality of different engineering software. |
| CO3 | To apply different software in engineering design. |

**MECHATRONICS**

| | |
|---|---|
| CO1 | To understand concept of mechatronics. |
| CO2 | To understand sensor and transducer construction and operation. |

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| | |
|---|---|
| CO3 | To understand microprocessor architecture and operation. |
| CO4 | To understand principle of construction and operation of PLC |
| CO5 | To design a robot for engineering application. |

**RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT**

| | |
|---|---|
| CO1 | To analysis data, information and knowledge. |
| CO2 | To understand concepts of marketing. |
| CO3 | To identify projects and work for community development |
| CO4 | To understand and analyze business model. |

**PROJECT MANAGEMENT**

| | |
|---|---|
| CO1 | To understand concepts of project management. |
| CO2 | To develop a project plan. |
| CO3 | To understand the project implementation strategy. |
| CO4 | To analyze post project affects. |

**BE- PART – I**

**INDUSTRIAL MANAGEMENT & ECONOMICS**

| | |
|---|---|
| CO1 | An ability to function on multidisciplinary teams |
| CO2 | An ability to identify, formulate, and solve engineering problems |
| CO3 | An understanding of professional and ethical responsibility |
| CO4 | An ability to communicate effectively |
| CO5 | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |
| CO6 | A recognition of the need for, and an ability to engage in life-long learning |

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| | |
|---|---|
| CO7 | A knowledge of contemporary issues |

**ELECTRICAL DRIVES**

| | |
|---|---|
| CO1 | Analyze the operation of the converter, chopper fed dc drive. |
| CO2 | Analyze the operation of both classical and modern induction motor drives. |
| CO3 | Design the current and speed controllers for a closed loop solid-state d.c motor drive. |
| CO4 | Select the drives for any particular application . |

**POWER SYSTEM OPERATION AND CONTROL**

| | |
|---|---|
| CO1 | Calculate the economic load dispatch for a given generator and load specifications. |
| CO2 | Model the governor system. |
| CO3 | Identify the blocks in a load frequency control system. |
| CO4 | Calculate the amount of reactive power to be compensated in a transmission system. |

**SWITCH GEAR AND PROTECTION**

| | |
|---|---|
| CO1 | Students will able to use mathematical tools and engineering knowledge to study the importance of protection needs. |
| CO2 | Students will able to design protection controls as per requirement. |
| CO3 | Students will understand their responsibility in designing protective schemes. |
| CO4 | Learner will able to design and use protection equipment's economically and understands its impact on environment. |
| CO5 | Students will have an ability to use technical skills, and modern engineering tools necessary for engineering practice. |

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## SMART ELECTRIC GRID

| | |
|---|---|
| CO1 | Acquire in-depth understanding on recent development of power grids, i.e. smart grid |
| CO2 | Apply advanced analysis tools in planning and operation of smart grids |
| CO3 | Acquire skills in presentation and interpretation of results in written form. |

## EHV A.C. TRANSMISSION SYSTEM

| | |
|---|---|
| CO1 | Highlight need for EHV ac transmission. |
| CO2 | Calculate line and ground parameters. |
| CO3 | Enlist problems encountered in EHV transmission. |
| CO4 | Express issues related to UHV transmission discussed. |

## BE- PART – II

## HIGH VOLTAGE ENGINEERING

| | |
|---|---|
| CO1 | Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid, liquid and gaseous materials along with various causes of overvoltage and protection from them. |
| CO2 | List and reproduce various methods of generation and measurement of DC, AC and impulse high voltage. |
| CO3 | Demonstrate an ability to carry various DC. AC and impulse testing on high voltage equipments and materials. |
| CO4 | Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory |



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## POWER QUALITY AND HARMONICS

| | |
|---|---|
| CO1 | Characterize power quality events. |
| CO2 | Reproduce causes of voltage sag and estimate magnitude of voltage sag. |
| CO3 | Carry out harmonic analysis and calculate total harmonic distortion. |
| CO4 | Calculate parameters for passive harmonic filter. |

## INDUSTRIAL AUTOMATION

| | |
|---|---|
| CO1 | Describe working of various blocks of basic industrial automation system. |
| CO2 | Connect the peripherals with the PLC. |
| CO3 | Use various PLC functions and develop small PLC programs. |
| CO4 | Summarize Distributed control system and SCADA system. |
| CO5 | Use various industrial motor drives for the Industrial Automation |

## HVDC AND FACTS

| | |
|---|---|
| CO1 | Understand the operations of different FACTS devices. |
| CO2 | Select the controllers for different Contingencies. |
| CO3 | Analyze the different FACTS devices in different stability conditions. |
| CO4 | Select an appropriate FACTS device for a particular application. |
| CO5 | Understand the importance of Transmission power through HVDC. |
| CO6 | Calculate power conversion between AC to DC and DC to AC |

## SPECIAL TOPICS IN ELECTRICAL ENGINEERING

| | |
|---|---|
| CO1 | Describe the process of restructuring of power system. |
| CO2 | Identify various operation of restructured power system. |
| CO3 | Knowledge of power sector in Indi |

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| | |
|---|---|
| **CO4** | Learn the preparation of energy audit report & conservation in different electrical system |

**IQAC Co-ordinator**

**HOD-Electrical Engi.**

**Principal**

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# CO's OF ELECTRICAL ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2019-20

### Vision

To provide quality education to produce world leading, highly skilled, dynamic & innovative electrical engineers with best human values to contribute the knowledge for the betterment of society

### Mission

- To provide high quality and effective education in the field of electrical engineering
- To create effective interface with industries and communities.
- To impart quality and value based education enabling the students to meet the growing challenges in the industry
- To develop students to cope up with modern technology to meet industry needs
- To provide extension services to rural society, industry professionals, and higher learning in the field of Electrical Engineering.
- To make the students aware of the impact of Electrical Engineering in the global scenario and the challenges of Electrical based industries and organizations.
- To provide knowledge-based services and technologies to meet the needs of Society

### Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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**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 Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| **PEO1** | To equip graduates with a strong foundation in engineering science and Electrical Engineering fundamentals to become effective collaborates, researchers and real-time problem solver with technical competencies. |
| **PEO2** | Perceive the limitation and impact of engineering solutions in social, legal, environmental, Economical and multidisciplinary contexts. |



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| | |
|---|---|
| PEO3 | Excel in industry/ technical profession, higher studies, and entrepreneurship exhibiting global competitiveness. |

## Course Outcomes:

### SE- PART– I

#### ELECTRICAL CIRCUIT ANALYSIS

| | |
|---|---|
| CO1 | Network theorems for the analysis of electrical circuits. |
| CO2 | Obtain the transient and steady-state response of electrical circuits. |
| CO3 | Analyze circuits in the sinusoidal steady-state (single-phase and three phase). |
| CO3 | Analyze two port circuit behaviors. |

#### ANALOG & DIGITAL CIRCUIT

| | |
|---|---|
| CO1 | Able to identify, analyze op-amp circuit topologies and design the op amp circuits. |
| CO2 | Able to demonstrate the operation of simple logic gates. |
| CO3 | Able to combine simple gates into more complex circuit. |

#### ELECTRICAL MACHINE-I

| | |
|---|---|
| CO1 | Understand the concepts of magnetic circuits. |
| CO2 | Understand the operation of dc machines. |
| CO3 | Analyse the differences in operation of different dc machine configurations. |
| CO4 | Analyse single phase and three phase transformers circuits. |
| CO5 | Design and conduct experiments as well as analyse the parameter of DC machine & transformer. |
| CO6 | Develop understanding of professional & ethical responsibility of DC machine & transformer |

#### NUMERICAL METHODS USING MATLAB



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| | |
|---|---|
| CO1 | Demonstrate types of errors in computation and their causes of occurrence. |
| CO2 | Identify various types of equation and apply appropriate numerical method to solve integration |
| CO3 | Apply different numerical method for interpolation, differentiation and numerical integrations |
| CO4 | Apply and Compare various numerical methods to solve first and second order ODE. |
| CO5 | Apply and Compare various numerical methods to solve Linear Simultaneous Equations. |

## ENGINEERING MECHANICS

| | |
|---|---|
| CO1 | Use scalar and vector analytical techniques for analysing forces in statically determinate structures |
| CO2 | Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems |
| CO3 | Apply basic knowledge of maths and physics to solve real-world problems |
| CO4 | Understand measurement error, and propagation of error in processed data |
| CO5 | Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts) |
| CO6 | Understand basic dynamics concepts – force, momentum, work and energy and Understand and be able to apply Newton"s laws of motion; |
| CO7 | Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution |
| CO8 | Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and Attain an introduction to basic machine parts such as pulleys and mass-spring systems. |

## EFFECTIVE TECHNICAL COMMUNICATION

| | |
|---|---|
| CO1 | Accumulate, review, mediate accurate information and transmit technical ideas, policies with greater clarity & precision. |
| CO2 | Draft, revise and edit technical drafts, letters, proposals, applications, with effective linguistic skills |
| CO3 | Absorb, inculcate and practice an industrial ethics, professional work culture and |



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| | |
|---|---|
| | collaborate |
| CO4 | Lead, present and communicate business strategies persuasively and convincingly through result oriented endeavors both verbally and non-verbally within and outside organizations |

## SE- PART – II

### ELECTRICAL MEASUREMENT & INSTRUMENTATION

| | |
|---|---|
| CO1 | Discuss the operating principles of common electrical and electronic measuring instruments, devices and circuits, and their application to testing |
| CO2 | Measure the performance of equipment and circuits and Identify and classify error sources, and explain how their effects can be minimized in particular measurement situations |
| CO3 | Discuss human and environmental implications of measurement systems; |
| CO3 | Analyze single- and three-phase circuits to determine voltage and current values; |
| CO3 | Analyze test measurements and circuit performance mathematically in both time and frequency domains; |
| CO3 | Specify details of instrumentation and devices intended for a particular application |
| CO3 | Evaluate the results of tests and measurements taken from circuitry constructed by the student. |

### ENGINEERING MATHEMATICS - III

| | |
|---|---|
| CO1 | Define the principal concepts about probability and express the concept of probability and its features. |
| CO2 | explain major distributions of random variables and calculate the expected value and the moments |
| CO3 | Students who can participate & succeed in competitive exams like GATE, GRE. |

### ELECTRICAL MACHINE – II

| | |
|---|---|
| CO1 | Student will be able to determine performance of the induction motor. |
| CO2 | Student will be able to design rating of induction motor for a given application |



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| | |
|---|---|
| CO3 | Student will be able to evaluate parameters of single phase induction motor |
| CO4 | Student will be able to evaluate performance of three phase synchronous machines |
| CO5 | Student will be able to design a three phase winding of AC machines |
| CO6 | Student will be able to design the ratings of synchronous machines for given application |

**SIGNALS AND SYSTEMS**

| | |
|---|---|
| CO1 | Be able to classify systems based on their properties: in particular, to understand and exploit the implications of linearity, time-invariance, causality, memory, and bounded-input, bounded-out (BIBO) stability |
| CO2 | Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions. |
| CO3 | Understand the need to define two new transforms—the Laplace and Z transforms—to treat a class of signals broader than what the Fourier transform can handle. |
| CO4 | Understand the relationships among the various representations of LTI systems—linear constant-coefficient difference or differential equation, frequency response, transfer function, and impulse response—and infer one representation from another (e.g., determine the impulse response from the difference equation, etc.). |

**POWER ELECTRONICS**

| | |
|---|---|
| CO1 | Understand the fundamental principles and applications of power electronics circuits |
| CO2 | Solve problems and design switching regulators according to specifications. |
| CO3 | Use Computer-aided techniques for the design of power converter circuits. |
| CO4 | Appreciate the latest developments in power electronics. |
| CO5 | Assimilate new technological and development in related field |

**BIOLOGY-I**



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| | |
|---|---|
| CO1 | Demonstrate basic knowledge of digestion, absorption, and metabolism. |
| CO2 | Define and discuss the functions and sources of nutrients and Define the basic mechanism of cell mitotic and meiotic divisions |
| CO3 | Demonstrate a broad knowledge of the concepts, mechanisms and underlying scientific laws that govern our living world and Distinguish among science, non-science and pseudo-science |

## TE- PART – I

### POWER SYSTEM ENGINEERING

| | |
|---|---|
| CO1 | Ability to model and represent power system components |
| CO2 | Ability to use software development tools to simulate and analyze the system |
| CO3 | Ability to implement corrective measure for immediate as well as long term solution to the system problems |

### ELECTRICAL MACHINE DESIGN

| | |
|---|---|
| CO1 | An ability to design a system, a component to meet desired needs, differentiate and will be able to compare different options based on results, and able to analyze and interpret results for different industrial application to meet desired needs within realistic constraints and confirms manufacture ability. |
| CO2 | Students will build an ability to identify, formulate and solve industrial problems related to machine and equipment design problems. |
| CO3 | With the basic knowledge of the machines, equipment's design and course, students will be able to develop computer programs for the utility and machine design techniques. |
| CO4 | Students will understand broad education necessary to understand the impact of electrical machine design solutions in a global and economical context. |

### CONTROL SYSTEM I



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| | |
|---|---|
| CO1 | Students will be able to analyze and represent the control system mathematically. |
| CO2 | Students will be able to analyze the control system in time and frequency domain. |

## MICROCONTROLLER AND MICROPROCESSORS

| | |
|---|---|
| CO1 | To Understand the basic architecture of 8051 and 8086. |
| CO2 | To understand the basic programming used in microcontroller and microprocessor based systems. |
| CO3 | To implement any system using microcontrollers and processors. |
| CO4 | To understand coprocessor 8087 and some high end processors. |
| CO5 | To develop interfacing to real world devices. |

## SIGNALS AND SYSTEMS

| | |
|---|---|
| CO1 | Be able to classify systems based on their properties: in particular, to understand and exploit the implications of linearity, time-invariance, causality, memory, and bounded-input, bounded-out (BIBO) stability |
| CO2 | Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions. |
| CO3 | Understand the need to define two new transforms—the Laplace and Z transforms—to treat a class of signals broader than what the Fourier transform can handle. |
| CO4 | Understand the relationships among the various representations of LTI systems—linear constant-coefficient difference or differential equation, frequency response, transfer function, and impulse response—and infer one representation from another (e.g., determine the impulse response from the difference equation, etc.). |
| CO5 | Understand the properties, as well the analysis and design implications, of interconnections of LTI systems—parallel, series (cascade), and feedback—in the time and transform domains. |



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# TE- PART – II

## ELECTROMAGNETIC FIELDS

| | |
|---|---|
| CO1 | To introduce the basic mathematical concepts related to electromagnetic vector fields |
| CO2 | To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications. |
| CO3 | To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications. |
| CO4 | To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector. |
| CO5 | To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector. |

## POWER SYSTEM ANALYSIS

| | |
|---|---|
| CO1 | Use the models of power system components and analyze them. |
| CO2 | Compute various electrical parameters of power system under various fault conditions. |
| CO3 | Carry out the stability studies for a single machine infinite bus system. |

## CONTROL SYSTEM-II

| | |
|---|---|
| CO1 | Students will be able to design the controller in time and frequency domain. |
| CO2 | Students will be able to analyze and design the control system in modern approach. |
| CO3 | Students will be able to analyze the non linear control system |
| CO3 | Students will be able to analyze the discrete time control system. |

## POWER ELECTRONICS



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| | |
|---|---|
| CO1 | Understand the fundamental principles and applications of power electronics circuits |
| CO2 | Solve problems and design switching regulators according to specifications. |
| CO3 | Use Computer-aided techniques for the design of power converter circuits. |
| CO4 | Appreciate the latest developments in power electronics. |
| CO5 | Assimilate new technological and development in related field |

## ELECTRICAL ESTIMATION & ELECTRICAL UTILIZATION

| | |
|---|---|
| CO1 | To develop ability amongst the students to design heating element for resistance furnaces and design-illumination schemes. To develop ability amongst the students to analyze the Performance of arc furnaces, electric traction, different sources of light, illumination schemes, electric traction. |
| CO2 | Students will understand domestic installation service connection and calculation of number of different materials in the form of an estimate. |
| CO3 | Students will develop self and lifelong learning skills, introduce professionalism for successful career. |

## BE- PART – I

## INDUSTRIAL MANAGEMENT & ECONOMICS

| | |
|---|---|
| CO1 | An ability to function on multidisciplinary teams |
| CO2 | An ability to identify, formulate, and solve engineering problems |
| CO3 | An understanding of professional and ethical responsibility |
| CO4 | An ability to communicate effectively |
| CO5 | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |



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| | |
|---|---|
| CO6 | A recognition of the need for, and an ability to engage in life-long learning |
| CO7 | A knowledge of contemporary issues |

## ELECTRICAL DRIVES

| | |
|---|---|
| CO1 | Analyze the operation of the converter, chopper fed dc drive. |
| CO2 | Analyze the operation of both classical and modern induction motor drives. |
| CO3 | Design the current and speed controllers for a closed loop solid-state d.c motor drive. |
| CO4 | Select the drives for any particular application . |

## POWER SYSTEM OPERATION AND CONTROL

| | |
|---|---|
| CO1 | Calculate the economic load dispatch for a given generator and load specifications. |
| CO2 | Model the governor system. |
| CO3 | Identify the blocks in a load frequency control system. |
| CO4 | Calculate the amount of reactive power to be compensated in a transmission system. |

## SWITCH GEAR AND PROTECTION

| | |
|---|---|
| CO1 | Students will able to use mathematical tools and engineering knowledge to study the importance of protection needs. |
| CO2 | Students will able to design protection controls as per requirement. |
| CO3 | Students will understand their responsibility in designing protective schemes. |
| CO4 | Learner will able to design and use protection equipment's economically and understands its impact on environment. |
| CO5 | Students will have an ability to use technical skills, and modern engineering tools necessary for engineering practice. |



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### SMART ELECTRIC GRID

| | |
|---|---|
| CO1 | Acquire in-depth understanding on recent development of power grids, i.e. smart grid |
| CO2 | Apply advanced analysis tools in planning and operation of smart grids |
| CO3 | Acquire skills in presentation and interpretation of results in written form. |

### EHV A.C. TRANSMISSION SYSTEM

| | |
|---|---|
| CO1 | Highlight need for EHV ac transmission. |
| CO2 | Calculate line and ground parameters. |
| CO3 | Enlist problems encountered in EHV transmission. |
| CO4 | Express issues related to UHV transmission discussed. |

## BE- PART – II

### HIGH VOLTAGE ENGINEERING

| | |
|---|---|
| CO1 | Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid, liquid and gaseous materials along with various causes of overvoltage and protection from them. |
| CO2 | List and reproduce various methods of generation and measurement of DC, AC and impulse high voltage. |
| CO3 | Demonstrate an ability to carry various DC, AC and impulse testing on high voltage equipments and materials. |
| CO4 | Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory |



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## POWER QUALITY AND HARMONICS

| | |
|---|---|
| CO1 | Characterize power quality events. |
| CO2 | Reproduce causes of voltage sag and estimate magnitude of voltage sag. |
| CO3 | Carry out harmonic analysis and calculate total harmonic distortion. |
| CO4 | Calculate parameters for passive harmonic filter. |

## INDUSTRIAL AUTOMATION

| | |
|---|---|
| CO1 | Describe working of various blocks of basic industrial automation system. |
| CO2 | Connect the peripherals with the PLC. |
| CO3 | Use various PLC functions and develop small PLC programs. |
| CO4 | Summarize Distributed control system and SCADA system. |
| CO5 | Use various industrial motor drives for the Industrial Automation |

## HVDC AND FACTS

| | |
|---|---|
| CO1 | Understand the operations of different FACTS devices. |
| CO2 | Select the controllers for different Contingencies. |
| CO3 | Analyze the different FACTS devices in different stability conditions. |
| CO4 | Select an appropriate FACTS device for a particular application. |
| CO5 | Understand the importance of Transmission power through HVDC. |
| CO6 | Calculate power conversion between AC to DC and DC to AC |

## SPECIAL TOPICS IN ELECTRICAL ENGINEERING

| | |
|---|---|
| CO1 | Describe the process of restructuring of power system. |
| CO2 | Identify various operation of restructured power system. |
| CO3 | Knowledge of power sector in India. |



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| | |
|---|---|
| CO4 | Learn the preparation of energy audit report & conservation in different electrical system |

IQAC Co-ordinator

HOD-Electrical Engi.

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# CO's OF ELECTRICAL ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2018-19

### Vision

To provide quality education to produce world leading, highly skilled, dynamic & innovative electrical engineers with best human values to contribute the knowledge for the betterment of society

### Mission

- To provide high quality and effective education in the field of electrical engineering
- To create effective interface with industries and communities.
- To impart quality and value based education enabling the students to meet the growing challenges in the industry
- To develop students to cope up with modern technology to meet industry needs
- To provide extension services to rural society, industry professionals, and higher learning in the field of Electrical Engineering.
- To make the students aware of the impact of Electrical Engineering in the global scenario and the challenges of Electrical based industries and organizations.
- To provide knowledge-based services and technologies to meet the needs of Society

### Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

**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, 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.

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**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 Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| **PEO1** | To equip graduates with a strong foundation in engineering science and Electrical Engineering fundamentals to become effective collaborates, researchers and real-time problem solver with technical competencies. |
| **PEO2** | Perceive the limitation and impact of engineering solutions in social, legal, environmental, Economical and multidisciplinary contexts. |

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| | |
|---|---|
| PEO3 | Excel in industry/ technical profession, higher studies, and entrepreneurship exhibiting global competitiveness. |

3

## Course Outcomes:

### SE- PART– I

**Engineering Mathematics - III**

| | |
|---|---|
| CO1 | Apply basic mathematical tools for solving engineering problems. |
| CO2 | Provide skills in vector calculus & linear differential equations which would enable them to devise engineering solutions for given situations they may encounter in their Profession. |
| CO3 | Deploy skills effectively in the solution of problems, principally in the area of Engineering Student will demonstrate basic knowledge of L.D.E., P.D.E., Vector & F.T |

**Electrical Machines-I**

| | |
|---|---|
| CO1 | Design and conduct experiments as well as analyse the parameter of DC machine & Transformer. |
| CO2 | Develop understanding of professional & ethical responsibility of DC machine & Transformer. , |
| CO3 | Analysis and investigation of the major performance characteristics of different types of motors. |

**ELECTRICAL MEASURMENT AND INSTRUMENTS**

| | |
|---|---|
| CO1 | Discuss the operating principles of common electrical and electronic measuring instruments, devices and circuits, and their application to testing; |

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| | |
|---|---|
| CO2 | Measure the performance of equipment and circuits; |
| CO3 | Identify and classify error sources, and explain how their effects can be minimized in particular measurement situations; |
| CO4 | Discuss human and environmental implications of measurement systems; |
| CO5 | Analyze single- and three-phase circuits to determine voltage and current values; |
| CO6 | Analyze test measurements and circuit performance mathematically in both time and Frequency domains |

## ELECTRONICS DEVICS AND CIRCUITS

| | |
|---|---|
| CO1 | Able to identify, analyze op-amp circuit topologies and discuss the relative properties of op-amp circuits. |
| CO2 | Able to combine simple gates into more complex circuit. |
| CO3 | Able to demonstrate the operation of simple logic gates. |

## NUMERICAL METHODS USINGMATLAB

| | |
|---|---|
| CO1 | Solve various methods of numerical analysis of linear and non linear problems in MATLAB by writing program. |
| CO2 | Use of method for solving the problems in engineering |
| CO3 | Develop algorithm, flow chart and computer program for solution of linear and nonlinear problems |

## SE- PART – II

## ENGINEERING MATHEMATICS - IV

| | |
|---|---|
| CO1 | Students will demonstrate basic knowledge of Laplace transform- |

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| | |
|---|---|
| | transform,Besselfunction & Complex Variable. |
| CO2 | Students will show the understanding of impact of Engg.Mathematics on Electrical Engg. |
| CO3 | Students who can participate & succeed in competitive exams like GATE, GRE. |

## ELECTRICAL MACHINE – II

| | |
|---|---|
| CO1 | Student will be able to determine performance of the induction motor. |
| CO2 | Student will be able to design rating of induction motor for a given application |
| CO3 | Student will be able to evaluate parameters of single phase induction motor |
| CO4 | Student will be able to evaluate performance of three phase synchronous machines |
| CO5 | Student will be able to design a three phase winding of AC machines |
| CO6 | Student will be able to design the ratings of synchronous machines for given application |

## ANALOG AND DIGITAL CIRCUIT

| | |
|---|---|
| CO1 | Able to identify, analyze op-amp circuit topologies and design the op amp circuits. |
| CO2 | Able to demonstrate the operation of simple logic gates. |
| CO3 | Able to combine simple gates into more complex circuit. |

## POWER PLANT ENGINEERING

| | |
|---|---|
| CO1 | Knowledge of the operation, construction and design of various components of power plants |
| CO2 | Calculate the performance parameters of various power plants |

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| | |
|---|---|
| CO3 | Define and calculate the various factors of plant load and economy. |

## NETWORK ANALYSIS

| | |
|---|---|
| CO1 | Student will able to work with basic fundamentals, theorems used in circuit's analysis. |
| CO2 | Student will able to work with steady state analysis of different AC circuits, Attenuators, filters and coupled circuit. |

## COMMUNICATION SKILLS

| | |
|---|---|
| CO1 | After going through the content of the syllabus, the students will be able to focus on the development of their personality with the help of good communication skills. |
| CO2 | At the end of the course, the students will be able to develop comprehension, improve Vocabulary, grammatical ability, enhance writing skills, correspond with others and enhance skills in spoken English. |

# TE- PART – I

## POWER SYSTEM ENGINEERING

| | |
|---|---|
| CO1 | Ability to model and represent power system components |
| CO2 | Ability to use software development tools to simulate and analyze the system |
| CO3 | Ability to implement corrective measure for immediate as well as long term solution to the system problems |

## ELECTRICAL MACHINE DESIGN

| | |
|---|---|
| CO1 | An ability to design a system, a component to meet desired needs, differentiate and will be able to compare different options based on results, and able to analyze and interpret results for different industrial application to meet desired needs within realistic constraints and confirms manufacture ability. |

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| | |
|---|---|
| CO2 | Students will build an ability to identify, formulate and solve industrial problems related to machine and equipment design problems. |
| CO3 | With the basic knowledge of the machines, equipment's design and course, students will be able to develop computer programs for the utility and machine design techniques. |
| CO4 | Students will understand broad education necessary to understand the impact of electrical machine design solutions in a global and economical context. |

**CONTROL SYSTEM I**

| | |
|---|---|
| CO1 | Students will be able to analyze and represent the control system mathematically. |
| CO2 | Students will be able to analyze the control system in time and frequency domain. |

**MICROCONTROLLER AND MICROPROCESSORS**

| | |
|---|---|
| CO1 | To Understand the basic architecture of 8051 and 8086. |
| CO2 | To understand the basic programming used in microcontroller and microprocessor based systems. |
| CO3 | To implement any system using microcontrollers and processors. |
| CO4 | To understand coprocessor 8087 and some high end processors. |
| CO5 | To develop interfacing to real world devices. |

**SIGNALS AND SYSTEMS**

| | |
|---|---|
| CO1 | Be able to classify systems based on their properties: in particular, to understand and exploit the implications of linearity, time-invariance, causality, memory, and bounded-input, bounded-out (BIBO) stability |
| CO2 | Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions. |

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| | |
|---|---|
| CO3 | Understand the need to define two new transforms—the Laplace and Z transforms—to treat a class of signals broader than what the Fourier transform can handle. |
| CO4 | Understand the relationships among the various representations of LTI systems—linear constant-coefficient difference or differential equation, frequency response, transfer function, and impulse response—and infer one representation from another (e.g., determine the impulse response from the difference equation, etc.). |
| CO5 | Understand the properties, as well the analysis and design implications, of interconnections of LTI systems—parallel, series (cascade), and feedback—in the time and transform domains. |

## TE- PART – II

### ELECTROMAGNETIC FIELDS

| | |
|---|---|
| CO1 | To introduce the basic mathematical concepts related to electromagnetic vector fields |
| CO2 | To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications. |
| CO3 | To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications. |
| CO4 | To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector. |
| CO5 | To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector. |

### POWER SYSTEM ANALYSIS

| | |
|---|---|
| CO1 | Use the models of power system components and analyze them. |
| CO2 | Compute various electrical parameters of power system under various fault conditions. |
| CO3 | Carry out the stability studies for a single machine infinite bus system. |

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## CONTROL SYSTEM-II

| | |
|---|---|
| CO1 | Students will be able to design the controller in time and frequency domain. |
| CO2 | Students will be able to analyze and design the control system in modern approach. |
| CO3 | Students will be able to analyze the non linear control system |
| CO3 | Students will be able to analyze the discrete time control system. |

## POWER ELECTRONICS

| | |
|---|---|
| CO1 | Understand the fundamental principles and applications of power electronics circuits |
| CO2 | Solve problems and design switching regulators according to specifications. |
| CO3 | Use Computer-aided techniques for the design of power converter circuits. |
| CO4 | Appreciate the latest developments in power electronics. |
| CO5 | Assimilate new technological and development in related field |

## ELECTRICAL ESTIMATION & ELECTRICAL UTILIZATION

| | |
|---|---|
| CO1 | To develop ability amongst the students to design heating element for resistance furnaces and design-illumination schemes. To develop ability amongst the students to analyze the Performance of arc furnaces, electric traction, different sources of light, illumination schemes, electric traction. |
| CO2 | Students will understand domestic installation service connection and calculation of number of different materials in the form of an estimate. |
| CO3 | Students will develop self and lifelong learning skills, introduce professionalism for successful career. |



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## INDUSTRIAL MANAGEMENT & ECONOMICS

| | |
|---|---|
| CO1 | An ability to function on multidisciplinary teams |
| CO2 | An ability to identify, formulate, and solve engineering problems |
| CO3 | An understanding of professional and ethical responsibility |
| CO4 | An ability to communicate effectively |
| CO5 | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |
| CO6 | A recognition of the need for, and an ability to engage in life-long learning |
| CO7 | A knowledge of contemporary issues |

## ELECTRICAL DRIVES

| | |
|---|---|
| CO1 | Analyze the operation of the converter, chopper fed dc drive. |
| CO2 | Analyze the operation of both classical and modern induction motor drives. |
| CO3 | Design the current and speed controllers for a closed loop solid-state d.c motor drive. |
| CO4 | Select the drives for any particular application . |

## POWER SYSTEM OPERATION AND CONTROL

| | |
|---|---|
| CO1 | Calculate the economic load dispatch for a given generator and load specifications. |
| CO2 | Model the governor system. |
| CO3 | Identify the blocks in a load frequency control system. |
| CO4 | Calculate the amount of reactive power to be compensated in a transmission system. |

## SWITCH GEAR AND PROTECTION

| | |
|---|---|
| CO1 | Students will able to use mathematical tools and engineering knowledge to study the |

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| | |
|---|---|
| | importance of protection needs. |
| CO2 | Students will able to design protection controls as per requirement. |
| CO3 | Students will understand their responsibility in designing protective schemes. |
| CO4 | Learner will able to design and use protection equipment's economically and understands its impact on environment. |
| CO5 | Students will have an ability to use technical skills, and modern engineering tools necessary for engineering practice. |

**SMART ELECTRIC GRID**

| | |
|---|---|
| CO1 | Acquire in-depth understanding on recent development of power grids, i.e. smart grid |
| CO2 | Apply advanced analysis tools in planning and operation of smart grids |
| CO3 | Acquire skills in presentation and interpretation of results in written form. |

**EHV A.C. TRANSMISSION SYSTEM**

| | |
|---|---|
| CO1 | Highlight need for EHV ac transmission. |
| CO2 | Calculate line and ground parameters. |
| CO3 | Enlist problems encountered in EHV transmission. |
| CO4 | Express issues related to UHV transmission discussed. |

**BE- PART – II**

**HIGH VOLTAGE ENGINEERING**

| | |
|---|---|
| CO1 | Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid, liquid and gaseous materials along with various causes of overvoltage and |

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| | |
|---|---|
| | protection from them. |
| CO2 | List and reproduce various methods of generation and measurement of DC, AC and impulse high voltage. |
| CO3 | Demonstrate an ability to carry various DC, AC and impulse testing on high voltage equipments and materials. |
| CO4 | Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory |

**POWER QUALITY AND HARMONICS**

| | |
|---|---|
| CO1 | Characterize power quality events. |
| CO2 | Reproduce causes of voltage sag and estimate magnitude of voltage sag. |
| CO3 | Carry out harmonic analysis and calculate total harmonic distortion. |
| CO4 | Calculate parameters for passive harmonic filter. |

**INDUSTRIAL AUTOMATION**

| | |
|---|---|
| CO1 | Describe working of various blocks of basic industrial automation system. |
| CO2 | Connect the peripherals with the PLC. |
| CO3 | Use various PLC functions and develop small PLC programs. |
| CO4 | Summarize Distributed control system and SCADA system. |
| CO5 | Use various industrial motor drives for the Industrial Automation |

**HVDC AND FACTS**

| | |
|---|---|
| CO1 | Understand the operations of different FACTS devices. |
| CO2 | Select the controllers for different Contingencies. |
| CO3 | Analyze the different FACTS devices in different stability conditions. |



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| | |
|---|---|
| CO4 | Select an appropriate FACTS device for a particular application. |
| CO5 | Understand the importance of Transmission power through HVDC. |
| CO6 | Calculate power conversion between AC to DC and DC to AC |

## SPECIAL TOPICS IN ELECTRICAL ENGINEERING

| | |
|---|---|
| CO1 | Describe the process of restructuring of power system. |
| CO2 | Identify various operation of restructured power system. |
| CO3 | Knowledge of power sector in India. |
| CO4 | Learn the preparation of energy audit report & conservation in different electrical system |

IQAC Co-ordinator

HOD-Electrical Engi.

Principal

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(Approved by AICTE, New Delhi & recognized by Govt. of Maharashtra and affiliated to DBATU Lonere, Dist. Raigad)

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# CO's OF ELECTRICAL ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2017-18

### Vision

To provide quality education to produce world leading, highly skilled, dynamic & innovative electrical engineers with best human values to contribute the knowledge for the betterment of society

### Mission

- To provide high quality and effective education in the field of electrical engineering
- To create effective interface with industries and communities.
- To impart quality and value based education enabling the students to meet the growing challenges in the industry
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**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.

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| | |
|---|---|
| PEO3 | Excel in industry/ technical profession, higher studies, and entrepreneurship exhibiting global competitiveness. |

## Course Outcomes:

### SE- PART– I

**Engineering Mathematics - III**

| | |
|---|---|
| CO1 | Apply basic mathematical tools for solving engineering problems. |
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|---|---|
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| | |
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| CO2 | Measure the performance of equipment and circuits; |
| CO3 | Identify and classify error sources, and explain how their effects can be minimized in particular measurement situations; |
| CO4 | Discuss human and environmental implications of measurement systems; |
| CO5 | Analyze single- and three-phase circuits to determine voltage and current values; |
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|---|---|
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| CO2 | Use of method for solving the problems in engineering |
| CO3 | Develop algorithm, flow chart and computer program for solution of linear and nonlinear problems |

## SE- PART – II

## ENGINEERING MATHEMATICS - IV

| | |
|---|---|
| CO1 | Students will demonstrate basic knowledge of Laplace transform- |

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| | |
|---|---|
| | transform,Besselfunction & Complex Variable. |
| CO2 | Students will show the understanding of impact of Engg.Mathematics on Electrical Engg. |
| CO3 | Students who can participate & succeed in competitive exams like GATE, GRE. |

## ELECTRICAL MACHINE – II

| | |
|---|---|
| CO1 | Student will be able to determine performance of the induction motor. |
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| CO1 | Knowledge of the operation, construction and design of various components of power plants |
| CO2 | Calculate the performance parameters of various power plants |

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| | |
|---|---|
| CO3 | Define and calculate the various factors of plant load and economy. |

## NETWORK ANALYSIS

| | |
|---|---|
| CO1 | Student will able to work with basic fundamentals, theorems used in circuit`s analysis. |
| CO2 | Student will able to work with steady state analysis of different AC circuits, Attenuators, filters and coupled circuit. |

## COMMUNICATION SKILLS

| | |
|---|---|
| CO1 | After going through the content of the syllabus, the students will be able to focus on the development of their personality with the help of good communication skills. |
| CO2 | At the end of the course, the students will be able to develop comprehension, improve Vocabulary, grammatical ability, enhance writing skills, correspond with others and enhance skills in spoken English. |

# TE- PART – I

## POWER SYSTEM ENGINEERING

| | |
|---|---|
| CO1 | Ability to model and represent power system components |
| CO2 | Ability to use software development tools to simulate and analyze the system |
| CO3 | Ability to implement corrective measure for immediate as well as long term solution to the system problems |

## ELECTRICAL MACHINE DESIGN

| | |
|---|---|
| CO1 | An ability to design a system, a component to meet desired needs, differentiate and will be able to compare different options based on results, and able to analyze and interpret results for different industrial application to meet desired needs within realistic constraints and confirms manufacture ability. |

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| | |
|---|---|
| CO2 | Students will build an ability to identify, formulate and solve industrial problems related to machine and equipment design problems. |
| CO3 | With the basic knowledge of the machines, equipment`s design and course, students will be able to develop computer programs for the utility and machine design techniques. |
| CO4 | Students will understand broad education necessary to understand the impact of electrical machine design solutions in a global and economical context. |

## CONTROL SYSTEM I

| | |
|---|---|
| CO1 | Students will be able to analyze and represent the control system mathematically. |
| CO2 | Students will be able to analyze the control system in time and frequency domain. |

## MICROCONTROLLER AND MICROPROCESSORS

| | |
|---|---|
| CO1 | To Understand the basic architecture of 8051 and 8086. |
| CO2 | To understand the basic programming used in microcontroller and microprocessor based systems. |
| CO3 | To implement any system using microcontrollers and processors. |
| CO4 | To understand coprocessor 8087 and some high end processors. |
| CO5 | To develop interfacing to real world devices. |

## SIGNALS AND SYSTEMS

| | |
|---|---|
| CO1 | Be able to classify systems based on their properties: in particular, to understand and exploit the implications of linearity, time-invariance, causality, memory, and bounded-input, bounded-out (BIBO) stability |
| CO2 | Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions. |

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| | |
|---|---|
| CO3 | Understand the need to define two new transforms—the Laplace and Z transforms—to treat a class of signals broader than what the Fourier transform can handle. |
| CO4 | Understand the relationships among the various representations of LTI systems—linear constant-coefficient difference or differential equation, frequency response, transfer function, and impulse response—and infer one representation from another (e.g., determine the impulse response from the difference equation, etc.). |
| CO5 | Understand the properties, as well the analysis and design implications, of interconnections of LTI systems—parallel, series (cascade), and feedback—in the time and transform domains. |

## TE- PART – II

### ELECTROMAGNETIC FIELDS

| | |
|---|---|
| CO1 | To introduce the basic mathematical concepts related to electromagnetic vector fields |
| CO2 | To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications. |
| CO3 | To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications. |
| CO4 | To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector. |
| CO5 | To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector. |

### POWER SYSTEM ANALYSIS

| | |
|---|---|
| CO1 | Use the models of power system components and analyze them. |
| CO2 | Compute various electrical parameters of power system under various fault conditions. |
| CO3 | Carry out the stability studies for a single machine infinite bus system. |

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## CONTROL SYSTEM-II

| | |
|---|---|
| CO1 | Students will be able to design the controller in time and frequency domain. |
| CO2 | Students will be able to analyze and design the control system in modern approach. |
| CO3 | Students will be able to analyze the non linear control system |
| CO3 | Students will be able to analyze the discrete time control system. |

## POWER ELECTRONICS

| | |
|---|---|
| CO1 | Understand the fundamental principles and applications of power electronics circuits |
| CO2 | Solve problems and design switching regulators according to specifications. |
| CO3 | Use Computer-aided techniques for the design of power converter circuits. |
| CO4 | Appreciate the latest developments in power electronics. |
| CO5 | Assimilate new technological and development in related field |

## ELECTRICAL ESTIMATION & ELECTRICAL UTILIZATION

| | |
|---|---|
| CO1 | To develop ability amongst the students to design heating element for resistance furnaces and design-illumination schemes. To develop ability amongst the students to analyze the Performance of arc furnaces, electric traction, different sources of light, illumination schemes, electric traction. |
| CO2 | Students will understand domestic installation service connection and calculation of number of different materials in the form of an estimate. |
| CO3 | Students will develop self and lifelong learning skills, introduce professionalism for successful career. |



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## INDUSTRIAL MANAGEMENT & ECONOMICS

| | |
|---|---|
| CO1 | An ability to function on multidisciplinary teams |
| CO2 | An ability to identify, formulate, and solve engineering problems |
| CO3 | An understanding of professional and ethical responsibility |
| CO4 | An ability to communicate effectively |
| CO5 | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |
| CO6 | A recognition of the need for, and an ability to engage in life-long learning |
| CO7 | A knowledge of contemporary issues |

## ELECTRICAL DRIVES

| | |
|---|---|
| CO1 | Analyze the operation of the converter, chopper fed dc drive. |
| CO2 | Analyze the operation of both classical and modern induction motor drives. |
| CO3 | Design the current and speed controllers for a closed loop solid-state d.c motor drive. |
| CO4 | Select the drives for any particular application . |

## POWER SYSTEM OPERATION AND CONTROL

| | |
|---|---|
| CO1 | Calculate the economic load dispatch for a given generator and load specifications. |
| CO2 | Model the governor system. |
| CO3 | Identify the blocks in a load frequency control system. |
| CO4 | Calculate the amount of reactive power to be compensated in a transmission system. |

## SWITCH GEAR AND PROTECTION

| | |
|---|---|
| CO1 | Students will able to use mathematical tools and engineering knowledge to study the |

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| | |
|---|---|
| | importance of protection needs. |
| CO2 | Students will able to design protection controls as per requirement. |
| CO3 | Students will understand their responsibility in designing protective schemes. |
| CO4 | Learner will able to design and use protection equipment's economically and understands its impact on environment. |
| CO5 | Students will have an ability to use technical skills, and modern engineering tools necessary for engineering practice. |

### SMART ELECTRIC GRID

| | |
|---|---|
| CO1 | Acquire in-depth understanding on recent development of power grids, i.e. smart grid |
| CO2 | Apply advanced analysis tools in planning and operation of smart grids |
| CO3 | Acquire skills in presentation and interpretation of results in written form. |

### EHV A.C. TRANSMISSION SYSTEM

| | |
|---|---|
| CO1 | Highlight need for EHV ac transmission. |
| CO2 | Calculate line and ground parameters. |
| CO3 | Enlist problems encountered in EHV transmission. |
| CO4 | Express issues related to UHV transmission discussed. |

## BE- PART – II

### HIGH VOLTAGE ENGINEERING

| | |
|---|---|
| CO1 | Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid, liquid and gaseous materials along with various causes of overvoltage and |

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| | |
|---|---|
| | protection from them. |
| CO2 | List and reproduce various methods of generation and measurement of DC , AC and impulse high voltage. |
| CO3 | Demonstrate an ability to carry various DC, AC and impulse testing on high voltage equipments and materials. |
| CO4 | Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory |

## POWER QUALITY AND HARMONICS

| | |
|---|---|
| CO1 | Characterize power quality events. |
| CO2 | Reproduce causes of voltage sag and estimate magnitude of voltage sag. |
| CO3 | Carry out harmonic analysis and calculate total harmonic distortion. |
| CO4 | Calculate parameters for passive harmonic filter. |

## INDUSTRIAL AUTOMATION

| | |
|---|---|
| CO1 | Describe working of various blocks of basic industrial automation system. |
| CO2 | Connect the peripherals with the PLC. |
| CO3 | Use various PLC functions and develop small PLC programs. |
| CO4 | Summarize Distributed control system and SCADA system. |
| CO5 | Use various industrial motor drives for the Industrial Automation |

## HVDC AND FACTS

| | |
|---|---|
| CO1 | Understand the operations of different FACTS devices. |
| CO2 | Select the controllers for different Contingencies. |
| CO3 | Analyze the different FACTS devices in different stability conditions. |

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| | |
|---|---|
| CO4 | Select an appropriate FACTS device for a particular application. |
| CO5 | Understand the importance of Transmission power through HVDC. |
| CO6 | Calculate power conversion between AC to DC and DC to AC |

## SPECIAL TOPICS IN ELECTRICAL ENGINEERING

| | |
|---|---|
| CO1 | Describe the process of restructuring of power system. |
| CO2 | Identify various operation of restructured power system. |
| CO3 | Knowledge of power sector in India. |
| CO4 | Learn the preparation of energy audit report & conservation in different electrical system |

IQAC Co-ordinator

HOD-ElectricalEngi.

Principal

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PO CO OF ELECTRONIC & TELECOMMUNICATION ENGINEERING DEPARTMENT

# ACADEMIC YEAR 2021-22

## Vision

To be a Centre of technical education in electronics & electronic communication to provide excellent technical resources to create technocrats for the well-being of society..

## Mission

- To educate the scholars of electronics & communication engineering stream with well-defined and rigorously structured curriculum and well equipped laboratories to meet the growing challenges of the Industry.
- Encouraging students with basic course knowledge to go for further higher Education.
- Promoting scholars towards research through constant interaction with research organizations and Industries..

## Graduate Attributes [Program Outcomes (POS)]

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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

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

**PO-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.

**PO-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.

**PO-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.

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**PO-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.

**PO-7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. The knowledge of, and need for sustainable development.

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

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

**PO-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.

**PO-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.

**PO-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 Educational Objectives.**

| | |
|---|---|
| PEO1 | To provide requisite Engineering knowledge as well as information about recent trends in the field of communication Engineering to the students |
| PEO2 | To develop lifelong learning environment for multidisciplinary engineering education. |

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## Course Outcomes:

### SE (E&TC) Part – I

**ENGINEERING MATHEMATICS -III**

| | |
|---|---|
| CO1 | Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. |
| CO2 | Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing |
| CO3 | Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing |
| CO4 | Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields. |
| CO5 | Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing |

**DIGITAL ELECTRONICS**

| | |
|---|---|
| CO1 | Use the basic logic gates and various reduction techniques of digital logic circuit in detail. |
| CO2 | Design combinational and sequential circuits |
| CO3 | Design and implement hardware circuit to test performance and application. |
| CO4 | Understand the architecture and use of VHDL for basic operations and Simulate using simulation software |

**ELECTRONIC DEVICES & CIRCUITS**

| | |
|---|---|
| CO1 | Comply and verify parameters after exciting devices by any stated method. |
| CO2 | Implement circuit and test the performance. |
| CO3 | Analyze small signal model of FET and MOSFET. |
| CO4 | Explain behavior of FET at low frequency. |
| CO5 | Design an adjustable voltage regulator circuits. |

**ELECTRICAL MACHINES & INSTRUMENTS**

| | |
|---|---|
| CO1 | The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions. |
| CO2 | The skill to analyze the response of any electrical machine. |
| CO3 | The ability to troubleshoot the operation of an electrical machine |
| CO4 | The ability to select a suitable measuring instrument for a given application. |

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| | |
|---|---|
| CO5 | The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument. |
| CO6 | Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights |

## SE (E&TC) Part – III

### NETWORK THEORY

| | |
|---|---|
| CO1 | Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same. |
| CO2 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |
| CO3 | Identify issues related to transmission of signals, analyze different RLC networks. |
| CO4 | Find technology recognition for the benefit of the society |

### BASIC HUMAN RIGHTS

| | |
|---|---|
| CO1 | Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights.. |
| CO2 | Strengthen the respect for human rights and fundamental freedoms. |
| CO3 | Enable all persons to participate effectively in a free society |
| CO4 | Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights. |
| CO5 | Learn about regional, national, state, and local law that reinforces international human rights law. |
| CO6 | Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights |

### PROBABILITY THEORY AND RANDOM PROCESSES

| | |
|---|---|
| CO1 | Understand representation of random signals |
| CO2 | Investigate characteristics of random processes |
| CO3 | Make use of theorems related to random signals |
| CO4 | To understand propagation of random signals in LTI systems. |

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**SIGNAL & SYSTEMS**

| | |
|---|---|
| CO1 | Understand mathematical description and representation of continuous and discrete time signals and systems. |
| CO2 | Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system |
| CO3 | Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms |
| CO4 | Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain |
| CO5 | Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event |

**PYTHON PROGRAMMING**

| | |
|---|---|
| CO1 | Experience with an interpreted Language. |
| CO2 | To build software for real needs |
| CO3 | Prior Introduction to testing software |

## TE (E&TC) Part – I

**CONTROL SYSTEMS ENGINEERING**

| | |
|---|---|
| CO1 | Model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer functions |
| CO2 | Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behaviour. . |
| CO3 | Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability |
| CO4 | Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis |
| CO5 | Determine the frequency response of a control system and use it to evaluate or adjust the relative stability |
| CO6 | Mdoel and analyse the control systems using state space analysis |
| CO7 | Design a P, PD, PI, or PID controller based on the transient and steady state response criteria. |

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## EIECTROMAGNETIC FIELD THOERY

| | |
|---|---|
| CO1 | Understanding the vector fields E, D, H & B |
| CO2 | Cleared the Concepts Divergence and Stokes theorem |
| CO3 | Get an idea of the concepts: Work done, Potential, Potential gradient and dipole |
| CO4 | Get the idea of the terms Conductors, Dielectrics, boundary conditions and capacitance |
| CO5 | Understanding of Poisson's and Laplace's equations |
| CO6 | Get knowledge about Time Varying Field and Maxwell's Equations |
| CO7 | Get an idea of Uniform Plane Wave used for propa |

## DIGITAL SIGNAL PROCESSING

| | |
|---|---|
| CO1 | Represent discrete-time signals analytically and visualize in time domain 2. 3. 4. |
| CO2 | Understand the meaning and implications of the properties of systems and signals |
| CO3 | Understand transform domain and its significance and problems related to computational complexity |
| CO4 | Specify and design digital filters |
| CO5 | Draw the structure for realization of a given system |

## COMPUTER ARCHITECTURE

| | |
|---|---|
| CO1 | Learn how computers work |
| CO2 | Know basic principles of computer"s working |
| CO3 | Analyze the performance of computers |
| CO4 | Know how computers are designed and built |
| CO5 | Understand issues affecting modern processors (caches, pipelines etc.). |

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**MICROCONTROLLER AND ITS APPLICATION**

| | |
|---|---|
| CO1 | Learner Gains Ability To Apply Knowledge Of Engineering In Designing Different Case Studies |
| CO2 | Students Get Ability To Conduct Experiments Based On Interfacing Of Devices To Or Interfacing To Real World Applications.. |
| CO3 | Graduates Will Be Able To Design Real Time Controllers Using Microcontroller Based System. |
| CO4 | Students Get Ability To Interface Mechanical System To Function In Multidisciplinary System Like In Robotics, Automobiles |
| CO5 | Students Can Identify And Formulate Control And Monitoring Systems Using Microcontrollers |
| CO6 | Students Will Design Cost Effective Real Time System To Serve Engineering Solution For Global, Social And Economic Context. |
| CO7 | Learners Get Acquainted With Modern Tools Like Programmers, Debuggers, Cross Compilers And Current IDE I.E. Integrated Development Environment Tools. |

**DATA STRUCTURE AND ALGORITHM USING JAVA**

| | |
|---|---|
| CO1 | To Impart The Basic Concepts Of Data Structures And Algorithms. |
| CO2 | To Understand Concepts About Searching And Sorting Techniques.. |
| CO3 | Describe How Arrays, Records, Linked Structures Are Represented In Memory And Use Them In Algorithms |
| CO4 | To Understand Basic Concepts About Stacks, Queues, Lists Trees And Graphs. |
| CO5 | To Enable Them To Write Algorithms For Solving Problems With The Help Of Fundamental Data Structures. |

## TE (E&TC) Part – II

**ANTENNA AND WAVE PROPAGATION**

| | |
|---|---|
| CO1 | Understand the concept of radiation through mathematical formulation |
| CO2 | Plot the characteristics of wire and aperture antennas. |
| CO3 | Develop the performance characteristics of array antenna. |
| CO4 | Measure the antenna parameters and understand its fundamentals. |
| CO5 | Understand the behavior of nature on em wave propagation |

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## COMPUTER NETWORK AND CLOUD COMPUTING

| | |
|---|---|
| CO1 | To Master The Terminology And Concepts Of The OSI Reference Model And The TCP-IP Reference Model |
| CO2 | To Master The Concepts Of Protocols, Network Interfaces, And Design/Performance Issues In Local Area Networks And Wide Area Networks. |
| CO3 | To Be Familiar With Wireless Networking Concepts. |
| CO4 | To Be Familiar With Contemporary Issues In Networking Technologies. |
| CO5 | To Be Familiar With Network Tools And Network Programming |
| CO6 | For A Given Requirement (Small Scale) Of Wide-Area Networks (Wans), Local Area Networks (Lans) And Wireless Lans (Wlans) Design It Based On The Market Available Component. |
| CO7 | For A Given Problem Related TCP/IP Protocol Developed The Network Programming. |

## DIGITAL IMAGE PROCESSING

| | |
|---|---|
| CO1 | Review The Fundamental Concepts Of Digital Image Processing System |
| CO2 | Analyze Images In The Frequency Domain Using Various Transforms. |
| CO3 | Categories Various Compression Techniques.. |
| CO4 | Interpret Image Segmentation And Representation Techniques.. |

## POWER ELECTRONICS

| | |
|---|---|
| CO1 | Understand basic principle of power conversion. |
| CO2 | Design & implement a triggering / gate drive circuit for a power device |
| CO3 | Design & implement protection circuits for power devices. |
| CO4 | Understand, design & analyze different Power electronics converters. |
| CO5 | Utilize power converters in different industrial applications |

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Vilasrao Deshmukh Foundation

## CGPA (REVISED)

## B. E. (E&TC) Part – I

### MICROWAVE THEORY AND TECHNIQUES

| | |
|---|---|
| CO1 | Understand Various Microwave System Components Their Properties |
| CO2 | Appreciate That During Analysis/ Synthesis Of Microwave Systems, The Different Mathematical Treatment Is Required Compared To General Circuit Analysis |
| CO3 | Understand Microwave Systems For Different Practical Application. |

### MOBILE COMMUNICATION NETWORK

| | |
|---|---|
| CO1 | Understand The Working Principles Of The Mobile Communication Systems |
| CO2 | Understand The Relation Between The User Features And Underlying Technology |
| CO3 | Analyze Mobile Communication Systems For Improved Performance. |

### FIBRE OPTIC COMMUNICATION

| | |
|---|---|
| CO1 | Estimate Various Losses In Optical Fiber |
| CO2 | Design Fiber Optic Communication Link |
| CO3 | Find Out The Necessity Of Optical Amplifier. |

### COMPUTER NETWORK

| | |
|---|---|
| CO1 | Identify The Components Required To Build Different Types Of Network |
| CO2 | Choose The Required Functionality At Each Layer For Given Application Identify Solution For Each Function At Each Layer |
| CO3 | Trace The Flow Of Information From One To Another Node In The Network |

## B. E. (E&TCl) Part – II

### SATELLITE COMMUNICATION

| | |
|---|---|
| CO1 | Visualize The Architecture Of Satellite Systems As A Means Of High Speed, High Range Communication System. |
| CO2 | State Various Aspects Related To Satellite Systems Such As Orbital Equations, Sub-Systems In A Satellite, Link Budget, Modulation And Multiple Access Schemes. |
| CO3 | Solve Numerical Problems Related To Orbital Motion And Design Of Link Budget For The Given Parameters And Conditions. |

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to Manjara Sugar Barshi Road, Latur

## MECHATRONICS

| | |
|---|---|
| CO1 | Identification Of Key Elements Of Mechatronics System And Its Representation In Terms Of Block Diagram |
| CO2 | Understanding The Concept Of Signal Processing And Use Of Interfacing Systems Such As ADC. DAC, Digital I/O.. |
| CO3 | Interfacing Of Sensors, Actuators Using Appropriate DAQ Micro-Controller. |
| CO4 | Time And Frequency Domain Analysis Of System Model (For Control Application) |
| CO5 | PID Control Implementation On Real Time Systems. |
| CO6 | Development Of PLC Ladder Programming And Implementation Of Real Life System. |

## ARTIFICIAL INTELLIGENCE DEEP LEARNING

| | |
|---|---|
| CO1 | Identify The AI Based Problems. |
| CO2 | Apply Techniques To Solve The AI Problems. |
| CO3 | Define Learning And Explain Various Logic Inferences. |
| CO4 | Discuss Different Learning Techniques |

## DIGITAL VLSI DESIGN

| | |
|---|---|
| CO1 | Model Digital Circuit With. Simulate, Synthesis In Microwind. |
| CO2 | Understand Chip Level Issues And Need Of Testability. |
| CO3 | Design Digital CMOS Circuits For Specified Applications. |

IQAC Coordinator

H.O.D.

Principal

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PO CO OF ELECTRONIC & TELECOMMUNICATION ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2020-21

**Vision**

To be a Centre of technical education in electronics & electronic communication to provide excellent technical resources to create technocrats for the well-being of society..

**Mission**

- To educate the scholars of electronics & communication engineering stream with well-defined and rigorously structured curriculum and well equipped laboratories to meet the growing challenges of the Industry.
- Encouraging students with basic course knowledge to go for further higher Education.
- Promoting scholars towards research through constant interaction with research organizations and Industries..

**Graduate Attributes [Program Outcomes (POS)]**

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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

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

**PO-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.

**PO-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.

**PO-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.

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**PO-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.

**PO-7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. The knowledge of, and need for sustainable development.

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

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

**PO-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.

**PO-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.

**PO-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 Educational Objectives.**

| | |
|---|---|
| **PEO1** | To provide requisite Engineering knowledge as well as information about recent trends in the field of communication Engineering to the students |
| **PEO2** | To develop lifelong learning environment for multidisciplinary engineering education. |

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## Course Outcomes:

### SE (E&TC) Part – I

**ENGINEERING MATHEMATICS -III**

| | |
|---|---|
| CO1 | Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. |
| CO2 | Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing |
| CO3 | Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing |
| CO4 | Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields. |
| CO5 | Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing |

**DIGITAL LOGIC DESIGN**

| | |
|---|---|
| CO1 | Use the basic logic gates and various reduction techniques of digital logic circuit in detail. 2. 3. 4. |
| CO2 | Design combinational and sequential circuits. |
| CO3 | Design and implement hardware circuit to test performance and application. |
| CO4 | Understand the architecture and use of VHDL for basic operations and Simulate using simulation software. |

**Electronic Devices & Circuits**

| | |
|---|---|
| CO1 | Comply and verify parameters after exciting devices by any stated method. |
| CO2 | Implement circuit and test the performance. |
| CO3 | Analyze small signal model of FET and MOSFET. |
| CO4 | Explain behavior of FET at low frequency. |
| CO5 | Design an adjustable voltage regulator circuits. |

**BASIC HUMAN RIGHTS**

| | |
|---|---|
| CO1 | Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights. |
| CO2 | Strengthen the respect for human rights and fundamental freedoms. |
| CO3 | Enable all persons to participate effectively in a free society |
| CO4 | Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights. |

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| | |
|---|---|
| CO5 | Learn about regional, national, state, and local law that reinforces international human rights law. |
| CO6 | Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights |

**NETWORK ANALYSIS**

| | |
|---|---|
| CO1 | Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same. |
| CO2 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |
| CO3 | Identify issues related to transmission of signals, analyze different RLC networks. |
| CO4 | Find technology recognition for the benefit of the society |

**Analog Circuits**

| | |
|---|---|
| CO1 | Understand the characteristics of IC and Op-Amp and identify the internal structure. |
| CO2 | Understand and identify various manufacturing techniques |
| CO3 | Derive and determine various performances based parameters and their significance for Op-Amp |
| CO4 | Comply and verify parameters after exciting IC by any stated method |
| CO5 | Analyze and identify the closed loop stability considerations and I/O limitations |
| CO6 | Analyze and identify linear and nonlinear applications of Op-Amp. |
| CO7 | Understand and verify results (levels of V & I) with hardware implementation. |
| CO8 | Implement hardwired circuit to test performance and application for what it is being designed |

## SE (E&TC) Part – II

**ELECTRICAL MACHINES & INSTRUMENTS**

| | |
|---|---|
| CO1 | The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions. |
| CO2 | The skill to analyze the response of any electrical machine |
| CO3 | The ability to troubleshoot the operation of an electrical machine |
| CO4 | The ability to select a suitable measuring instrument for a given application |

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| | |
|---|---|
| CO5 | The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument. |

## ANALOG COMMUNICATION ENGINEERING

| | |
|---|---|
| CO1 | Understand and identify the fundamental concepts and various components of analog communication systems. |
| CO2 | Understand the concepts of modulation and demodulation techniques. |
| CO3 | Design circuits to generate modulated and demodulated wave. |
| CO4 | Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance. |
| CO5 | Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase). |
| CO6 | Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system |
| CO7 | Develop the ability to compare and contrast the strengths and weaknesses of various communication systems |

## MICROPROCESSOR

| | |
|---|---|
| CO1 | Learner gains ability to apply knowledge of engineering in designing different case studies. |
| CO2 | Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles |
| CO3 | Students can identify and formulate control and monitoring systems using microprocessors. |
| CO4 | Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications. |
| CO5 | Students will design cost effective real time system to serve engineering solution for Global, social and economic context. |
| CO6 | This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation. |
| CO7 | Learn use of hardware and software tools. 8. Develop interfacing to real world device |

## SIGNAL & SYSTEMS

| | |
|---|---|
| CO1 | Understand mathematical description and representation of continuous and discrete time signals and systems. |
| CO2 | Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system |
| CO3 | Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms |
| CO4 | Understand the limitations of Fourier transform and need for Laplace transform and develop |

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| | |
|---|---|
| | the ability to analyze the system in s- domain |
| CO5 | Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event |

**PRODUCT DESIGN ENGINEERING**

| | |
|---|---|
| CO1 | Create simple mechanical or other designs |
| CO2 | Create design documents for knowledge sharing |
| CO3 | Manage own work to meet design requirements |
| CO4 | Work effectively with colleagues |

**NUMERICAL METHODS AND COMPUTER PROGRAMMIMG**

| | |
|---|---|
| CO1 | Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem. |
| CO2 | Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques |
| CO3 | . Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values |
| CO4 | Prepare them to write computer programs for the numerical computational techniques |
| CO5 | Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc |
| CO6 | Understand procedure-oriented and object oriented programming concepts |
| CO7 | Capable of writing C and C++ programs efficiently |

## TE (E&TC) Part – I

**CONTROL SYSTEMS**

| | |
|---|---|
| CO1 | Model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer functions |
| CO2 | Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behaviour. . |
| CO3 | Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability |
| CO4 | Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis |
| CO5 | Determine the frequency response of a control system and use it to evaluate or adjust the relative stability |
| CO6 | Mdoel and analyse the control systems using state space analysis |
| CO7 | Design a P, PD, PI, or PID controller based on the transient and steady state response criteria. |

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## EIECTROMAGNETIC ENGINEERING

| | |
|---|---|
| CO1 | Understanding the vector fields E, D, H & B |
| CO2 | Cleared the Concepts Divergence and Stokes theorem |
| CO3 | Get an idea of the concepts: Work done, Potential, Potential gradient and dipole |
| CO4 | Get the idea of the terms Conductors, Dielectrics, boundary conditions and capacitance |
| CO5 | Understanding of Poisson's and Laplace's equations |
| CO6 | Get knowledge about Time Varying Field and Maxwell's Equations |
| CO7 | Get an idea of Uniform Plane Wave used for propa |

## DIGITAL SIGNAL PROCESSING

| | |
|---|---|
| CO1 | Represent discrete-time signals analytically and visualize in time domain 2, 3, 4. |
| CO2 | Understand the meaning and implications of the properties of systems and signals |
| CO3 | Understand transform domain and its significance and problems related to computational complexity |
| CO4 | Specify and design digital filters |
| CO5 | Draw the structure for realization of a given system |

## COMMUNICATION ENGINEERING

| | |
|---|---|
| CO1 | Understand the random process by the perceptive of channel noise. |
| CO2 | Analyze behavior of analog communication system in presence of channel noise. |
| CO3 | Analyze effect of channel noise on the analog communication system |
| CO4 | Design the Optimum Filter like Matched Filter to optimize the detector performan |

## PROFESSIONAL ELECTIVE-1 (COMPUTER ORGANIZATION

| | |
|---|---|
| CO1 | Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os. |
| CO2 | Analyze the principles of computer architecture using examples drawn from commercially available computers |
| CO3 | Analyze the principles of computer architecture using examples drawn from commercially available computers. |

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**ECONOMIC AND MANAGEMENT**

| | |
|---|---|
| CO1 | To impart knowledge, with respect to concepts, principles and practical applications of Economics, which govern the functioning of a firm/organization under different market conditions. |
| CO2 | To help the students to understand the fundamental concepts and principles of management: the basic roles, skills, functions of management, various organizational structures and basic knowledge of marketing |

## TE (E&TC) Part – II

**EMBEDDED SYSTEMS**

| | |
|---|---|
| CO1 | Explain ARM architecture |
| CO2 | Identify built-in peripherals and write programs for interfacing of I/O devices |
| CO3 | Write embedded C programs for ARM |
| CO4 | Design real world problems using the concepts of RTOS . |

**DIGITAL COMMUNICATION**

| | |
|---|---|
| CO1 | Understand the principles of digital communications system. |
| CO2 | Explain importance and use of probability and random variables in digital □ communication |
| CO3 | Characterize communication signal and system. |
| CO4 | Work out the practical and design implementation of different type of encoding and decoding techniques. |
| CO5 | To understand concepts of Information theory and various coding techniques. |
| CO6 | Understand the M-ary communication which is pre-requisites for Digital Commun |

**ANTENNA AND WAVE PROPAGATION**

| | |
|---|---|
| CO1 | Understand the concept of radiation through mathematical formulation |
| CO2 | Plot the characteristics of wire and aperture antennas. |
| CO3 | Develop the performance characteristics of array antenna. |
| CO4 | Measure the antenna parameters and understand its fundamentals. |
| CO5 | Understand the behavior of nature on em wave propagation |

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### POWER ELECTRONICS

| | |
|---|---|
| CO1 | Understand basic principle of power conversion. |
| CO2 | Design & implement a triggering / gate drive circuit for a power device |
| CO3 | Design & implement protection circuits for power devices. |
| CO4 | Understand, design & analyze different Power electronics converters. |
| CO5 | Utilize power converters in different industrial applications |

### (PROFESSIONAL ELECTIVE -II )DIGITAL IMAGE PROCESSING

| | |
|---|---|
| CO1 | Describe the fundamentals of Image Processing and Image transform techniques. |
| CO2 | Apply image enhancement technique in frequency and spatial domain |
| CO3 | Develop and analyze image compression techniques |
| CO4 | Demonstrate segmentation algorithms for general image. |
| CO5 | Apply morphological operations to images/ Improve segmented image output by morphological operations. |
| CO6 | Design and implement image processing algorithms for real-world problems. |

### CYBER SECURITY

| | |
|---|---|
| CO1 | Describe the fundamentals of Image Processing and Image transform techniques. |
| CO2 | Apply image enhancement technique in frequency and spatial domain |
| CO3 | Develop and analyze image compression techniques |
| CO4 | Demonstrate segmentation algorithms for general image. |
| CO5 | Apply morphological operations to images/ Improve segmented image output by morphological operations. |
| CO6 | Design and implement image processing algorithms for real-world problems. |

## B. E. (E&TC) Part – I

### RF ANTENNA AND MICROWAVE ENGINEERING

| | |
|---|---|
| CO1 | Ability to understand the basic operation and working of Microwave Tubes |
| CO2 | Identify the state of art microwave tubes and semiconductors and their real use In real life |
| CO3 | Application of microwave and RF antenna for industrial and scientific purpose |

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### (EL-1)SATELLITE COMMUNICATION AND RADAR ENGINEERING

| | |
|---|---|
| CO1 | Understand fundamental underlying principles of satellite communication |
| CO2 | Describe complete knowledge about the earth and space subsystems |
| CO3 | Have a basic knowledge of the use of Satellite system and mobile services provided. |
| CO4 | Explain the basics of satellite communication |
| CO5 | Explain and analyzes link budget of satellite signal for proper communication |
| CO6 | Use the different application of satellite communication |

### DIGITAL VLSI DESIGN

| | |
|---|---|
| CO1 | ]Model digital circuit with, simulate, synthesis in Microwind. |
| CO2 | Understand chip level issues and need of testability |
| CO3 | Design digital CMOS circuits for specified applications. |

### WIRELESS AND MOBILE COMMUNICATION)

| | |
|---|---|
| CO1 | Explain and apply the concepts telecommunication switching, traffic and networks. |
| CO2 | Analyze the telecommunication traffic. |
| CO3 | Analyze radio channel and cellular capacity |
| CO4 | Explain and apply concepts of GSM and CDMA system. |

## B. E. (E&TCI) Part – II

### OPTICAL FIBER COMMUNICATION

| | |
|---|---|
| CO1 | Estimate various losses in optical fiber. |
| CO2. | Design fiber optic communication link |
| CO3 | Find out the necessity of optical amplifier |

### COMPUTER NETWORKS

| | |
|---|---|
| CO1 | Identify the components required to build different types of network |
| CO2 | Choose the required functionality at each layer for given application identify solution for each function at each layer |
| CO3 | Trace the flow of information from one to another node in the network |

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**EL-III(IOT & SENSOR NETWORK)**

| | |
|---|---|
| CO1 | Explain in a concise manner how the general Internet as well as Internet of Things work. |
| CO2 | Understand constraints and opportunities of wireless and mobile networks for Internet of Things |
| CO3 | Use basic measurement tools to determine the real-time performance of packet based networks |
| CO4 | Analyze trade-offs in interconnected wireless embedded sensor networks. |
| CO5 | Understand the vision of IoT from a global context. |
| CO6 | Determine the Market perspective of IoT |
| CO7 | Use of Devices, Gateways and Data Management in IoT. |
| CO8 | Building state of the art architecture in IoT. |
| CO9 | Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints |

**EL-IV (INDUSTRIAL ORGANIZATION & PROJECT MANAGEMENT**

| | |
|---|---|
| CO1 | Students will able to follow types of industries. |
| CO2 | Students can evaluate time estimation of the project used in industry. |
| CO3 | Students will able to understand software evaluation used with industry |

IQAC Coordinator

H.O.D.

Prof Waghmare M.A.

Principal

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**PO-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.

**PO-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.

**PO-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.

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

**PO-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.

**PO-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.

**PO-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 Educational Objectives.**

| | |
|---|---|
| **PEO1** | To provide requisite Engineering knowledge as well as information about recent trends in the field of communication Engineering to the students |
| **PEO2** | To develop lifelong learning environment for multidisciplinary engineering education. |

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## Course Outcomes:

### SE (E&TC) Part – I

**ENGINEERING MATHEMATICS -III**

| | |
|---|---|
| CO1 | Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. |
| CO2 | Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing |
| CO3 | Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing |
| CO4 | Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields. |
| CO5 | Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing |

**DIGITAL LOGIC DESIGN**

| | |
|---|---|
| CO1 | Use the basic logic gates and various reduction techniques of digital logic circuit in detail. 2. 3. 4. |
| CO2 | Design combinational and sequential circuits. |
| CO3 | Design and implement hardware circuit to test performance and application. |
| CO4 | Understand the architecture and use of VHDL for basic operations and Simulate using simulation software. |

**Electronic Devices & Circuits**

| | |
|---|---|
| CO1 | Comply and verify parameters after exciting devices by any stated method. |
| CO2 | Implement circuit and test the performance. |
| CO3 | Analyze small signal model of FET and MOSFET. |
| CO4 | Explain behavior of FET at low frequency. |
| CO5 | Design an adjustable voltage regulator circuits. |

**BASIC HUMAN RIGHTS**

| | |
|---|---|
| CO1 | Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights. |
| CO2 | Strengthen the respect for human rights and fundamental freedoms. |
| CO3 | Enable all persons to participate effectively in a free society |
| CO4 | Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights. |

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| | |
|---|---|
| CO5 | Learn about regional, national, state, and local law that reinforces international human rights law. |
| CO6 | Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights |

**NETWORK ANALYSIS**

| | |
|---|---|
| CO1 | Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same. |
| CO2 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |
| CO3 | Identify issues related to transmission of signals, analyze different RLC networks. |
| CO4 | Find technology recognition for the benefit of the society |

**Analog Circuits**

| | |
|---|---|
| CO1 | Understand the characteristics of IC and Op-Amp and identify the internal structure. |
| CO2 | Understand and identify various manufacturing techniques |
| CO3 | Derive and determine various performances based parameters and their significance for Op-Amp |
| CO4 | Comply and verify parameters after exciting IC by any stated method |
| CO5 | Analyze and identify the closed loop stability considerations and I/O limitations |
| CO6 | Analyze and identify linear and nonlinear applications of Op-Amp. |
| CO7 | Understand and verify results (levels of V & I) with hardware implementation. |
| CO8 | Implement hardwired circuit to test performance and application for what it is being designed |

## SE (E&TC) Part – II

**ELECTRICAL MACHINES & INSTRUMENTS**

| | |
|---|---|
| CO1 | The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions. |
| CO2 | The skill to analyze the response of any electrical machine |
| CO3 | The ability to troubleshoot the operation of an electrical machine |
| CO4 | The ability to select a suitable measuring instrument for a given application |

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| | |
|---|---|
| CO5 | The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument. |

## ANALOG COMMUNICATION ENGINEERING

| | |
|---|---|
| CO1 | Understand and identify the fundamental concepts and various components of analog communication systems. |
| CO2 | Understand the concepts of modulation and demodulation techniques. |
| CO3 | Design circuits to generate modulated and demodulated wave. |
| CO4 | Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance. |
| CO5 | Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase). |
| CO6 | Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system |
| CO7 | Develop the ability to compare and contrast the strengths and weaknesses of various communication systems |

## MICROPROCESSOR

| | |
|---|---|
| CO1 | Learner gains ability to apply knowledge of engineering in designing different case studies. |
| CO2 | Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles |
| CO3 | Students can identify and formulate control and monitoring systems using microprocessors. |
| CO4 | Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications. |
| CO5 | Students will design cost effective real time system to serve engineering solution for Global, social and economic context. |
| CO6 | This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation. |
| CO7 | Learn use of hardware and software tools. 8. Develop interfacing to real world device |

## SIGNAL & SYSTEMS

| | |
|---|---|
| CO1 | Understand mathematical description and representation of continuous and discrete time signals and systems. |
| CO2 | Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system |
| CO3 | Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms |
| CO4 | Understand the limitations of Fourier transform and need for Laplace transform and develop |

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| | |
|---|---|
| | the ability to analyze the system in s- domain |
| CO5 | Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event |

**PRODUCT DESIGN ENGINEERING**

| | |
|---|---|
| CO1 | Create simple mechanical or other designs |
| CO2 | Create design documents for knowledge sharing |
| CO3 | Manage own work to meet design requirements |
| CO4 | Work effectively with colleagues |

**NUMERICAL METHODS AND COMPUTER PROGRAMMIMG**

| | |
|---|---|
| CO1 | Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem. |
| CO2 | Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques |
| CO3 | . Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values |
| CO4 | Prepare them to write computer programs for the numerical computational techniques |
| CO5 | Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc |
| CO6 | Understand procedure-oriented and object oriented programming concepts |
| CO7 | Capable of writing C and C++ programs efficiently |

## TE (E&TC) Part – I

**CONTROL SYSTEMS**

| | |
|---|---|
| CO1 | Model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer functions |
| CO2 | Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behaviour. . |
| CO3 | Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability |
| CO4 | Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis |
| CO5 | Determine the frequency response of a control system and use it to evaluate or adjust the relative stability |
| CO6 | Mdoel and analyse the control systems using state space analysis |
| CO7 | Design a P, PD, PI, or PID controller based on the transient and steady state response criteria. |

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## EIECTROMAGNETIC ENGINEERING

| | |
|---|---|
| CO1 | Understanding the vector fields E, D, H & B |
| CO2 | Cleared the Concepts Divergence and Stokes theorem |
| CO3 | Get an idea of the concepts: Work done, Potential, Potential gradient and dipole |
| CO4 | Get the idea of the terms Conductors, Dielectrics, boundary conditions and capacitance |
| CO5 | Understanding of Poisson's and Laplace's equations |
| CO6 | Get knowledge about Time Varying Field and Maxwell's Equations |
| CO7 | Get an idea of Uniform Plane Wave used for propa |

## DIGITAL SIGNAL PROCESSING

| | |
|---|---|
| CO1 | Represent discrete-time signals analytically and visualize in time domain 2, 3, 4. |
| CO2 | Understand the meaning and implications of the properties of systems and signals |
| CO3 | Understand transform domain and its significance and problems related to computational complexity |
| CO4 | Specify and design digital filters |
| CO5 | Draw the structure for realization of a given system |

## COMMUNICATION ENGINEERING

| | |
|---|---|
| CO1 | Understand the random process by the perceptive of channel noise. |
| CO2 | Analyze behavior of analog communication system in presence of channel noise. |
| CO3 | Analyze effect of channel noise on the analog communication system |
| CO4 | Design the Optimum Filter like Matched Filter to optimize the detector performan |

## PROFESSIONAL ELECTIVE-1 (COMPUTER ORGANIZATION

| | |
|---|---|
| CO1 | Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os. |
| CO2 | Analyze the principles of computer architecture using examples drawn from commercially available computers |
| CO3 | Analyze the principles of computer architecture using examples drawn from commercially available computers. |

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**ECONOMIC AND MANAGEMENT**

| | |
|---|---|
| CO1 | To impart knowledge, with respect to concepts, principles and practical applications of Economics, which govern the functioning of a firm/organization under different market conditions. |
| CO2 | To help the students to understand the fundamental concepts and principles of management: the basic roles, skills, functions of management, various organizational structures and basic knowledge of marketing |

## TE (E&TC) Part – II

**EMBEDDED SYSTEMS**

| | |
|---|---|
| CO1 | Explain ARM architecture |
| CO2 | Identify built-in peripherals and write programs for interfacing of I/O devices |
| CO3 | Write embedded C programs for ARM |
| CO4 | Design real world problems using the concepts of RTOS . |

**DIGITAL COMMUNICATION**

| | |
|---|---|
| CO1 | Understand the principles of digital communications system. |
| CO2 | Explain importance and use of probability and random variables in digital □ communication |
| CO3 | Characterize communication signal and system. |
| CO4 | Work out the practical and design implementation of different type of encoding and decoding techniques. |
| CO5 | To understand concepts of Information theory and various coding techniques. |
| CO6 | Understand the M-ary communication which is pre-requisites for Digital Commun |

**ANTENNA AND WAVE PROPAGATION**

| | |
|---|---|
| CO1 | Understand the concept of radiation through mathematical formulation |
| CO2 | Plot the characteristics of wire and aperture antennas. |
| CO3 | Develop the performance characteristics of array antenna. |
| CO4 | Measure the antenna parameters and understand its fundamentals. |
| CO5 | Understand the behavior of nature on em wave propagation |

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### POWER ELECTRONICS

| | |
|---|---|
| CO1 | Understand basic principle of power conversion. |
| CO2 | Design & implement a triggering / gate drive circuit for a power device |
| CO3 | Design & implement protection circuits for power devices. |
| CO4 | Understand, design & analyze different Power electronics converters. |
| CO5 | Utilize power converters in different industrial applications |

### (PROFESSIONAL ELECTIVE -II )DIGITAL IMAGE PROCESSING

| | |
|---|---|
| CO1 | Describe the fundamentals of Image Processing and Image transform techniques. |
| CO2 | Apply image enhancement technique in frequency and spatial domain |
| CO3 | Develop and analyze image compression techniques |
| CO4 | Demonstrate segmentation algorithms for general image. |
| CO5 | Apply morphological operations to images/ Improve segmented image output by morphological operations. |
| CO6 | Design and implement image processing algorithms for real-world problems. |

### CYBER SECURITY

| | |
|---|---|
| CO1 | Describe the fundamentals of Image Processing and Image transform techniques. |
| CO2 | Apply image enhancement technique in frequency and spatial domain |
| CO3 | Develop and analyze image compression techniques |
| CO4 | Demonstrate segmentation algorithms for general image. |
| CO5 | Apply morphological operations to images/ Improve segmented image output by morphological operations. |
| CO6 | Design and implement image processing algorithms for real-world problems. |

## B. E. (E&TC) Part – I

### RF ANTENNA AND MICROWAVE ENGINEERING

| | |
|---|---|
| CO1 | Ability to understand the basic operation and working of Microwave Tubes |
| CO2 | Identify the state of art microwave tubes and semiconductors and their real use In real life |
| CO3 | Application of microwave and RF antenna for industrial and scientific purpose |

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### (EL-1)SATELLITE COMMUNICATION AND RADAR ENGINEERING

| | |
|---|---|
| CO1 | Understand fundamental underlying principles of satellite communication |
| CO2 | Describe complete knowledge about the earth and space subsystems |
| CO3 | Have a basic knowledge of the use of Satellite system and mobile services provided. |
| CO4 | Explain the basics of satellite communication |
| CO5 | Explain and analyzes link budget of satellite signal for proper communication |
| CO6 | Use the different application of satellite communication |

### DIGITAL VLSI DESIGN

| | |
|---|---|
| CO1 | ]Model digital circuit with, simulate, synthesis in Microwind. |
| CO2 | Understand chip level issues and need of testability |
| CO3 | Design digital CMOS circuits for specified applications. |

### WIRELESS AND MOBILE COMMUNICATION)

| | |
|---|---|
| CO1 | Explain and apply the concepts telecommunication switching, traffic and networks. |
| CO2 | Analyze the telecommunication traffic. |
| CO3 | Analyze radio channel and cellular capacity |
| CO4 | Explain and apply concepts of GSM and CDMA system. |

## B. E. (E&TCI) Part – II

### OPTICAL FIBER COMMUNICATION

| | |
|---|---|
| CO1 | Estimate various losses in optical fiber. |
| CO2. | Design fiber optic communication link |
| CO3 | Find out the necessity of optical amplifier |

### COMPUTER NETWORKS

| | |
|---|---|
| CO1 | Identify the components required to build different types of network |
| CO2 | Choose the required functionality at each layer for given application identify solution for each function at each layer |
| CO3 | Trace the flow of information from one to another node in the network |

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**EL-III(IOT & SENSOR NETWORK)**

| | |
|---|---|
| CO1 | Explain in a concise manner how the general Internet as well as Internet of Things work. |
| CO2 | Understand constraints and opportunities of wireless and mobile networks for Internet of Things |
| CO3 | Use basic measurement tools to determine the real-time performance of packet based networks |
| CO4 | Analyze trade-offs in interconnected wireless embedded sensor networks. |
| CO5 | Understand the vision of IoT from a global context. |
| CO6 | Determine the Market perspective of IoT |
| CO7 | Use of Devices, Gateways and Data Management in IoT. |
| CO8 | Building state of the art architecture in IoT. |
| CO9 | Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints |

**EL-IV (INDUSTRIAL ORGANIZATION & PROJECT MANAGEMENT**

| | |
|---|---|
| CO1 | Students will able to follow types of industries. |
| CO2 | Students can evaluate time estimation of the project used in industry. |
| CO3 | Students will able to understand software evaluation used with industry |

IQAC Coordinator

H.O.D.

Prof Waghmare M.A.

Principal

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(Approved by AICTE, New Delhi & recognized by Govt. of Maharashtra and affiliated to DBATU Lonere, Dist. Raigad)

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# PO CO OF ELECTRONIC & TELECOMMUNICATION ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2018-19

**Vision**

To be a Centre of technical education in electronics & electronic communication to provide excellent technical resources to create technocrats for the well-being of society..

**Mission**

- To educate the scholars of electronics & communication engineering stream with well-defined and rigorously structured curriculum and well equipped laboratories to meet the growing challenges of the Industry.
- Encouraging students with basic course knowledge to go for further higher Education.
- Promoting scholars towards research through constant interaction with research organizations and Industries..

**Graduate Attributes [Program Outcomes (POS)]**

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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

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

**PO-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.

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**PO-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.

**PO-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.

**PO-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.

**PO-7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. The knowledge of, and need for sustainable development.

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

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

**PO-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.

**PO-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.

**PO-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.

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## ENGINEERING MATHEMATICS –III

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. |
| CO2 | Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing |
| CO3 | Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing |
| CO4 | Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields. |
| CO5 | Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing |

## DIGITAL LOGIC DESIGN

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Use the basic logic gates and various reduction techniques of digital logic circuit in detail. |
| CO2 | Understand the architecture and use of VHDL for basic operations and Simulate using simulation software. |
| CO3 | Design combinational and sequential circuits |
| CO4 | Design and implement hardware circuit to test performance and application. |

## ELECTRONICS CIRCUITS & DEVICES-I

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Demonstrate Semiconductor Diode and Diode circuits |
| CO2 | Implement circuit and test the performance. |
| CO3 | Analyze small signal model of FET and MOSFET. |
| CO4 | Explain behavior of FET at low frequency. |
| CO5 | Design an adjustable voltage regulator circuits & Oscillator circuits |

## NUMERICAL ANALYSIS & COMPUTATION

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem. |

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| | |
|---|---|
| CO2 | Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques |
| CO3 | Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values |
| CO4 | Prepare them to write computer programs for the numerical computational techniques |
| CO5 | Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc |

NETWORK THEORY

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same. |
| CO2 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |
| CO3 | Identify issues related to transmission of signals, analyze different RLC networks. |
| CO4 | Find technology recognition for the benefit of the society |
| CO5 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |

PROFESSIONAL COMMUNICATION

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Communication with essential communication skills (writing, verbal and non-verbal) |
| CO2 | Master the presentation skill and be ready for facing interviews. |
| CO3 | Do effective Business Correspondence |

SE (E&TC) Part – II

ENGINEERING MATHEMATICS –IV

**After successfully completing the course students will be able to**

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| | |
|---|---|
| CO1 | Solve Z-Transform |
| CO2 | Perform Linear Transformations |
| | Understand & solve Complex Integration |
| | Understand & solve Probability distribution |
| CO3 | Understand & solve a function of a Complex Variable |

**ELECTRONICS DEVICS & CIRCUITS-II**

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Demonstrate Transistors at high Frequencies |
| CO2 | Explain Application of OP-AMP with Diode |
| CO3 | Demonstrate Operational Amplifier and their General linear application |
| CO4 | Demonstrate Power Amplifiers |
| CO5 | Explain specification and use of various Voltage Regulators ICS |

**ANALOG COMMUNICATION SYSTEMS**

| | |
|---|---|
| CO1 | Understand and identify the fundamental concepts and various components of analog communication systems. |
| CO2 | Understand the concepts of modulation and demodulation techniques. |
| CO3 | Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system |
| CO4 | Design circuits to generate modulated and demodulated wave. |
| CO5 | Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase). |

**SIGNAL & SYSTEMS**

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Understand mathematical description and representation of continuous and discrete time signals and systems. |
| CO2 | Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system |
| CO3 | Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms |
| CO4 | Understand the limitations of Fourier transform and need for Laplace transform and develop |

**MICROPROCESSOR & INTERFACING**

**After successfully completing the course students will be able to**

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| | |
|---|---|
| CO1 | Explain Intel 8086 Architecture |
| CO2 | Design the 8086 CPU module |
| CO3 | Explain 8087 coprocessor |
| CO4 | . Learner gains ability to apply knowledge of engineering in designing different case studies |

**OBJECT ORIENTED PROGRAMMING**

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Understand: object oriented programming |
| CO2 | Understand: catching an exception & Exception objects |
| CO3 | Define: Components and Categories |
| CO4 | Describe: Different types of inheritance |

## TE (E&TC) Part – I&II

**DATA STRUCTURES AND COMPUTER ALGORITHMS**

| | |
|---|---|
| CO1 | Able to understand the concepts of data structure, data type and array data structure. |
| CO2 | Able to analyze algorithms and determine their time complexity. |
| CO3 | Able to implement linked list data structure to solve various problems. |
| CO4 | Able to understand and apply various data structure such as stacks, queues, trees and graphs to solve various computing problems using C-programming language. |
| CO5 | Able to implement and know when to apply standard algorithms for searching and sorting. |
| CO6 | Able to effectively choose the data structure that efficiently model the information in a problem |

**DIGITAL SIGNAL PROCESSING**

| | |
|---|---|
| CO1 | Understand the Discrete Time Signals Analytically & Visualize them in the time and frequency domain |
| CO2 | Able to Understand the Transform domain & it's significance & problems related to computational complexity. |
| CO3 | Be able to specify & design any digital filters. |

**CONTROL SYSTEMS**

| | |
|---|---|
| CO1 | Represent the mathematical model of a system |
| CO2 | Determine the response of different order systems for various step inputs |

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| | |
|---|---|
| CO3 | Analyse the stability of the system |

**STOCHASTIC PROCESS**

| | |
|---|---|
| CO1 | Have a fundamental knowledge of the basic probability concepts |
| CO2 | Have a good knowledge of standard distributions which can describe real life phenomena |
| CO3 | Acquire skills in handling situations involving several random variable and functions of random variables. |
| CO4 | Understand and characterize phenomena which evolve with respect to time in probabilistic Manner |

**EMBEDDED SYSTEM DESIGN**

| | |
|---|---|
| CO1 | After successfully completing the course students will be able to describe the microcontroller and ARM Processor Architecture and its Features. |
| CO2 | Learn importance of microcontroller and ARM Processor in designing embedded applications. |
| CO3 | Learn use of hardware and software tools. |
| CO4 | Develop interfacing to real world devices |

**PROFESSIONAL ETHICS**

| | |
|---|---|
| CO1 | Be able to distinguish among morals, values, ethics, and the law and to explore how they impact professional practice |
| CO2 | Have an increased personal understanding of issues related to ethics and the law |
| CO3 | Have examined one's own ethical decision-making processes and develop guidelines for enhancing one's ability to generate ethical behavior and solutions to conflicts arising in the practice. |

**MINI PROJECT-I**

| | |
|---|---|
| CO1 | Demonstrate a through and systematic understanding of project contents. |
| CO2 | Understand methodologies and professional way of documentation and communication. |
| CO3 | Know the key stages in development of the project. |
| CO4 | Extend or use the idea in mini project for major project |

**DIGITAL COMMUNICATION SYSTEMS**

| | |
|---|---|
| CO1 | Perform the time and frequency domain analysis of the signals in a digital communication systems. |
| CO2 | Design a suitable source and channel coding scheme for a communication system. |

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| | |
|---|---|
| CO3 | Analyze Performance of Multiple Access and Spread Spectrum Techniques. |

**ELECTROMAGNETIC ENGINEERING**

| | |
|---|---|
| CO1 | Apply vector calculus to static electric-magnetic fields in different engineering situations |
| CO2 | Analyze Maxwell's equations in different forms (differential & integral) & apply them to engineering problems. |
| CO3 | Examine the phenomena of wave propagation in different media & its interfaces & in applications of microwave engineering |
| CO4 | Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications. |

**POWER ELECTRONICS**

| | |
|---|---|
| CO1 | Demonstrate an understanding of fundamentals of thyristor family. |
| CO2 | Analyze the various applications and circuits based on thyristor . |
| CO3 | Build and test circuits using power devices such as SCR, IGBT and MOSFET. |
| CO4 | Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters, how to analyze these rectifiers , inverters and some basic application examples |

**ELECTRONIC INSTRUMENTS AND MEASUREMENTS**

| | |
|---|---|
| CO1 | To identify various errors in measurement system and correct them. |
| CO2 | To know the fundamentals of measuring systems including the particular limitations and capabilities of a number of measuring devices (pressure transducers, strain gages, thermocouples, etc.) and equipments (oscilloscope, spectrum analyser, etc.). |
| CO3 | To be familiar with various computer controlled test systems |

**PROFESSIONAL APTITUDE AND LOGICAL REASONING**

| | |
|---|---|
| CO1 | Crack different aptitude tests of various competitive exams. |
| CO2 | Achieve success in recruitment process of various industries. |

**MINI PROJECT-II**

| | |
|---|---|
| CO1 | Demonstrate a through and systematic understanding of project contents. |
| CO2 | Understand methodologies and professional way of documentation and communication. |
| CO3 | Know the key stages in development of the project. |
| CO4 | Extend or use the idea in mini project for major project. |

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# BE (E&TC) Part – I&II

**Digital VLSI DESIGN**

| | |
|---|---|
| CO1 | Model digital circuit with, simulate, synthesis in Microwind |
| CO2 | Understand chip level issues and need of testability. |
| CO3 | Design digital CMOS circuits for specified applications |

**RF Antenna & Microwave engineering**

| | |
|---|---|
| CO1 | Ability to understand the basic operation and working of Microwave Tube |
| CO2 | Identify the state of art microwave tubes and semiconductors and their real use In real life |
| CO3 | Application of microwave and RF antenna for industrial and scientific purpose |

**Satellite Communication & Radar Engineering**

| | |
|---|---|
| CO1 | Understand fundamental underlying principles of satellite communication |
| CO2 | Describe complete knowledge about the earth and space subsystems |
| CO3 | Have a basic knowledge of the use of Satellite system and mobile services provided. |
| CO4 | Explain the basics of satellite communication |
| CO5 | Explain and analyzes link budget of satellite signal for proper communication |
| CO6 | Use the different application of satellite communication |

**Wireless & Mobile Communication**

| | |
|---|---|
| CO1 | Explain and apply the concepts telecommunication switching, traffic and networks. |
| CO2 | Analyze the telecommunication traffic. |
| CO3 | Analyze radio channel and cellular capacity. |
| CO4 | Explain and apply concepts of GSM and CDMA system |

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| | Computer Network |
|---|---|
| CO1 | Identify the components required to build different types of network |
| CO2 | Choose the required functionality at each layer for given application identify solution for each function at each layer |
| CO3 | Trace the flow of information from one to another node in the network |

| | Optical Fiber Communication |
|---|---|
| CO1 | Estimate various losses in optical fiber, |
| CO2 | Design fiber optic communication link |
| CO3 | Find out the necessity of optical amplifier. |

| | Internet Of Things & Sensor |
|---|---|
| CO1 | Explain in a concise manner how the general Internet as well as Internet of Things work |
| CO2 | Understand programming using python and raspberry PI . |
| CO3 | Use basic measurement tools to determine the real-time performance of packet based networks. |
| CO4 | Analyze trade-offs in interconnected wireless embedded sensor networks. |
| CO5 | Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints. |
| CO6 | To study different hardware physical devices like Beagle bone , Black cubiboard. |

| | Industrial Organization & Project Management |
|---|---|
| CO1 | Students will able to follow types of industries. |
| CO2 | Students can evaluate time estimation of the project used in industry |
| CO3 | Students will able to understand software evaluation used with industry. |

VDF School of Engg. & Tech. Educity New M.I.D.C Latur

IQAC Coordinator

H. O. D.

Principal.

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(Approved by AICTE, New Delhi & recognized by Govt. of Maharashtra and affiliated to DBATU Lonere, Dist. Raigad)

T (02382) 267731/32/33 Email-info.engg@vdf.in Website: www.vdfengineering.co.in (DTE Code: 2254)

# PO CO OF ELECTRONIC & TELECOMMUNICATION ENGINEERING DEPARTMENT

## ACADEMIC YEAR 2018-19

**Vision**

To be a Centre of technical education in electronics & electronic communication to provide excellent technical resources to create technocrats for the well-being of society..

**Mission**

- To educate the scholars of electronics & communication engineering stream with well-defined and rigorously structured curriculum and well equipped laboratories to meet the growing challenges of the Industry.
- Encouraging students with basic course knowledge to go for further higher Education.
- Promoting scholars towards research through constant interaction with research organizations and Industries..

**Graduate Attributes [Program Outcomes (POS)]**

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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

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

**PO-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.

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**PO-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.

**PO-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.

**PO-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.

**PO-7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. The knowledge of, and need for sustainable development.

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

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

**PO-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.

**PO-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.

**PO-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.

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## ENGINEERING MATHEMATICS –III

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits. |
| CO2 | Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing |
| CO3 | Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing |
| CO4 | Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields. |
| CO5 | Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing |

## DIGITAL LOGIC DESIGN

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Use the basic logic gates and various reduction techniques of digital logic circuit in detail. |
| CO2 | Understand the architecture and use of VHDL for basic operations and Simulate using simulation software. |
| CO3 | Design combinational and sequential circuits |
| CO4 | Design and implement hardware circuit to test performance and application. |

## ELECTRONICS CIRCUITS & DEVICES-I

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Demonstrate Semiconductor Diode and Diode circuits |
| CO2 | Implement circuit and test the performance. |
| CO3 | Analyze small signal model of FET and MOSFET. |
| CO4 | Explain behavior of FET at low frequency. |
| CO5 | Design an adjustable voltage regulator circuits & Oscillator circuits |

## NUMERICAL ANALYSIS & COMPUTATION

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem. |

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| | |
|---|---|
| CO2 | Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques |
| CO3 | Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values |
| CO4 | Prepare them to write computer programs for the numerical computational techniques |
| CO5 | Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc |

NETWORK THEORY

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same. |
| CO2 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |
| CO3 | Identify issues related to transmission of signals, analyze different RLC networks. |
| CO4 | Find technology recognition for the benefit of the society |
| CO5 | Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters |

PROFESSIONAL COMMUNICATION

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Communication with essential communication skills (writing, verbal and non-verbal) |
| CO2 | Master the presentation skill and be ready for facing interviews. |
| CO3 | Do effective Business Correspondence |

SE (E&TC) Part – II

ENGINEERING MATHEMATICS –IV

**After successfully completing the course students will be able to**

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| | |
|---|---|
| CO1 | Solve Z-Transform |
| CO2 | Perform Linear Transformations |
| | Understand & solve Complex Integration |
| | Understand & solve Probability distribution |
| CO3 | Understand & solve a function of a Complex Variable |

**ELECTRONICS DEVICS & CIRCUITS-II**

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Demonstrate Transistors at high Frequencies |
| CO2 | Explain Application of OP-AMP with Diode |
| CO3 | Demonstrate Operational Amplifier and their General linear application |
| CO4 | Demonstrate Power Amplifiers |
| CO5 | Explain specification and use of various Voltage Regulators ICS |

**ANALOG COMMUNICATION SYSTEMS**

| | |
|---|---|
| CO1 | Understand and identify the fundamental concepts and various components of analog communication systems. |
| CO2 | Understand the concepts of modulation and demodulation techniques. |
| CO3 | Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system |
| CO4 | Design circuits to generate modulated and demodulated wave. |
| CO5 | Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase). |

**SIGNAL & SYSTEMS**

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Understand mathematical description and representation of continuous and discrete time signals and systems. |
| CO2 | Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system |
| CO3 | Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms |
| CO4 | Understand the limitations of Fourier transform and need for Laplace transform and develop |

**MICROPROCESSOR & INTERFACING**

**After successfully completing the course students will be able to**

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| | |
|---|---|
| CO1 | Explain Intel 8086 Architecture |
| CO2 | Design the 8086 CPU module |
| CO3 | Explain 8087 coprocessor |
| CO4 | . Learner gains ability to apply knowledge of engineering in designing different case studies |

**OBJECT ORIENTED PROGRAMMING**

**After successfully completing the course students will be able to**

| | |
|---|---|
| CO1 | Understand: object oriented programming |
| CO2 | Understand: catching an exception & Exception objects |
| CO3 | Define: Components and Categories |
| CO4 | Describe: Different types of inheritance |

## TE (E&TC) Part – I&II

**DATA STRUCTURES AND COMPUTER ALGORITHMS**

| | |
|---|---|
| CO1 | Able to understand the concepts of data structure, data type and array data structure. |
| CO2 | Able to analyze algorithms and determine their time complexity. |
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**DIGITAL SIGNAL PROCESSING**

| | |
|---|---|
| CO1 | Understand the Discrete Time Signals Analytically & Visualize them in the time and frequency domain |
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| CO1 | Represent the mathematical model of a system |
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|---|---|
| CO3 | Analyse the stability of the system |

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| | |
|---|---|
| CO1 | Have a fundamental knowledge of the basic probability concepts |
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**MINI PROJECT-I**

| | |
|---|---|
| CO1 | Demonstrate a through and systematic understanding of project contents. |
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| | |
|---|---|
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| | |
|---|---|
| CO3 | Analyze Performance of Multiple Access and Spread Spectrum Techniques. |

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| | |
|---|---|
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| CO2 | Achieve success in recruitment process of various industries. |

**MINI PROJECT-II**

| | |
|---|---|
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# BE (E&TC) Part – I&II

**Digital VLSI DESIGN**

| | |
|---|---|
| CO1 | Model digital circuit with, simulate, synthesis in Microwind |
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**Satellite Communication & Radar Engineering**

| | |
|---|---|
| CO1 | Understand fundamental underlying principles of satellite communication |
| CO2 | Describe complete knowledge about the earth and space subsystems |
| CO3 | Have a basic knowledge of the use of Satellite system and mobile services provided. |
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| CO6 | Use the different application of satellite communication |

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| | |
|---|---|
| CO1 | Explain and apply the concepts telecommunication switching, traffic and networks. |
| CO2 | Analyze the telecommunication traffic. |
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| | Computer Network |
|---|---|
| CO1 | Identify the components required to build different types of network |
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| CO1 | Estimate various losses in optical fiber, |
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|---|---|
| CO1 | Explain in a concise manner how the general Internet as well as Internet of Things work |
| CO2 | Understand programming using python and raspberry PI . |
| CO3 | Use basic measurement tools to determine the real-time performance of packet based networks. |
| CO4 | Analyze trade-offs in interconnected wireless embedded sensor networks. |
| CO5 | Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints. |
| CO6 | To study different hardware physical devices like Beagle bone , Black cubiboard. |

| | Industrial Organization & Project Management |
|---|---|
| CO1 | Students will able to follow types of industries. |
| CO2 | Students can evaluate time estimation of the project used in industry |
| CO3 | Students will able to understand software evaluation used with industry. |

VDF School of Engg. & Tech. Educity New M.I.D.C Latur

IQAC Coordinator

H. O. D.

Principal.

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GROUP OF INSTITUTIONS
VDF School of Engg.&Tech.
New MIDC,Latur-413531

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(Approved by AICTE, New Delhi & recognized by Govt. of Maharashtra and affiliated to DBATU Lonere, Dist. Raigad)

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# PO CO OF MECHANICAL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2021-22

## Vision

The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students.

## Mission

Imparting quality education, looking after holistic development of students and conducting need based research and extension.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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, 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 Vision The vision of the department is to achieve



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excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| PEO1 | Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices. |
| PEO2 | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| PEO3 | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| PEO4 | Graduates are expected to continue personal development through professional study and self-learning. |
| PEO5 | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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## Course Outcomes:

### SE (Mechanical) Part – I

**Engineering Mathematics-III**

| | |
|---|---|
| CO1 | Expose the learners to different processes used in physics for industrial and technological applications. |
| CO2 | Understand the importance of Applied Physics in physical phenomena. |
| CO3 | Acquire Basic knowledge of Oscillation for Simple Harmonic, Mechanical and electrical simple harmonic oscillators. |
| CO4 | Demonstrate knowledge of quantum mechanics and thermal physics. |
| CO5 | Employ the knowledge of optical instruments mirrors and lens. |
| CO6 | Implement the concept thermo dynamical equations and their applications in various fields of geometric optics |

**Fluid Mechanics**

| | |
|---|---|
| CO1 | Define fluid, define and calculate various properties of fluid |
| CO2 | Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies |
| CO3 | Explain various types of flow. Calculate acceleration of fluid particles |
| CO4 | Apply Bernoulli's equation to simple problems in fluid mechanics |
| CO5 | Explain laminar and turbulent flows on flat plates and through pipes |
| CO6 | Explain and use dimensional analysis to simple problems in fluid mechanics |
| CO7 | Understand centrifugal pump. |

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**Thermodynamics**

| | |
|---|---|
| CO1 | Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics. |
| CO2 | Studied different laws of thermodynamics and apply these to simple thermal systems to study energy balance |
| CO3 | Studied Entropy, application and disorder. |
| CO4 | Studied various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes. |
| CO5 | Represent phase diagram of pure substance (steam) on different thermodynamic planes like p-v, T-s, h-s, etc. Show various constant property lines on them. |

**Machine Drawing and CAD Lab**

| | |
|---|---|
| CO1 | Interpret the object with the help of given sectional and orthographic views. |
| CO2 | Construct the curve of intersection of two solids |
| CO3 | Draw machine element using keys, cotter, knuckle, bolted and welded joint |
| CO4 | Assemble details of any given part. i. e. valve, pump , machine tool part etc. |
| CO5 | Represent tolerances and level of surface finish on production drawings |
| CO6 | Understand various creating and editing commands in Auto Cad |

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## SE (Mechanical) Part – II

### Manufacturing Processes-I

| | |
|---|---|
| CO1 | Identify castings processes, working principles and applications and list various defects in metal casting |
| CO2 | Understand the various metal forming processes, working principles and applications |
| CO3 | Classify the basic joining processes and demonstrate principles of welding, brazing and soldering. |
| CO4 | Study center lathe and its operations including plain, taper turning, work holding devices and cutting tool. |
| CO5 | Understand milling machines and operations, cutters and indexing for gear cutting. |
| CO6 | Study shaping, planing and drilling, their types and related tooling's |

### Theory of Machines- I

| | |
|---|---|
| CO1 | Define basic terminology of kinematics of mechanisms |
| CO2 | Classify planar mechanisms and calculate its degree of freedom |
| CO3 | Perform kinematic analysis of a given mechanism using ICR and RV methods |
| CO4 | Introduction of different types of lubrication system. |
| CO5 | Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach |
| CO6 | Perform balancing of unbalance forces in rotating masses, different types of single/multi cylinder reciprocating engines in different positions. |

### Basic Human Rights

| | |
|---|---|
| CO1 | Understand the history of human rights. |
| CO2 | Learn to respect others caste, religion, region and culture. |
| CO3 | Be aware of their rights as Indian citizen. |
| CO4 | Understand the importance of groups and communities in the society. |
| CO5 | Realize the philosophical and cultural basis and historical perspectives of human rights. |
| CO6 | Make them aware of their responsibilities towards the nation. |

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**Strength of Materials**

| | |
|---|---|
| CO1 | State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ, etc. |
| CO2 | Recognize the stress state (tension, compression, bending, shear, etc.) and calculate the value of stress developed in the component in axial/eccentric static and impact load cases. |
| CO3 | Distinguish between uniaxial and multiaxial stress situation and calculate principal stresses, max. Shear stress, their planes and max. Normal and shear stresses on a given plane. |
| CO4 | Analyze given beam for calculations of SF and BM |
| CO5 | Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's , Area-moment and superposition methods |

**Applied Thermodynamics**

| | |
|---|---|
| CO1 | Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air, equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel. |
| CO2 | Studied and Analyze gas power cycles and vapour power cycles and derive expressions for the performance parameters like thermal efficiency. |
| CO3 | Classify various types of boiler, nozzle, steam turbine and condenser used in steam power plant. |
| CO4 | Classify various types condenser, nozzle and derived equations for its efficiency. |
| CO5 | Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors. |

**Fluid Machinery**

| | |
|---|---|
| CO1 | Understand and apply momentum equation |
| CO2 | Understand and explain Hydrodynamic Machines |
| CO3 | Explain difference between impulse and reaction turbines |
| CO4 | Find efficiencies, draw velocity triangles |
| CO5 | Explain governing mechanisms for hydraulic turbines |
| CO6 | Explain working of various types of pumps, draw velocity diagrams, do simple calculations |
| CO7 | Design simple pumping systems |



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## TE (Mechanical) Part – I

### Heat Transfer

| | |
|---|---|
| CO1 | Explain the laws of heat transfer and deduce the general heat conduction equation and to explain it for 1-D steady state heat transfer in regular shape bodies |
| CO2 | Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transferInterpret the extended surfaces |
| CO3 | Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions |
| CO4 | Describe the Boiling heat transfer, mass transfer and Evaluate the heat exchanger |
| CO5 | and examine the LMTD and NTU methods applied to engineering problems |
| CO6 | Explain the thermal radiation black body, emissivity and reflectivity and evaluationof view factor and radiation shields |

### Applied Thermodynamics - I

| | |
|---|---|
| CO1 | Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air,equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel. |
| CO2 | Study and Analyze gas power cycles and vapour power cycles like Otto, Diesel, dual, Joule and Rankine cycles and derive expressions for the performance parameters like thermal efficiency, Pm |
| CO3 | Classify various types of boiler, nozzle, steam turbine and condenser used in steam power plant. |
| CO4 | Classify various types of IC engines. Sketch the cut section of typical diesel engine and label its components. Define the terms like TDC, BDC, rc, etc. |
| CO5 | Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors. |

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**Applied Thermodynamics Lab**

| | |
|---|---|
| CO1 | Conduct test on Bomb calorimeter, nozzle, steam turbine, condenser, compressor etc. to study their performance. |
| CO2 | Draw performance curves of these machines. |
| CO3 | Analyze the results obtained from the tests. |
| CO4 | Draw conclusions based on the results of the experiments |
| CO5 | Based on your visit to Industry, sketch its layout and write specifications. |

**Machine Design Practice - I**

| | |
|---|---|
| CO1 | Apply design process to an open ended problem |
| CO2 | Determine suitable material and size for structural component of machine/system |
| CO3 | Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing |
| CO4 | Choose logically and defend selection of design factors |
| CO5 | Design of components for given part/system i.e. shaft, keys, coupling, links, screws, springs etc. |
| CO6 | Work effectively as a part of design group/team |
| CO7 | Have good communication skill, orally, graphically as well as in writing |

**Theory of Machines Lab - II**

| | |
|---|---|
| CO1 | Explain various types of gear boxes, gear trains, belt and rope drives |
| CO2 | Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel |
| CO3 | Measure vibration parameters in single degree of freedom systems |
| CO4 | Evaluating natural frequency of 1 dof |

**Field Training/Internship/Industrial Training - II**

| | |
|---|---|
| CO1 | To make the students aware of industrial culture and organizational setup |
| CO2 | To create awareness about technical report writing among the student. |

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## TE (Mechanical) Part – II

### Manufacturing Processes - II

| | |
|---|---|
| CO1 | Understand the process of powder metallurgy and its applications |
| CO2 | Calculate the cutting forces in orthogonal and oblique cutting |
| CO3 | Evaluate the machinability of materials |
| CO4 | Understand the abrasive processes |
| CO5 | Explain the different precision machining processes |
| CO6 | Design jigs and fixtures for given application |

### Machine Design - II

| | |
|---|---|
| CO1 | Define function of bearing and classify bearings. |
| CO2 | Understanding failure of bearing and their influence on its selection. |
| CO3 | Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter. |
| CO4 | Select materials and configuration for machine element like gears, belts and chain |
| CO5 | Design of elements like gears, belts and chain for given power rating |
| CO6 | Design thickness of pressure vessel using thick and thin criteria |

### Applied Thermodynamics – II

| | |
|---|---|
| CO1 | Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air, equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel. |
| CO2 | Study and Analyze gas power cycles and vapour power cycles like Otto, Diesel, dual, Joule and Rankine cycles and derive expressions for the performance parameters like thermal efficiency, Pm power plant. |
| CO3 | Classify various types of IC engines. Sketch the cut section of typical diesel engine and label its components. Define the terms like TDC, BDC, rc, etc. |
| CO4 | Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors. |

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**Additive Manufacturing**

| | |
|---|---|
| CO1 | Understand the importance of Additive Manufacturing |
| CO2 | Classify the different AM processes |
| CO3 | Design for AM processes |
| CO4 | Understand the applications of AM |
| CO5 | Differentiate the post processing processes |

**Quantitative Techniques in Project Management**

| | |
|---|---|
| CO1 | Define and formulate research models to solve real life problems for allocating limited resources by linear programming. |
| CO2 | Apply transportation and assignment models to real life situations. |
| CO3 | Apply queuing theory for performance evaluation of engineering and management systems. |
| CO4 | Apply the mathematical tool for decision making regarding replacement of items in real life. |
| CO5 | Determine the EOQ, ROP and safety stock for different inventory models. |
| CO6 | Construct a project network and apply CPM and PERT method. |

**Renewable Energy Sources**

| | |
|---|---|
| CO1 | Explain the difference between renewable and non-renewable energy |
| CO2 | Describe working of solar collectors |
| CO3 | Explain various applications of solar energy |
| CO4 | Describe working of other renewable energies such as wind, biomass |

**Solar Energy**

| | |
|---|---|
| CO1 | Describe measurement of direct, diffuse and global solar radiations falling on horizontal and inclined surfaces. |
| CO2 | Analyze the performance of flat plate collector, air heater and concentrating type collector. |
| CO3 | Understand test procedures and apply these while testing different types of collectors. |
| CO4 | Study and compare various types of thermal energy storage systems. |
| CO5 | Analyze payback period and annual solar savings due to replacement of conventional systems. |
| CO6 | Design solar water heating system for a few domestic and commercial applications. |

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**Metrology and Quality Control Lab**

| | |
|---|---|
| CO1 | Measure linear, angular circular features, dimensional and geometric features |
| CO2 | Measure surface roughness of components |
| CO3 | Calibration of metrological equipment |

**Machine Design Practice - II**

| | |
|---|---|
| CO1 | Apply design process to an open ended problems |
| CO2 | Determine suitable material and size for structural component of machine/system |
| CO3 | Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing Choose logically and defend selection of design factors |
| CO5 | Design of components for given part/system i.e shaft, keys, coupling, links, screws, springs etc. Work effectively as a part of design group/team |
| CO6 | Have good communication skill, orally, graphically as well as in writing |

**IC Engine Lab**

| | |
|---|---|
| CO1 | Conduct test on IC Engines to study their performance. |
| CO2 | Draw performance curves of these machines/systems. |
| CO3 | Analyse the results obtained from the tests. |
| CO4 | Draw conclusions based on the results of the experiments |

**Refrigeration and Air Conditioning Lab**

| | |
|---|---|
| CO1 | Conduct test on Refrigeration and air conditioning test units to study their performance. |
| CO2 | Draw performance curves of these machines/systems. |
| CO3 | Analyse the results obtained from the tests. |
| CO4 | Draw conclusions based on the results of the experiments |

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**Technical Project for Community Services**

| | |
|---|---|
| CO1 | Visit nearby places to understand the problems of the community |
| CO2 | Select one of the problems for the study, state the exact title of the project and define scope of the problem |
| CO3 | Explain the motivation, objectives and scope of the project |
| CO4 | Evaluate possible solutions of the problem |
| CO5 | Design, produce, test and analyze the performance of product/system/process |
| CO6 | Modify, improve the product/system/process |

## BE (Mechanical) Part – I

**Automation in Manufacturing**

| | |
|---|---|
| CO1 | To Understand the basics of Automation & Control system in Manufacturing. |
| CO2 | To use fundamentals of FMS & Automation principle in manufacturing. |
| CO3 | To apply concepts of soft & hard Automation. |
| CO4 | To understand functioning of NC machines, CNC machines, CAD, CAM. |

**Refrigeration and Air conditioning**

| | |
|---|---|
| CO1 | Illustrate the fundamental principles and applications of refrigeration and air conditioning system |
| CO2 | Obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems |
| CO3 | Present the properties, applications and environmental issues of different refrigerants |
| CO4 | Calculate cooling load for air conditioning systems used for various applications |
| CO5 | Operate and analyze the refrigeration and air conditioning systems. |

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**Finite Element Method**

| | |
|---|---|
| CO1 | Understand the concept of finite element method to solve various Mechanical Engineering problems. |
| CO2 | Apply the knowledge of FEM for 1D stress analysis and heat transfer analysis. |
| CO3 | Understand the role and significance of shape functions in finite element formulations and use of linear, quadratic, and cubic shape functions for interpolation |
| CO4 | Be aware of global, local, and natural coordinates |
| CO5 | Formulate and solve problems of trusses, beams, planar loading and axisymmetric. |
| CO6 | Understand the formulation of two-dimensional elements (triangle and quadrilateral continuum and shell elements) |

**Power Plant Engineering**

| | |
|---|---|
| CO1 | Explain layout , construction and working of the components inside a thermal power plant |
| CO2 | Explain layout, construction and working of the components inside a Diesel, Gas and |
| CO3 | Combined Cycle Power Plants |
| CO4 | Explain layout , construction and working of the components inside a Nuclear Power Plant |
| CO5 | Explain layout , construction and working of the components inside Renewable Energy Power Plants |
| CO6 | Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of the environmental hazards and estimate the costs of the electrical energy production |

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**Gas Dynamics and Jet Propulsion Subject Code**

| | |
|---|---|
| CO1 | Understand the thermodynamic cycles of jet engines. |
| CO2 | Understand the basics of compressible fluid flow in inlets of compressors and turbines. |
| CO3 | Analyze Jet engines; determine propulsion efficiency and design of inlets and outlets. |
| CO4 | Understand the Jet propulsion systems working principles. |

**Product Design and Development**

| | |
|---|---|
| CO1 | Understand and explain the product design concept |
| CO2 | Understand and explain the concept of Conceptual design |
| CO3 | Explain the concept of Industrial design and robust design concepts. |
| CO4 | Understand the concept of Design for manufacture and assembly. |
| CO5 | Understand the legal factors, social issues, engineering ethics related to product design |
| CO6 | Understand the concept of Concurrent engineering, rapid prototyping |

**Maintenance and Reliability**

| | |
|---|---|
| CO1 | Understand the fundamental concept of Reliability and Maintenance & the various types of probability theories. |
| CO2 | Analyze and use particular maintenance strategies like, predictive, preventive etc. |
| CO3 | Illustrate the role of Failure Mode, Effects and Criticality Analysis |
| CO4 | Adopt Reliability principles in product life cycle management |

**Mechanical Engineering Lab III (Analysis)**

| | |
|---|---|
| CO1 | Analyze stresses and strains induced in 2-D truss subjected to plane forces |
| CO2 | Analyze stresses and strains induced in 1-D beam (simply supported or cantilever beams) |
| CO3 | Use FEA software for Static stress concentration factor calculation |
| CO4 | Use FEA software to solve 2D Forced convection problem |
| CO5 | Analyze any machine component using FEA software. |
| CO6 | Analyze Stress and deflection of any machine component consisting of 3-D elements using FEA software. |

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**Interview Techniques and Mock Exercise**

| | |
|---|---|
| CO1 | Learners would be familiar with different interview skills and techniques employed in the industrial and the corporate world. |
| CO2 | Students would be able to perform well in interview by developing body language, rationalizing their aptitude and attitude for the interview. |
| CO3 | They would be able to participate effectively in group discussions, accept leadership and express their ideas effectively. |
| CO4 | Students would be able to draft effective job applications and resume, CVs accurately as per the needs of the industries |
| CO5 | Students would develop right frame of mind by learning socializing skills, corporate etiquettes, and manners. |

## BE (Mechanical) Part – II

**Industrial Engineering and Management**

| | |
|---|---|
| CO1 | This subject also helps a student to be a self-employable by getting knowledge of management techniques. |
| CO2 | Statistical Knowledge enhances chances to get a certification from worldwide famous organization like ASQ. i.e. American Society for Quality |
| CO3 | Student will demonstrate Commitment to quality, timeliness, and continuous improvement in production rate in manufacturing sector |
| CO4 | Enhancing General awareness of Work System Design, Production Planning and Inventory Control, Management of Quality |

**Design of Transmission System**

| | |
|---|---|
| CO1 | Apply the concepts of design to belts, chains and rope drives. |
| CO2 | Apply the concepts of design to spur, helical gears. |
| CO3 | Apply the concepts of design to worm and bevel gears. |
| CO4 | Apply the concepts of design to gear boxes. |
| CO5 | Apply the concepts of design to cams, brakes and clutches |

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**Total Quality Management**

| | |
|---|---|
| CO1 | Students should be able to Quality environment of the organization. |
| CO2 | Student should be able to know the TQM approach for manufacturing/service organization in length. |
| CO3 | Student should be able to know various Quality terms like Tolerance and Variability, PDCA cycle, Crosby's 10 points and Deming's 14 Points. |
| CO4 | Student should be able to know international/national Quality awards |

**Machine Tool Design**

| | |
|---|---|
| CO1 | Ability enhancement for the design of various components of structures, guideways, spindles of machine tools |
| CO2 | Ability enhancement to adopt & implement the recent trends required as per the applications |
| CO3 | Students are able to understand the knowledge of vibration of machine tool, different control systems in machine tool and different machine tool testing methods |

**Numerical Method for Engineers**

| | |
|---|---|
| CO1 | Apply Mathematical Modeling and for Engineering Problem Solving. |
| CO2 | Understand different root finding methods. |
| CO3 | Solve Mathematical Equations by various methods. |
| CO4 | Solve system of linear equation |
| CO5 | Apply Numerical Integration |

**Internet of Things**

| | |
|---|---|
| CO1 | Able to understand the application areas of IOT. |
| CO2 | Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks |
| CO3 | Able to understand building blocks of Internet of Things and characteristics. |

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**Cyber Law & Ethics**

| | |
|---|---|
| CO1 | Understanding concepts related to cyber world and cyber law in general |
| CO2 | Develop competitive edge on various facets of cyber crimes |
| CO3 | Problems arising out of online transactions and provoke them to find solutions |
| CO4 | Intellectual property issues in the cyber space and the growth and development of the law |
| CO5 | Regulation of cyber space at national and international level. |
| CO6 | Upholding ethical standards in cyber laws and intellectual property issues |

**Artificial Intelligence**

| | |
|---|---|
| CO1 | Artificial intelligence enhance work force and create jobs. |
| CO2 | AI helps flag bais and drive diversity. |
| CO3 | AI creates business oriented architecture. |
| CO4 | AI makes positive impact on the world with other technologies. |

**Entrepreneurship Development**

| | |
|---|---|
| CO1 | Appreciate the importance of embarking on self-employment and has developed the confidence and personal skills for the same. |
| CO2 | Identify business opportunities in chosen sector / sub-sector and plan and market and sell products / services. |
| CO3 | Start a small business enterprise by liaising with different stake holders 4. Effectively manage small business enterprise. |

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# PO CO OF MECHANICAL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2020-21

## Vision

The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students.

## Mission

Imparting quality education, looking after holistic development of students and conducting need based research and extension.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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, 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 Vision The vision of the department is to achieve



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**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 Educational Objective**

| | |
|---|---|
| **PEO1** | Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices. |
| **PEO2** | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| **PEO3** | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| **PEO4** | Graduates are expected to continue personal development through professional study and self-learning. |
| **PEO5** | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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## Course Outcomes:

### SE (Mechanical) Part – I

**Physics - II (Optics and Waves)**

| | |
|---|---|
| CO1 | Expose the learners to different processes used in physics for industrial and technological applications. |
| CO2 | Understand the importance of Applied Physics in physical phenomena. |
| CO3 | Acquire Basic knowledge of Oscillation for Simple Harmonic, Mechanical and electrical simple harmonic oscillators. |
| CO4 | Demonstrate knowledge of quantum mechanics and thermal physics. |
| CO5 | Employ the knowledge of optical instruments mirrors and lens. |
| CO6 | Implement the concept thermodynamically equations and their applications in various fields of geometric optics |

**Mathematics - III**

| | |
|---|---|
| CO1 | Understand the solution methodologies for second order Partial Differential Equations. |
| CO2 | Solve interpolation and integral using numerical methods. |
| CO3 | Solve the Ordinary and Partial Differential Equations using Laplace Transformation. |
| CO4 | Use the concept of correlation and regressions for statistical parameters. |
| CO5 | Formulate and solve problems involving random variables and probability distribution. |
| CO6 | Apply statistical methods for analyzing experimental data. |

**Thermodynamics**

| | |
|---|---|
| CO1 | Apply various laws of thermodynamics to various processes and real systems. |
| CO2 | Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes |
| CO3 | Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case. |
| CO4 | Analyze the condition of steam and performance of vapour power cycle and vapour compression cycle. |
| CO5 | Understand Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants. |
| CO6 | Use Psychrometric charts and estimate various essential properties related to Psychrometry and processes. |



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**Basic Electronics Engineering**

| | |
|---|---|
| CO1 | Design an application using Operational amplifier |
| CO2 | Troubleshoot and maintain standard electronic circuits. |
| CO3 | Design and verify the basic logic gate operations. |
| CO4 | Design the basics of Electronic communication transmission medium circuits. |
| CO5 | Understand the principles of semiconductor devices and their applications. |
| CO6 | Be aware of the working of timing circuits and oscillators. |
| CO7 | Analyze logic gates and flip flop as a building block of digital systems. |
| CO8 | Learn the basics of Electronic communication system |

**Engineering Mechanics**

| | |
|---|---|
| CO1 | Use scalar and vector analytical techniques for analyzing forces in statically determinate structures |
| CO2 | Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems. |
| CO3 | Apply basic knowledge of mathematics and physics to solve real-world problems. |
| CO4 | Know basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts). |
| CO5 | Realize basic dynamics concepts – force, momentum, work and energy. |
| CO6 | Understand and be able to apply Newton"s laws of motion. |
| CO7 | Apply basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution. |
| CO8 | Recognize basic machine parts such as pulleys and mass-spring systems. |

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**Effective Technical Communication**

| | |
|---|---|
| CO1 | Accumulate, review, mediate accurate information and transmit technical ideas, policies with greater clarity & precision. |
| CO2 | Draft, revise and edit technical drafts, letters, proposals, applications, with effective linguistic skills and abilities by eliminating grammatical errors in the same. |
| CO3 | Absorb, inculcate and practice an industrial ethics, professional work culture and collaborate effectively in organizational communication system. |
| CO4 | Lead, present and communicate business strategies persuasively and convincingly through result oriented endeavors both verbally and non-verbally within and outside organizations. |

**Seminar - I**

| | |
|---|---|
| CO1 | Use multiple thinking strategies to examine real-world issues through self learning. |
| CO2 | Explore creative avenues of expression, solve problems, and make consequential decisions. |
| CO3 | Developing stage courage and confidence. |
| CO4 | Apply innovative thinking for best presentation. |

**Environmental Science**

| | |
|---|---|
| CO1 | Understand the basics of environmental science. |
| CO2 | Learn about causes of different pollution and their remedies. |
| CO3 | Learn about social issues that are connected to environment |
| CO4 | Apply knowledge for protection of environment. |

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## SE (Mechanical) Part – II

### Internal Combustion Engine

| | |
|---|---|
| CO1 | Relate the basic Thermodynamics, Heat Transfer with actual cycle analysis and actual losses in engine. |
| CO2 | Recognize functioning and differences among fuel introduction systems of different engines also designs of fuel carburetor and design principles. |
| CO3 | Understand the working and construction of turbocharging and supercharging. |
| CO4 | Determine and understand the effects of spark timing, valve timing, A/F ratio, engine geometry, fuel type, and manifold on engine performance and emissions |
| CO5 | Prepare a performance report and emissions analysis of an internal combustion engine |
| CO6 | Plot performance characteristics curve during testing and to know about engine emissions. |

### Fluid Mechanics and Machinery

| | |
|---|---|
| CO1 | Develop basic knowledge on Fluid Statistics, Dynamics, and Hydro-electric power stations. |
| CO2 | Apply principles of fluid mechanics to the operation, design, and selection of machinery. |
| CO3 | Mathematically analyze simple flow situations. |
| CO4 | Estimation of efficiency, performance of pumps and turbines. |
| CO5 | Design and planning of Hydroelectric Power plant with the available water resources and requirement of power. |
| CO6 | Identify, formulate and solve problems related to fluids at rest and in motion. |
| CO7 | Knowledge to design pipeline systems, floating bodies and hydraulic gates. |
| CO8 | Knowledge to design pipeline systems, floating bodies and hydraulic gates. |

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**Strength of Material**

| | |
|---|---|
| CO1 | Understand the concepts of various stresses and their significant effects in context with engineering applications. |
| CO2 | Acquire elementary knowledge of stresses, strains & material properties. Understand & analyze the basic principles involved in the behavior of machine parts under load in the context of designing it. |
| CO3 | Use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads. |
| CO4 | Effectively use the concepts of shear force and bending moment diagrams in design of machine elements. |
| CO5 | Compute the principal stresses and Strains by analytical and graphical methods (Mohr''s circle of stress 2-D. |
| CO6 | Estimate the Slope and Deflection in determinate beams. |
| CO7 | Explain the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines. |

**Mechanical Engineering Drawing**

| | |
|---|---|
| CO1 | Read and interpret the drawing. |
| CO2 | Understand the concepts of limit, fits, and tolerance for various machine parts. |
| CO3 | Visualize and prepare detail drawing of a given object. |
| CO4 | Draw details and assembly of different mechanical systems. |
| CO5 | Convert detailed drawing into assembly drawing using modeling software. |
| CO6 | Convert assembly drawing into detailed drawing using modeling software. |
| CO7 | Prepare detailed drawing of any given physical object/machine element with actual measurements. |

**Instrumentation & Control**

| | |
|---|---|
| CO1 | Understand concepts of process dynamics and various forms of mathematical models. |
| CO2 | Develop mathematical models of chemical and processes by writing unsteady-state mass and energy balances. |
| CO3 | Analyze, design and tune feedback / feed forward controllers in the context of various control strategies used to control chemical and biological processes. |
| CO4 | Recognize and fit various simple empirical models that are used for designing controllers. |
| CO5 | Understand and design basic control strategies. |



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**Biology for Engineers**

| | |
|---|---|
| CO1 | Understand the body sensory system |
| CO2 | Understand the body Immunology |
| CO3 | Understand the body Metabolism Functions |
| CO4 | Understand the Genetics |

**Professional Practice, Law and Ethics**

| | |
|---|---|
| CO1 | Illustrate as a practitioners of the mechanical engineering profession in the society. |
| CO2 | Develop ideas of the legal and practical aspects of their profession. |
| CO3 | Apply principles of contract management. |
| CO4 | Use alternative Dispute Resolution system. |
| CO5 | Perform the concept of Intellectual property. |

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## TE (Mechanical) Part – I

### Manufacturing Technology – II

| | |
|---|---|
| CO1 | The students will be able to understand the details about machines used in production |
| CO2 | The students will be able to understand the mechanics behind metal cutting. |
| CO3 | The students will be able to understand the finishing and super finishing processes. |
| CO4 | The students will be able to understand the Physics of material removal behind the various non-conventional machining processes. |

### Machine Design- I

| | |
|---|---|
| CO1 | Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part |
| CO2 | Ability to decide optimum design parameters for mechanical systems. |
| CO3 | Ability to design mechanical system for fluctuating loads. |
| CO4 | Acquire skill in preparing production drawing pertaining to various designs |

### Heat Transfer

| | |
|---|---|
| CO1 | Understand the modes of heat transfer and basic laws of heat transfer |
| CO2 | Analyze the problems involving steady state heat conduction with and without internal heat generation. |
| CO3 | Develop solutions for transient heat conduction. |
| CO4 | Understand and Evaluate heat transfer coefficients for natural and forced convection |
| CO5 | Analyze the heat exchanger and fins performance. |
| CO6 | Calculate radiation heat transfer between black body and gray body surfaces. |

### Mechatronics - I

| | |
|---|---|
| CO1 | Develop the skill to identify the suitable sensor and actuator for a Mechatronic system. |
| CO2 | Develop the skill required for interfacing the electronic and electro-mechanical systems. |
| CO3 | Develop the skill to indigenously design and develop a Mechatronic system. |
| CO4 | Develop the skill to model a complete automated electro-mechanical system. |
| CO5 | Understand the working and use of hydraulic and pneumatic actuators. |



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**CAD/CAM**

| | |
|---|---|
| CO1 | Identify proper computer graphics techniques for geometric modeling. |
| CO2 | Transform, manipulate objects, store and manage data. |
| CO3 | Prepare computer assisted part program and post process. |
| CO4 | Prepare part programming applicable to CNC machines. |
| CO5 | Use rapid prototyping and tooling concepts in any real life applications. |

## TE (Mechanical) Part – II

**Tool Engineering**

| | |
|---|---|
| CO1 | Selection of a die for a given component |
| CO2 | Classify and explain various press tools and press tools operations |
| CO3 | Selection of locating and clamping devices for given component |
| CO4 | Select and design jig and fixture for given component. |

**Machine Design - II**

| | |
|---|---|
| CO1 | Design and analyze belts, brakes, clutches. |
| CO2 | Understand gear drives and their applications; design procedure and introduction to gear design standard practices. |
| CO3 | The construction, working, important features and selection process from manufacturers catalogue for rolling contact bearings |
| CO4 | Analyze the pressure distribution and design of journal bearings. |

**Power Developing Devices**

| | |
|---|---|
| CO1 | Differentiate between SI and CI Engines |
| CO2 | Understand and explain Combustion of SI and CI Engines. |
| CO3 | Plot and analyze Performance Characteristics of SI and CI Engines |
| CO4 | Explain Gas Turbine and its performance. |

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**Mechatronics - II**

| | |
|---|---|
| CO1 | Student shall understand Basic component and design of pneumatic systems. |
| CO2 | Student shall understand Basic component and design of HYDRULIC systems |
| CO3 | Student To understand the signal conditioning phenomenon, necessity, and outline. |
| CO4 | . Student to understand concept of PLC its industrial use, application to Mechatronics. |
| CO5 | Student shall Development of PLC ladder programming and implementation of real life system Hydraulics+Pneumatics + Electrical Electronics +Plc . |

**Power Plant Engineering**

| | |
|---|---|
| CO1 | Ability to have adequacy with design, erection and development of Power Plant. |
| CO2 | Optimization of Power Plants with respect to available resources. |

## B. E. (Mechanical) Part – I

**Refrigeration and Air Conditioning**

| | |
|---|---|
| CO1 | In order to assess the students' progress in the subject towards achieving knowledge and learning. He/She is assessed by conducting three tests in the semester , He/She is assigned minimum five assignments, homework problems, Solving University Question papers to grasp knowledge in the subject |
| CO2 | The various experiments were performed during practical hours to understand the basic concept and working of the Refrigeration cycle. A local cold storage plant is visited to understand the cycle of Refrigeration and Air conditioning. Finally the student is examined by conducting Practical/Oral Examination based on Term Work, Test performance and finally theory paper of University level, based on the syllabus. |
| CO3 | The student is expected to use his subject knowledge to design the Refrigeration or Air Conditioning plant and to optimize the performance of the same. |

**Finite Element Methods**

| | |
|---|---|
| CO1 | Develop the finite element equations to model engineering problems |
| CO2 | Apply the basic finite element formulation techniques to solve engineering problems. |
| CO3 | Use commercial FEA software, to solve problems related to mechanical engineering |



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**Advanced Machining & Manufacturing**

| | |
|---|---|
| CO1 | Selection of appropriate manufacturing process for Advance components. |
| CO2 | Characterization of work piece materials. |

**Operations Research Techniques**

| | |
|---|---|
| CO1 | Upon successful completion of this course, the student will be able to |
| CO2 | Illustrate the need to optimally utilize the resources in various types of industries |
| CO3 | Apply and analyze mathematical optimization functions to various applications. |
| CO4 | Demonstrate cost effective strategies in various applications in industry |

**Renewable Energy**

| | |
|---|---|
| CO1 | Apply the technology to capture the energy from the renewable source like Sun, Wind, Ocean, Biomass and Geothermal. |
| CO2 | Apply the direct energy conversion methods. |

## B. E. (Mechanical) Part – II

**Automobile Engineering**

| | |
|---|---|
| CO1 | Students will be able to demonstrate and explain various automobile systems |
| CO2 | Students will be able to explain the importance of various important systems like differential, steering, Brakes, Suspensions etc. |
| CO3 | Students will be able to explain principle of operation, construction and application of latest sensor Technology used in automobiles. |

**Production Planning & Control**

| | |
|---|---|
| CO1 | Illustrate the types of production and use of functions of PPC on the shop floor. |
| CO2 | Illustrate the design and development of the product on the shop floor. |
| CO3 | Illustrate the optimization technique used in batch production. |
| CO4 | To calculate the idle time and machine cycle efficiency to improve the productivity. |
| CO5 | To develop the balanced line of production with minimum idle time. |
| CO6 | To understand how to maintain the inventory for shop floor. |



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**Quality Engineering**

| | |
|---|---|
| CO1 | After studying the subject students will become experts in applying the various tools and able to operate the skill in taking sharp decisions in business. |

**Automation & Robotics**

| | |
|---|---|
| CO1 | Acquire the skills in understanding Automation in Industry & Robot programming Language. |
| CO2 | Acquire the skill in robot task planning for problem solving. |
| CO3 | Develop skills in understanding various sensors, robot peripherals and their use. |
| CO4 | Develop skills in identifying areas in manufacturing, where robotics can be deployed for enhancing productivity. |

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# PO CO OF MECHANICAL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2019-20

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|---|---|
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| PEO2 | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| PEO3 | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| PEO4 | Graduates are expected to continue personal development through professional study and self-learning. |
| PEO5 | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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## Course Outcomes:

### SE (Mechanical) Part – I

**Physics - II (Optics and Waves)**

| | |
|---|---|
| CO1 | Expose the learners to different processes used in physics for industrial and technological applications. |
| CO2 | Understand the importance of Applied Physics in physical phenomena. |
| CO3 | Acquire Basic knowledge of Oscillation for Simple Harmonic, Mechanical and electrical simple harmonic oscillators. |
| CO4 | Demonstrate knowledge of quantum mechanics and thermal physics. |
| CO5 | Employ the knowledge of optical instruments mirrors and lens. |
| CO6 | Implement the concept thermodynamically equations and their applications in various fields of geometric optics |

**Mathematics - III**

| | |
|---|---|
| CO1 | Understand the solution methodologies for second order Partial Differential Equations. |
| CO2 | Solve interpolation and integral using numerical methods. |
| CO3 | Solve the Ordinary and Partial Differential Equations using Laplace Transformation. |
| CO4 | Use the concept of correlation and regressions for statistical parameters. |
| CO5 | Formulate and solve problems involving random variables and probability distribution. |
| CO6 | Apply statistical methods for analyzing experimental data. |

**Thermodynamics**

| | |
|---|---|
| CO1 | Apply various laws of thermodynamics to various processes and real systems. |
| CO2 | Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes |
| CO3 | Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case. |
| CO4 | Analyze the condition of steam and performance of vapour power cycle and vapour compression cycle. |
| CO5 | Understand Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants. |
| CO6 | Use Psychrometric charts and estimate various essential properties related to Psychrometry and processes. |

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**Basic Electronics Engineering**

| | |
|---|---|
| CO1 | Design an application using Operational amplifier |
| CO2 | Troubleshoot and maintain standard electronic circuits. |
| CO3 | Design and verify the basic logic gate operations. |
| CO4 | Design the basics of Electronic communication transmission medium circuits. |
| CO5 | Understand the principles of semiconductor devices and their applications. |
| CO6 | Be aware of the working of timing circuits and oscillators. |
| CO7 | Analyze logic gates and flip flop as a building block of digital systems. |
| CO8 | Learn the basics of Electronic communication system |

**Engineering Mechanics**

| | |
|---|---|
| CO1 | Use scalar and vector analytical techniques for analyzing forces in statically determinate structures |
| CO2 | Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems. |
| CO3 | Apply basic knowledge of mathematics and physics to solve real-world problems. |
| CO4 | Know basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts). |
| CO5 | Realize basic dynamics concepts – force, momentum, work and energy. |
| CO6 | Understand and be able to apply Newton"s laws of motion. |
| CO7 | Apply basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution. |
| CO8 | Recognize basic machine parts such as pulleys and mass-spring systems. |

**Effective Technical Communication**

| | |
|---|---|
| CO1 | Accumulate, review, mediate accurate information and transmit technical ideas, policies with greater clarity & precision. |
| CO2 | Draft, revise and edit technical drafts, letters, proposals, applications, with effective linguistic skills and abilities by eliminating grammatical errors in the same. |
| CO3 | Absorb, inculcate and practice an industrial ethics, professional work culture and collaborate effectively in organizational communication system. |
| CO4 | Lead, present and communicate business strategies persuasively and convincingly through result oriented endeavors both verbally and non-verbally within and outside organizations. |

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**Seminar - I**

| | |
|---|---|
| CO1 | Use multiple thinking strategies to examine real-world issues through self learning. |
| CO2 | Explore creative avenues of expression, solve problems, and make consequential decisions. |
| CO3 | Developing stage courage and confidence. |
| CO4 | Apply innovative thinking for best presentation. |

**Environmental Science**

| | |
|---|---|
| CO1 | Understand the basics of environmental science. |
| CO2 | Learn about causes of different pollution and their remedies. |
| CO3 | Learn about social issues that are connected to environment |
| CO4 | Apply knowledge for protection of environment. |

## SE (Mechanical) Part – II

**Internal Combustion Engine**

| | |
|---|---|
| CO1 | Relate the basic Thermodynamics, Heat Transfer with actual cycle analysis and actual losses in engine. |
| CO2 | Recognize functioning and differences among fuel introduction systems of different engines also designs of fuel carburetor and design principles. |
| CO3 | Understand the working and construction of turbocharging and supercharging. |
| CO4 | Determine and understand the effects of spark timing, valve timing, A/F ratio, engine geometry, fuel type, and manifold on engine performance and emissions |
| CO5 | Prepare a performance report and emissions analysis of an internal combustion engine |
| CO6 | Plot performance characteristics curve during testing and to know about engine emissions. |

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**Fluid Mechanics and Machinery**

| | |
|---|---|
| CO1 | Develop basic knowledge on Fluid Statistics, Dynamics, and Hydro-electric power stations. |
| CO2 | Apply principles of fluid mechanics to the operation, design, and selection of machinery. |
| CO3 | Mathematically analyze simple flow situations. |
| CO4 | Estimation of efficiency, performance of pumps and turbines. |
| CO5 | Design and planning of Hydroelectric Power plant with the available water resources and requirement of power. |
| CO6 | Identify, formulate and solve problems related to fluids at rest and in motion. |
| CO7 | Knowledge to design pipeline systems, floating bodies and hydraulic gates. |
| CO8 | Knowledge to design pipeline systems, floating bodies and hydraulic gates. |

**Strength of Material**

| | |
|---|---|
| CO1 | Understand the concepts of various stresses and their significant effects in context with engineering applications. |
| CO2 | Acquire elementary knowledge of stresses, strains & material properties. Understand & analyze the basic principles involved in the behavior of machine parts under load in the context of designing it. |
| CO3 | Use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads. |
| CO4 | Effectively use the concepts of shear force and bending moment diagrams in design of machine elements. |
| CO5 | Compute the principal stresses and Strains by analytical and graphical methods (Mohr"s circle of stress 2-D. |
| CO6 | Estimate the Slope and Deflection in determinate beams. |
| CO7 | Explain the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines. |

**Mechanical Engineering Drawing**

| | |
|---|---|
| CO1 | Read and interpret the drawing. |
| CO2 | Understand the concepts of limit, fits, and tolerance for various machine parts. |
| CO3 | Visualize and prepare detail drawing of a given object. |
| CO4 | Draw details and assembly of different mechanical systems. |
| CO5 | Convert detailed drawing into assembly drawing using modeling software. |
| CO6 | Convert assembly drawing into detailed drawing using modeling software. |
| CO7 | Prepare detailed drawing of any given physical object/machine element with actual measurements. |



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**Instrumentation & Control**

| | |
|---|---|
| CO1 | Understand concepts of process dynamics and various forms of mathematical models. |
| CO2 | Develop mathematical models of chemical and processes by writing unsteady-state mass and energy balances. |
| CO3 | Analyze, design and tune feedback / feed forward controllers in the context of various control strategies used to control chemical and biological processes. |
| CO4 | Recognize and fit various simple empirical models that are used for designing controllers. |
| CO5 | Understand and design basic control strategies. |

**Biology for Engineers**

| | |
|---|---|
| CO1 | Understand the body sensory system |
| CO2 | Understand the body Immunology |
| CO3 | Understand the body Metabolism Functions |
| CO4 | Understand the Genetics |

**Professional Practice, Law and Ethics**

| | |
|---|---|
| CO1 | Illustrate as a practitioners of the mechanical engineering profession in the society. |
| CO2 | Develop ideas of the legal and practical aspects of their profession. |
| CO3 | Apply principles of contract management. |
| CO4 | Use alternative Dispute Resolution system. |
| CO5 | Perform the concept of Intellectual property. |

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## TE (Mechanical) Part – I

### Manufacturing Technology – II

| | |
|---|---|
| CO1 | The students will be able to understand the details about machines used in production |
| CO2 | The students will be able to understand the mechanics behind metal cutting. |
| CO3 | The students will be able to understand the finishing and super finishing processes. |
| CO4 | The students will be able to understand the Physics of material removal behind the various non-conventional machining processes. |

### Machine Design- I

| | |
|---|---|
| CO1 | Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part |
| CO2 | Ability to decide optimum design parameters for mechanical systems. |
| CO3 | Ability to design mechanical system for fluctuating loads. |
| CO4 | Acquire skill in preparing production drawing pertaining to various designs |

### Heat Transfer

| | |
|---|---|
| CO1 | Understand the modes of heat transfer and basic laws of heat transfer |
| CO2 | Analyze the problems involving steady state heat conduction with and without internal heat generation. |
| CO3 | Develop solutions for transient heat conduction. |
| CO4 | Understand and Evaluate heat transfer coefficients for natural and forced convection |
| CO5 | Analyze the heat exchanger and fins performance. |
| CO6 | Calculate radiation heat transfer between black body and gray body surfaces. |

### Mechatronics - I

| | |
|---|---|
| CO1 | Develop the skill to identify the suitable sensor and actuator for a Mechatronic system. |
| CO2 | Develop the skill required for interfacing the electronic and electro-mechanical systems. |
| CO3 | Develop the skill to indigenously design and develop a Mechatronic system. |
| CO4 | Develop the skill to model a complete automated electro-mechanical system. |
| CO5 | Understand the working and use of hydraulic and pneumatic actuators. |

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**CAD/CAM**

| | |
|---|---|
| CO1 | Identify proper computer graphics techniques for geometric modeling. |
| CO2 | Transform, manipulate objects, store and manage data. |
| CO3 | Prepare computer assisted part program and post process. |
| CO4 | Prepare part programming applicable to CNC machines. |
| CO5 | Use rapid prototyping and tooling concepts in any real life applications. |

## TE (Mechanical) Part – II

**Tool Engineering**

| | |
|---|---|
| CO1 | Selection of a die for a given component |
| CO2 | Classify and explain various press tools and press tools operations |
| CO3 | Selection of locating and clamping devices for given component |
| CO4 | Select and design jig and fixture for given component. |

**Machine Design - II**

| | |
|---|---|
| CO1 | Design and analyze belts, brakes, clutches. |
| CO2 | Understand gear drives and their applications; design procedure and introduction to gear design standard practices. |
| CO3 | The construction, working, important features and selection process from manufacturers catalogue for rolling contact bearings |
| CO4 | Analyze the pressure distribution and design of journal bearings. |

**Power Developing Devices**

| | |
|---|---|
| CO1 | Differentiate between SI and CI Engines |
| CO2 | Understand and explain Combustion of SI and CI Engines. |
| CO3 | Plot and analyze Performance Characteristics of SI and CI Engines |
| CO4 | Explain Gas Turbine and its performance. |

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**Mechatronics - II**

| | |
|---|---|
| CO1 | Student shall understand Basic component and design of pneumatic systems. |
| CO2 | Student shall understand Basic component and design of HYDRULIC systems |
| CO3 | Student To understand the signal conditioning phenomenon, necessity, and outline. |
| CO4 | . Student to understand concept of PLC its industrial use, application to Mechatronics. |
| CO5 | Student shall Development of PLC ladder programming and implementation of real life system Hydraulics+Pneumatics + Electrical Electronics +Plc . |

**Power Plant Engineering**

| | |
|---|---|
| CO1 | Ability to have adequacy with design, erection and development of Power Plant. |
| CO2 | Optimization of Power Plants with respect to available resources. |

## B. E. (Mechanical) Part – I

**Refrigeration and Air Conditioning**

| | |
|---|---|
| CO1 | In order to assess the students' progress in the subject towards achieving knowledge and learning. He/She is assessed by conducting three tests in the semester , He/She is assigned minimum five assignments, homework problems, Solving University Question papers to grasp knowledge in the subject |
| CO2 | The various experiments were performed during practical hours to understand the basic concept and working of the Refrigeration cycle. A local cold storage plant is visited to understand the cycle of Refrigeration and Air conditioning. Finally the student is examined by conducting Practical/Oral Examination based on Term Work, Test performance and finally theory paper of University level, based on the syllabus. |
| CO3 | The student is expected to use his subject knowledge to design the Refrigeration or Air Conditioning plant and to optimize the performance of the same. |

**Finite Element Methods**

| | |
|---|---|
| CO1 | Develop the finite element equations to model engineering problems |
| CO2 | Apply the basic finite element formulation techniques to solve engineering problems. |
| CO3 | Use commercial FEA software, to solve problems related to mechanical engineering |

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**Advanced Machining & Manufacturing**

| | |
|---|---|
| CO1 | Selection of appropriate manufacturing process for Advance components. |
| CO2 | Characterization of work piece materials. |

**Operations Research Techniques**

| | |
|---|---|
| CO1 | Upon successful completion of this course, the student will be able to |
| CO2 | Illustrate the need to optimally utilize the resources in various types of industries |
| CO3 | Apply and analyze mathematical optimization functions to various applications. |
| CO4 | Demonstrate cost effective strategies in various applications in industry |

**Renewable Energy**

| | |
|---|---|
| CO1 | Apply the technology to capture the energy from the renewable source like Sun, Wind, Ocean, Biomass and Geothermal. |
| CO2 | Apply the direct energy conversion methods. |

## B. E. (Mechanical) Part – II

**Automobile Engineering**

| | |
|---|---|
| CO1 | Students will be able to demonstrate and explain various automobile systems |
| CO2 | Students will be able to explain the importance of various important systems like differential, steering, Brakes, Suspensions etc. |
| CO3 | Students will be able to explain principle of operation, construction and application of latest sensor Technology used in automobiles. |

**Production Planning & Control**

| | |
|---|---|
| CO1 | Illustrate the types of production and use of functions of PPC on the shop floor. |
| CO2 | Illustrate the design and development of the product on the shop floor. |
| CO3 | Illustrate the optimization technique used in batch production. |
| CO4 | To calculate the idle time and machine cycle efficiency to improve the productivity. |
| CO5 | To develop the balanced line of production with minimum idle time. |
| CO6 | To understand how to maintain the inventory for shop floor. |



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**Quality Engineering**

| | |
|---|---|
| CO1 | After studying the subject students will become experts in applying the various tools and able to operate the skill in taking sharp decisions in business. |

**Automation & Robotics**

| | |
|---|---|
| CO1 | Acquire the skills in understanding Automation in Industry & Robot programming Language. |
| CO2 | Acquire the skill in robot task planning for problem solving. |
| CO3 | Develop skills in understanding various sensors, robot peripherals and their use. |
| CO4 | Develop skills in identifying areas in manufacturing, where robotics can be deployed for enhancing productivity. |

IQAC Coordinator

H.O.D.

Principal

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# PO CO OF MECHANICAL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2018-19

## Vision

The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students.

## Mission

Imparting quality education, looking after holistic development of students and conducting need based research and extension.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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, 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.

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| PEO1 | Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices. |
| PEO2 | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| PEO3 | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| PEO4 | Graduates are expected to continue personal development through professional study and self-learning. |
| PEO5 | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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## Course Outcomes:

### SE (Mechanical) Part – I

**Engineering Mathematics - III**

| | |
|---|---|
| CO1 | Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector & F.T |
| CO2 | Student will show the understanding of impact of Engg.Mathematics on Mech |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

**Engineering Thermodynamics**

| | |
|---|---|
| CO1 | Apply fundamental concepts of thermodynamic to solve real life engineering problems |
| CO2 | Identify problems & analyse power producing and consuming devices. |
| CO3 | To apply fundamentals of engineering thermodynamics to compressors |

**Engineering Metallurgy**

| | |
|---|---|
| CO1 | Apply fundamental concepts of Metallurgy to solve real life engineering problems. |
| CO2 | Identify problems and suggest suitable material/ heat treatment to get the requisite mechanical properties for a given application |
| CO3 | To apply advanced Metallurgical techniques to solve numerous engineering problems |

**Mechanical Measurement And Metrology**

| | |
|---|---|
| CO1 | After going through basic study of generalized measurement system, students will be able to understand the stepwise working of all instruments and will be able to find out the output factors. |
| CO2 | They will be able to know the importance of all factors affecting on output of instruments i.e. errors |
| CO3 | They can suggest some points in the design & working of instruments after studying the basics if metrology. |
| CO4 | Students will be able to differentiate between all types of measurements i.e. Direct & indirect type, contact & non-contact type as well as they can design the components with provisions of tolerance in manufacturing through the concepts of metrology |

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**Strength of Materials**

| | |
|---|---|
| CO1 | Student will be able to effectively use the concepts of shear force and bending moment diagrams in design of machine elements. |
| CO2 | Will be able to compute the principal stresses and Strains by analytical and graphical methods (Mohr's circle of stress 2-D. |
| CO3 | Able to use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads. |
| CO4 | Able to estimate the Slope and Deflection in determinate beams. |
| CO5 | This subject enables the student to understand the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines. |

## SE (Mechanical) Part – II

**Engineering Mathematics - IV**

| | |
|---|---|
| CO1 | Student will demonstrate basic knowledge of Functions of Complex Variable & Numerical Technique. |
| CO2 | Student will show the understanding of impact of Engg.Mathematics on Mech. |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

**Theory of Machines**

| | |
|---|---|
| CO1 | Identify the basic relations between distance, time, velocity, and acceleration. |
| CO2 | Apply vector mechanics as a tool for problem solving techniques. |
| CO3 | Distinguish the basics of kinematics and kinetics of motion |
| CO4 | Develop familiarity with application of kinematics theories to real-world machines. |
| CO5 | Understand analytical linkage analysis |
| CO6 | Determine cam profiles |
| CO7 | Understand gear trains |
| CO8 | Use the techniques to study the motions of machines and their components. |
| CO9 | Use the techniques, skills, and modern engineering tools necessary for engineering practice. |

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**Manufacturing Technology – I**

| | |
|---|---|
| CO1 | Ability to classify and apply the knowledge gained for applicability of processes for different product manufacturing. |
| CO2 | To compare and select best suitable manufacturing process based on requirements, advantages, limitations and applications |

**Fluid Mechanics & Hydraulics Machines**

| | |
|---|---|
| CO1 | An ability to identify, formulate and solve problems related to fluids at rest and in motion. |
| CO2 | Knowledge to design pipeline systems, floating bodies and hydraulic gates. |
| CO3 | Knowledge to design hydraulic turbines and pumps. |

**Machine Drawing and CAD**

| | |
|---|---|
| CO1 | Able to create drawings as per BIS standards. |
| CO2 | Visualize & prepare detail drawing of a given object. |
| CO3 | Read & interpret a given drawing |
| CO4 | Able to create assembly models of simple machine |

**Professional Communication Skill**

| | |
|---|---|
| CO1 | Students would understand the concept, process and importance of Professional Communication |
| CO2 | Students would acquire English Speaking and Writing Skills |
| CO3 | Students would develop Presentation Skills |

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## TE (Mechanical) Part – I

### Manufacturing Technology – II

| | |
|---|---|
| CO1 | The students will be able to understand the details about machines used in production |
| CO2 | The students will be able to understand the mechanics behind metal cutting. |
| CO3 | The students will be able to understand the finishing and super finishing processes. |
| CO4 | The students will be able to understand the Physics of material removal behind the various non-conventional machining processes. |

### Machine Design- I

| | |
|---|---|
| CO1 | Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part |
| CO2 | Ability to decide optimum design parameters for mechanical systems. |
| CO3 | Ability to design mechanical system for fluctuating loads. |
| CO4 | Acquire skill in preparing production drawing pertaining to various designs |

### Heat Transfer

| | |
|---|---|
| CO1 | Understand the modes of heat transfer and basic laws of heat transfer |
| CO2 | Analyze the problems involving steady state heat conduction with and without internal heat generation. |
| CO3 | Develop solutions for transient heat conduction. |
| CO4 | Understand and Evaluate heat transfer coefficients for natural and forced convection |
| CO5 | Analyze the heat exchanger and fins performance. |
| CO6 | Calculate radiation heat transfer between black body and gray body surfaces. |

### Mechatronics - I

| | |
|---|---|
| CO1 | Develop the skill to identify the suitable sensor and actuator for a Mechatronic system. |
| CO2 | Develop the skill required for interfacing the electronic and electro-mechanical systems. |
| CO3 | Develop the skill to indigenously design and develop a Mechatronic system. |
| CO4 | Develop the skill to model a complete automated electro-mechanical system. |
| CO5 | Understand the working and use of hydraulic and pneumatic actuators. |

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**CAD/CAM**

| | |
|---|---|
| CO1 | Identify proper computer graphics techniques for geometric modeling. |
| CO2 | Transform, manipulate objects, store and manage data. |
| CO3 | Prepare computer assisted part program and post process. |
| CO4 | Prepare part programming applicable to CNC machines. |
| CO5 | Use rapid prototyping and tooling concepts in any real life applications. |

## TE (Mechanical) Part – II

**Tool Engineering**

| | |
|---|---|
| CO1 | Selection of a die for a given component |
| CO2 | Classify and explain various press tools and press tools operations |
| CO3 | Selection of locating and clamping devices for given component |
| CO4 | Select and design jig and fixture for given component. |

**Machine Design - II**

| | |
|---|---|
| CO1 | Design and analyze belts, brakes, clutches. |
| CO2 | Understand gear drives and their applications; design procedure and introduction to gear design standard practices. |
| CO3 | The construction, working, important features and selection process from manufacturers catalogue for rolling contact bearings |
| CO4 | Analyze the pressure distribution and design of journal bearings. |

**Power Developing Devices**

| | |
|---|---|
| CO1 | Differentiate between SI and CI Engines |
| CO2 | Understand and explain Combustion of SI and CI Engines. |
| CO3 | Plot and analyze Performance Characteristics of SI and CI Engines |
| CO4 | Explain Gas Turbine and its performance. |

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**Mechatronics - II**

| | |
|---|---|
| CO1 | Student shall understand Basic component and design of pneumatic systems. |
| CO2 | Student shall understand Basic component and design of HYDRULIC systems |
| CO3 | Student To understand the signal conditioning phenomenon, necessity, and outline. |
| CO4 | . Student to understand concept of PLC its industrial use, application to Mechatronics. |
| CO5 | Student shall Development of PLC ladder programming and implementation of real life system Hydraulics+Pneumatics + Electrical Electronics +Plc . |

**Power Plant Engineering**

| | |
|---|---|
| CO1 | Ability to have adequacy with design, erection and development of Power Plant. |
| CO2 | Optimization of Power Plants with respect to available resources. |

## B. E. (Mechanical) Part – I

**Refrigeration and Air Conditioning**

| | |
|---|---|
| CO1 | In order to assess the students' progress in the subject towards achieving knowledge and learning. He/She is assessed by conducting three tests in the semester , He/She is assigned minimum five assignments, homework problems, Solving University Question papers to grasp knowledge in the subject |
| CO2 | The various experiments were performed during practical hours to understand the basic concept and working of the Refrigeration cycle. A local cold storage plant is visited to understand the cycle of Refrigeration and Air conditioning. Finally the student is examined by conducting Practical/Oral Examination based on Term Work, Test performance and finally theory paper of University level, based on the syllabus. |
| CO3 | The student is expected to use his subject knowledge to design the Refrigeration or Air Conditioning plant and to optimize the performance of the same. |

**Finite Element Methods**

| | |
|---|---|
| CO1 | Develop the finite element equations to model engineering problems |
| CO2 | Apply the basic finite element formulation techniques to solve engineering problems. |
| CO3 | Use commercial FEA software, to solve problems related to mechanical engineering |

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**Advanced Machining & Manufacturing**

| | |
|---|---|
| CO1 | Selection of appropriate manufacturing process for Advance components. |
| CO2 | Characterization of work piece materials. |

**Operations Research Techniques**

| | |
|---|---|
| CO1 | Upon successful completion of this course, the student will be able to |
| CO2 | Illustrate the need to optimally utilize the resources in various types of industries |
| CO3 | Apply and analyze mathematical optimization functions to various applications. |
| CO4 | Demonstrate cost effective strategies in various applications in industry |

**Renewable Energy**

| | |
|---|---|
| CO1 | Apply the technology to capture the energy from the renewable source like Sun, Wind, Ocean, Biomass and Geothermal. |
| CO2 | Apply the direct energy conversion methods. |

## B. E. (Mechanical) Part – II

**Automobile Engineering**

| | |
|---|---|
| CO1 | Students will be able to demonstrate and explain various automobile systems |
| CO2 | Students will be able to explain the importance of various important systems like differential, steering, Brakes, Suspensions etc. |
| CO3 | Students will be able to explain principle of operation, construction and application of latest sensor Technology used in automobiles. |

**Production Planning & Control**

| | |
|---|---|
| CO1 | Illustrate the types of production and use of functions of PPC on the shop floor. |
| CO2 | Illustrate the design and development of the product on the shop floor. |
| CO3 | Illustrate the optimization technique used in batch production. |
| CO4 | To calculate the idle time and machine cycle efficiency to improve the productivity. |
| CO5 | To develop the balanced line of production with minimum idle time. |
| CO6 | To understand how to maintain the inventory for shop floor. |

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**Quality Engineering**

| | |
|---|---|
| CO1 | After studying the subject students will become experts in applying the various tools and able to operate the skill in taking sharp decisions in business. |

**Automation & Robotics**

| | |
|---|---|
| CO1 | Acquire the skills in understanding Automation in Industry & Robot programming Language. |
| CO2 | Acquire the skill in robot task planning for problem solving. |
| CO3 | Develop skills in understanding various sensors, robot peripherals and their use. |
| CO4 | Develop skills in identifying areas in manufacturing, where robotics can be deployed for enhancing productivity. |

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(Approved by AICTE, New Delhi & recognized by Govt. of Maharashtra and affiliated to DBATU Lonere, Dist. Raigad)

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# PO CO OF MECHANICAL ENGINEERING DEPARTMENT OF ACADEMIC YEAR 2017-18

## Vision

The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students.

## Mission

Imparting quality education, looking after holistic development of students and conducting need based research and extension.

## Graduate Attributes

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

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, 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.

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**7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate Vision The vision of the department is to achieve excellence in teaching, learning, research and transfer of technology and overall development of students. Mission Imparting quality education, looking after holistic development of students and conducting need based research and extension. 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 Educational Objective**

| | |
|---|---|
| PEO1 | Graduates should excel in engineering positions in industry and other organizations that emphasize design and implementation of engineering systems and devices. |
| PEO2 | Graduates should excel in best post-graduate engineering institutes, acquiring advanced degrees in engineering and related disciplines. |
| PEO3 | Alumni should establish a successful career in an engineering-related field and adapt to changing technologies. |
| PEO4 | Graduates are expected to continue personal development through professional study and self-learning. |
| PEO5 | Graduates should be good citizens and cultured human beings, with full appreciation of the importance of professional, ethical and societal responsibilities. |

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## Course Outcomes:

### SE (Mechanical) Part – I

| | Engineering Mathematics - III |
|---|---|
| CO1 | Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector & F.T |
| CO2 | Student will show the understanding of impact of Engg.Mathematics on Mech |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

| | Engineering Thermodynamics |
|---|---|
| CO1 | Apply fundamental concepts of thermodynamic to solve real life engineering problems |
| CO2 | Identify problems & analyse power producing and consuming devices. |
| CO3 | To apply fundamentals of engineering thermodynamics to compressors |

| | Engineering Metallurgy |
|---|---|
| CO1 | Apply fundamental concepts of Metallurgy to solve real life engineering problems. |
| CO2 | Identify problems and suggest suitable material/ heat treatment to get the requisite mechanical properties for a given application |
| CO3 | To apply advanced Metallurgical techniques to solve numerous engineering problems |

| | Mechanical Measurement And Metrology |
|---|---|
| CO1 | After going through basic study of generalized measurement system, students will be able to understand the stepwise working of all instruments and will be able to find out the output factors. |
| CO2 | They will be able to know the importance of all factors affecting on output of instruments i.e. errors |
| CO3 | They can suggest some points in the design & working of instruments after studying the basics if metrology. |
| CO4 | Students will be able to differentiate between all types of measurements i.e. Direct & indirect type, contact & non-contact type as well as they can design the components with provisions of tolerance in manufacturing through the concepts of metrology |

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**Strength of Materials**

| | |
|---|---|
| CO1 | Student will be able to effectively use the concepts of shear force and bending moment diagrams in design of machine elements. |
| CO2 | Will be able to compute the principal stresses and Strains by analytical and graphical methods (Mohr's circle of stress 2-D. |
| CO3 | Able to use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads. |
| CO4 | Able to estimate the Slope and Deflection in determinate beams. |
| CO5 | This subject enables the student to understand the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines. |

## SE (Mechanical) Part – II

**Engineering Mathematics - IV**

| | |
|---|---|
| CO1 | Student will demonstrate basic knowledge of Functions of Complex Variable & Numerical Technique. |
| CO2 | Student will show the understanding of impact of Engg.Mathematics on Mech. |
| CO3 | Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics. |

**Theory of Machines**

| | |
|---|---|
| CO1 | Identify the basic relations between distance, time, velocity, and acceleration. |
| CO2 | Apply vector mechanics as a tool for problem solving techniques. |
| CO3 | Distinguish the basics of kinematics and kinetics of motion |
| CO4 | Develop familiarity with application of kinematics theories to real-world machines. |
| CO5 | Understand analytical linkage analysis |
| CO6 | Determine cam profiles |
| CO7 | Understand gear trains |
| CO8 | Use the techniques to study the motions of machines and their components. |
| CO9 | Use the techniques, skills, and modern engineering tools necessary for engineering practice. |



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**Manufacturing Technology – I**

| | |
|---|---|
| CO1 | Ability to classify and apply the knowledge gained for applicability of processes for different product manufacturing. |
| CO2 | To compare and select best suitable manufacturing process based on requirements, advantages, limitations and applications |

**Fluid Mechanics & Hydraulics Machines**

| | |
|---|---|
| CO1 | An ability to identify, formulate and solve problems related to fluids at rest and in motion. |
| CO2 | Knowledge to design pipeline systems, floating bodies and hydraulic gates. |
| CO3 | Knowledge to design hydraulic turbines and pumps. |

**Machine Drawing and CAD**

| | |
|---|---|
| CO1 | Able to create drawings as per BIS standards. |
| CO2 | Visualize & prepare detail drawing of a given object. |
| CO3 | Read & interpret a given drawing |
| CO4 | Able to create assembly models of simple machine |

**Professional Communication Skill**

| | |
|---|---|
| CO1 | Students would understand the concept, process and importance of Professional Communication |
| CO2 | Students would acquire English Speaking and Writing Skills |
| CO3 | Students would develop Presentation Skills |

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## TE (Mechanical) Part – I

### Manufacturing Technology – II

| | |
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| CO1 | The students will be able to understand the details about machines used in production |
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### Machine Design- I

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| CO1 | Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part |
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## TE (Mechanical) Part – II

**Tool Engineering**

| | |
|---|---|
| CO1 | Selection of a die for a given component |
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| CO1 | Ability to have adequacy with design, erection and development of Power Plant. |
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## B. E. (Mechanical) Part – I

**Refrigeration and Air Conditioning**

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| CO1 | Selection of appropriate manufacturing process for Advance components. |
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|---|---|
| CO1 | Apply the technology to capture the energy from the renewable source like Sun, Wind, Ocean, Biomass and Geothermal. |
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|---|---|
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