Electronics and Communication

A graduate of the Electronics and Communication Engineering Program will demonstrate:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: 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.

PO4: 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.

PO5: 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.

PO6: 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.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: 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.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSO's)**

A graduate of the Electronics and Communication Engineering Program will demonstrate:

PSO1: Build Embedded Software and Digital Circuit Development platform for Robotics, Embedded Systems and Signal Processing Applications.

PSO2: Focus on the Application Specific Integrated Circuit (ASIC) Prototype designs, Virtual Instrumentation and System on Chip (SOC) designs.

PSO3: Make use of High Frequency Structure Simulator (HFSS) for modeling and evaluating the Patch and Smart Antennas for Wired and Wireless Communication Applications.

**Electron Devices (EC301)**

CO1. Differentiate the conduction techniques in semi-conductor materials.

CO2. Analyze characteristics of Semi-conductor diodes and solve problems.

CO3. Analyze characteristics of Bi-polar Transistors and solve problems.

CO4. Analyze characteristics of MOS Transistors and solve problems.

CO5. Differentiate between different Opto-electronic devices

**Electron Devices Lab (EC391)**

Course Outcome

a) An ability to verify the working of different diodes, transistors, CRO probes and measuring

instruments. Identifying the procedure of doing the experiment.

b) Ability to understand the characteristics of BJT and FET and how to Determine different

parameters for designing purpose..

c) Ability to understand properties of photoelectric devices

d) Ability to measure and record the experimental data, analyze the results, and prepare a formal

laboratory report.

**Digital System Design Lab (EC392)**

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Design and analyze combinational logic circuits

2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder

3. Design & analyze synchronous sequential logic circuits

4. Design circuit using PSPICE software

**Digital System Design(EC302)**

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Design and analyze combinational logic circuits

2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder

3. Design & analyze synchronous sequential logic circuits

**Signals and Systems (EC303)**

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze different types of signals

2. Represent continuous and discrete systems in time and frequency domain using different

transforms

3. Investigate whether the system is stable

4. Sampling and reconstruction of a signal

**Network Theory (EC304)**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.

2. Appreciate electrical network theorems.

3. Apply Laplace Transform for steady state and transient analysis.

4. Determine different network functions.

5. Appreciate the frequency domain techniques.

Semester-V

**Electromagnetic Waves (EC501)**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines

2. Carryout impedance transformation on TL

3. Use sections of transmission line sections for realizing circuit elements

4. Characterize uniform plane wave

5. Calculate reflection and transmission of waves at media interface

6. Analyze wave propagation on metallic waveguides in modal form

7. Understand principle of radiation and radiation characteristics of an antenna

**Computer Architecture (EC502)**

Course Outcomes

At the end of this course students will demonstrate the ability to

1. learn how computers work

2. know basic principles of computer’s working

3. analyze the performance of computers

4. know how computers are designed and built

5. Understand issues affecting modern processors (caches, pipelines etc.).

**Digital Communication and Stochastic Process (EC503)**

Course Outcome: At the end of this course students will demonstrate the ability to

1. understand the concept of Stochastic Process in Communication System

2. represent various signals in different mathematical forms

3. analyze baseband transmission mode of digital data

4. analyze different career modulation techniques considering noise aspects

**Digital Signal Processing (EC504)**

**Course Outcomes:**

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for various applications

**Power Electronics (PC-EC505C)**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Build and test circuits using power devices such as SCR

2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,

3. Learn how to analyze these inverters and some basic applications.

4. Design SMPS.

**Electromagnetic Waves Lab(EC591)**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines

2. Carryout impedance transformation on TL

3. Use sections of transmission line sections for realizing circuit elements

4. Characterize uniform plane wave

5. Calculate reflection and transmission of waves at media interface

6. Analyze wave propagation on metallic waveguides in modal form

7. Understand principle of radiation and radiation characteristics of an antenna

8. Understand Smith chart.

**Digital Communication Lab (EC592)**

Course Outcome: At the end of this course students will demonstrate the ability to

1. understand the concept of Stochastic Process in Communication System

2. represent various signals in different mathematical forms

3. analyze baseband transmission mode of digital data

4. analyze different career modulation techniques considering noise aspects

5. Able to use PCM, PAM, FSK, BPSK kit

**Digital Signal Processing Lab (EC593)**

**Course Outcomes:**

At the end of this course students will demonstrate the ability to

1. Sampled sinusoidal signal, various sequences and different arithmetic operations.

2. Convolution of two sequences using graphical methods and using commands

verification of the properties of convolution.

3. Z-transform of various sequences - verification of the properties of Z-transform.

4. Twiddle factors - verification of the properties.

5. DFTs / IDFTs using matrix multiplication and also using commands.

6. Circular convolution of two sequences using graphical methods and using commands,

differentiation between linear and circularconvolutions.

7. Verifications of the different algorithms associated with filtering of long data sequences

and Overlap -add and Overlap-save methods.

8. Butterworth filter design with different set of parameters.

9. FIR filter design using rectangular, Hamming and Blackman windows.

Semester –VII

**Wireless Communication (EC701)**

**Course Outcomes:**

1. Explain the Classification of mobile communication systems
2. Analyze the radio channel characteristics and the cellular principle
3. Analyze the measures to increase the capacity in GSM systems- sectorization and Spatial Filtering for Interference Reduction.
4. Ability to analyze improved data services in cellular communication

**Microwave Engineering and Radar (EC702)**

**Course Outcomes:**

The student after undergoing this course will be able to:

1. Explain different types of waveguides and their respective modes of propagation.

2. Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations.

3. Design microwave matching networks using L section, single and double stub and quarter wave transformer.

4. Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc.

5. Describe and explain working of microwave tubes and solid state devices.

6. Perform measurements on microwave devices and networks using power meter and VNA.

7. Explain the operation of RADAR systems and recite their applications.

**FPGA and Reconfigurable Computing (EC703B)**

CO1: Identify mapping algorithms into architectures.

CO2: Summarize various delays in combinational circuit and its optimization methods. CO3: summarize circuit design of latches and flip-flops.

CO3: Construct combinational and sequential circuits of medium complexity, that is based on VLSIs, and programmable logic devices.

CO4: Summarize the advanced topics such as reconfigurable computing, partially reconfigurable, Pipeline reconfigurable architectures and block configurable.

**Embedded System (EC704A)**

**The student will be able to:**

1. Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
2. Get familiarized with programming environment to develop embedded solutions.
3. Program ARM microcontroller to perform various tasks.
4. Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

**Artificial Intelligence (EC705A)**

**Upon successful completion of this course, the student shall be able to:**

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

2) Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

3) Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

4) Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data Mining tool.

5) Demonstrate proficiency in applying scientific method to models of machine learning.

6) Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

**FPGA and Reconfigurable Computing Lab (EC793)**

CO1: Create the knowledge of high level VLSI design coding language to carry out research and development in the area of digital IC design.

CO2: Model the digital designs including FSMs to Processor architectures using the knowledge of HDL Language.

CO3: Apply the knowledge of Reconfigurable architectures like FPGAs in designing and implementing digital ICs.

CO4: Apply the techniques to improve the timing analysis of digital circuits..

CO5: Implement practical and state of the art of Digital VLSI design, suitable for real life and Industry applications.

**Microwave Lab (EC792)**

On completion of this lab course the students will be able to:

CO1. Able to handle microwave equipment

CO2. Able to understand microwave measurements.

CO3. Able to understand Wave guide and antenna measurements

Semester –VIII

**Nano Technology (EC801A)**

Upon successful completion, students will have the knowledge and skills to:

1. Explain the fundamental principles of nanotechnology and their application to biomedical engineering.
2. Apply engineering and physics concepts to the nano-scale and non-continuum domain.
3. Identify and compare state-of-the-art nanofabrication methods and perform a critical analysis of the research literature.
4. Design processing conditions to engineer functional nanomaterials.
5. Evaluate current constraints, such as regulatory, ethical, political, social and economical, encountered when solving problems in living systems.
6. Apply and transfer interdisciplinary systems engineering approaches to the field of bioand nanotechnology projects.
7. Discuss and evaluate state-of-the-art characterization methods for nanomaterials, and determine nanomaterial safety and handling methods required during characterization.

**Radar & Navigation (EC801C)**

**Course Outcomes:**

1. Knowledge in the topics such as Fundamentals of Radar

2. To become familiar with fundamentals of Different types of RADAR

3. To gain in-depth knowledge about the different types of RADAR and their operations

4. Understand signal detection in RADAR and various detection techniques

5. Understand Navigational Aids and Modern Navigation

**Digital Image Processing (EC802A)**

**Course Outcomes:**

CO1: understand the need for image transforms different types of image transforms and their properties.

CO2: develop any image processing application.

CO3: understand the rapid advances in Machine vision.

CO4: learn different techniques employed for the enhancement of images.

CO5: learn different causes for image degradation and overview of image restoration techniques.

CO6: understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.

CO7: learn different feature extraction techniques for image analysis and recognition

**Mobile Computing (EC802B)**

**Course Outcomes:**

1. Explain the basics of mobile Computing.
2. Describe the functionality of Mobile IP and Transport Layer.
3. Classify different types of mobile telecommunication systems
4. Demonstrate the Adhoc networks concepts and its routing protocols
5. Make use of mobile operating systems in developing mobile applications

Semester-VI

**Control System & Instrumentation(EC601)**

Course Outcomes (CO):

At the end of this course students will demonstrate the ability to:

1. Characterize a system and find its steady state behavior.

2. Investigate stability of a system using different tests.

3. Design various controllers.

4. Solve linear, non linearand optimal control problems.

5. Study with CRO, Wave analyzer, Spectrum analyzer knowing their functional details

**Computer Network (EC602)**

**Course Outcomes**

At the end of this course students will demonstrate the ability to

1. learn how computers work

2. know basic principles of computer’s working

3. analyze the performance of computers

4. know how computers are designed and built

5. Understand issues affecting modern processors (caches, pipelines etc.).

**Introduction to MEMS (PE-EC603A)**

Course Outcomes:

At the end of the course the students will be able to

1. Appreciate the underlying working principles of MEMS and NEMS devices.

2. Design and model MEM devices.

**Bio-Medical Electronics (PE-EC603B)**

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the application of the electronic systems in biological and medical applications.

2. Understand the practical limitations on the electronic components while handling biosubstances.

3. Understand and analyze the biological processes like other electronic processes.

**CMOS VLSI Design (PE-EC603C)**

CO1: acquire the knowledge about various CMOS fabrication process and its modeling.

CO2: infer about the second order effects of MOS transistor characteristics.

CO3: analyze and implement various CMOS static logic circuits.

CO4: learn the design of various CMOS dynamic logic circuits.

CO5: learn the design techniques low voltage and low power CMOS circuits for various applications.

CO6: learn the different types of memory circuits and their design.

CO7: design and implementation of various structures for low power applications

**Electronic Measurements and Measuring Instruments (OE-EC604A)**

1. Describe the fundamental concepts and principles of instrumentation

2. Explain the operation of various instruments required in measurements

3. Apply the measurement techniques for different types of tests

4. To select specific instruments for specific measurement function.

5. Understand principle of operation and working of different electronic instruments

Students will understand functioning, specification and application of signal analyzing instruments

**Computer Network Lab (EC691)**

Course Outcomes:

1. Understand the practical approach to network communication protocols.
2. Understand network layers, structure/format and role of each network layer.
3. Able to design and implement various network application such as data transmission between client and server, file transfer, real-time multimedia transmission.
4. Understand the various Routing Protocols/Algorithms and Internetworking.

**Control System & Instrumentation Lab (EC692)**

Course Outcomes:

**After the successful completion of the course the students will be able to:**

1. Develop the mathematical model of the physical systems.

2. Analyze the response of the closed and open loop systems.

3. Analyze the stability of the closed and open loop systems.

4. Design the various kinds of compensator.

5. Develop and analyze state space models.

Semester-IV

**Analog Communication (EC401)**

**Learning outcome:**

**Module - 1:** The learner must be able to appreciate the need for modulation and calculate the antenna size for different carrier frequencies.

From the functional representation of the modulated carrier wave, the learner must be able to

identify the type of modulation, calculate the side-band frequencies, identify the modulating

and carrier frequencies, decide the type of generation method to be adopted. Solve problems.

**Module - 2:** After understanding the basic concepts the learner must be able to compare

between the different demodulation methods, design an envelope detector, calculate the IF and image frequencies for the superheterdyne receivers given the carrier and modulating frequencies, calculate the oscillator frequency.

**Module - 3:** From the functional representation of the modulated carrier wave, the learner

must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted. Solve problems.

**Module - 4:** Appreciate the importance of Multiplexing, find out their application areas. The

learner must be able to calculate the Noise temperature & SNR for different systems, also

compare between the performance of the different modulation methods by comparing their

SNR. Also Understand the statistical analysis of Communication System.

**Analog Electronic Circuits (EC402)**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the characteristics of diodes and transistors

2. Design and analyze various rectifier and amplifier circuits

3. Design sinusoidal and non-sinusoidal oscillators

4. Understand the functioning of OP-AMP and design OP-AMP based circuits

**Microprocessor & Microcontroller (EC403)**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Do assembly language programming

2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.

3. Develop systems using different microcontrollers

4. Understand RSIC processors and design ARM microcontroller based systems

**Design and Analysis of Algorithm (ES-CS401)**

Course Outcomes:

1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.
2. 2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
5. For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
6. Explain the ways to analyze randomized algorithms (expected running time, probability of error).
7. Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

**Numerical Methods (BS-M401)**

Course Outcomes:

1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

2. Apply numerical methods to obtain approximate solutions to mathematical problems.

3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

4. Analyze and evaluate the accuracy of common numerical methods.

5. Implement numerical methods in Python.

6. Write efficient, well-documented Python code and present numerical results in an informative way.

**Analog Communication Lab(EC491)**

Upon the completion of this course, the student will be able to

1. Acquire knowledge on MATLAB or any other simulation programming skills to simulate analog and pulse modulation and demodulation techniques

2. Understand the operations of analog and pulse modulation & demodulation techniques

3. Exposed to various aspects of analog and pulse communications viz. modulation

&demodulation techniques, sampling theorem verification and study of spectrum analyzer, frequency synthesizer, AGC &PLL

4. Design of communication circuits such as AM, SSB-SC, DSB-SC, FM, PAM, PWM

& PPM

**Analog Electronic Circuits Lab (EC492)**

**Course Objective:**

1. To illustrate the students different electronic circuit and their application in practice.
2. To impart knowledge on assessing performance of electronic circuit through monitoring of sensitive parameters.
3. To evaluate the use of computer‐based analysis tools to review performance of semiconductor device circuit.

**Microprocessor & Microcontroller Lab (EC493)**

CO1: Demonstrate ability to handle arithmetic operations using assembly language programming in TASM and training boards

CO2: Demonstrate ability to handle logical operations using assembly language programming in TASM

CO3: Demonstrate ability to handle string instructions using assembly language programming in TASM

CO4: Demonstrate ability to handle sorting operations and using assembly language programming in TASM

**Numerical Methods Lab (BS-M(CS)491)**

Students will be able to solve problems of mathematics using computers and apply their knowledge gain solving real life problems appearing in various engineering applications that are often impossible to solve using analytical techniques.

**Digital Electronics Lab(PC-EE492)**

CO1 Learn the basics of gates.

CO2 Construct basic combinational circuits and verify their functionalities

CO3 Apply the design procedures to design basic sequential circuits

CO4 Learn about counters

CO5 Learn about Shift registers

CO6 To understand the basic digital circuits and to verify their operation

Mechanical

|  |  |
| --- | --- |
| **DEPARTMENT NAME: MECHANICAL ENGINEERING** | |
| Programme: | B.Tech / UG |
| Programme Outcomes (Pos) | * Recognize, visualize, prepare and resolve engineering problems within the field of mechanicalengineering. * Plan and carry out experiments to seek out appropriate resolution within the field of mechanicalengineering. * Apply basic information of mathematics, science and engineering principles to resolvetechnological& scientific problems. * Apply moral& ethical principles and responsibilities throughout skilled apply. * Operate on multi disciplinary groups as a team member/leader and build user friendly setting. * Apply the skills, techniques, engineering tools for engineering program. * communicate information of up to date problems concerning society and setting.   Be familiar with the need and engage in  life-long learning |
| Programme Specific Outcomes (PSOs) | 1.Ability to use the mechanical engineering information for the improvement of  nation. |
| 2. Investigate, plan and develop systems to  solve the engineering problems by integrating different domains of mechanical engineering. |

**Mathematics III (BS-M 301)**

Course Outcomes:

Upon completion of this course, students will be able to solve field problems in engineering

involving PDEs. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

**Biology (BS-BIO301)**

**After studying the course, the student will be able to:**

1. Describe how biological observations of 18th Century that lead to major discoveries.

2. Convey that classification per se is not what biology is all about but highlight the underlying

criteria, such as morphological, biochemical and ecological

3. Highlight the concepts of recessiveness and dominance during the passage of genetic

material from parent to offspring

4. Convey that all forms of life have the same building blocks and yet the manifestations are as

diverse as one can imagine

5. Classify enzymes and distinguish between different mechanisms of enzyme action.

6. Identify DNA as a genetic material in the molecular basis of information transfer.

7. Analyse biological processes at the reductionistic level

8. Apply thermodynamic principles to biological systems.

9. Identify and classify microorganisms

**Basic Electronics Engineering (ES-ECE301)**

**Course Outcomes:**

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor devices and their applications.

2. Design an application using Operational amplifier.

3. Understand the working of timing circuits and oscillators.

4. Understand logic gates, flip flop as a building block of digital systems.

5. Learn the basics of Electronic communication system.

**Engineering Mechanics (ES-ME 301)**

**Course Outcomes:**

**At the end of this course students will be able to**

1. Use scalar and vector analytical techniques for analysing forces in statically determinate

structures.

2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple,

practical problems.

3. Apply basic knowledge of maths and physics to solve real-world problems.

4. 4.Understand measurement error, and propagation of error in processed data.

5. Understand basic kinematics concepts – displacement, velocity and acceleration (and their

angular counterparts).

6. Understand basic dynamics concepts – force, momentum, work and energy.

7. Understand and be able to apply Newton’s laws of motion.

8. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle,

Impulse-Momentum principle and the coefficient of restitution.

9. Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's

Equation and considering energy of a system in general plane motion, and the work of

couples and moments of forces).

10. Learn to solve dynamics problems. Appraise given information and determine which

concepts apply, and choose an appropriate solution strategy

11. Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

**Thermodynamics (PC-ME 301)**

**Course Outcomes:**

1. After completing this course, the students will be able to apply energy balance to systems

and control volumes, in situations involving heat and work interactions

2. Students can evaluate changes in thermodynamic properties of substances

3. The students will be able to evaluate the performance of energy conversion devices

4. The students will be able to differentiate between high grade and low grade energies.

**Manufacturing Processes (PC-ME 302)**

**Course Outcomes:**

Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products

**Engineering Mechanics (ES-ME 301)** **Course Outcomes:**

**At the end of this course students will be able to**

1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures.

2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.

3. Apply basic knowledge of maths and physics to solve real-world problems.

4. Understand measurement error, and propagation of error in processed data.

5. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts).

6. Understand basic dynamics concepts – force, momentum, work and energy.

7. Understand and be able to apply Newton’s laws of motion.

8. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution.

9. Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's

Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces).

10. Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy

11. Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

**Heat Transfer (PC-ME501)**

**Course Outcomes:**

1. After completing the course, the students will be able to formulate and analyze a heat transfer problem involving any of the three modes of heat transfer

2. The students will be able to obtain exact solutions for the temperature variation using analytical methods where possible or employ approximate methods or empirical correlations to evaluate the rate of heat transfer

3. The students will be able to design devices such as heat exchangers and also estimate the insulation needed to reduce heat losses where necessary.

**Solid Mechanics (PC-ME502)**

**Course Outcomes:**

Upon completion of this course, students will be able understand the deformation behavior of solids under different types of loading and obtain mathematical solutions for simple geometries.

**Kinematics & Theory of Machines (PC-ME503)**

At the end of course the students will be able to:

1. Build up critical thinking and problem solving capacity of various mechanical engineering problems related to kinematics of machines.

2. Asses various concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and working principles of power elements (Gears, gear trains, Cams, Belt and Chain drives) and design related problems effectively.

3. Utilize analytical, mathematical and graphical aspects of kinematics of Machines for effective design.

**Humanities I (HM-HU501)**

**Course Outcomes:**

After completing this course, the students will be able to

1. Understand the dynamics of Verbal and Non Verbal aspects of technical communication

2. Practice multi-step writing process to plan, draft, and revise reports, correspondence, and presentations.

3. Illustrate and examine the knowledge of ethical aspects of engineering

4. Demonstrate and explain social and professional etiquettes.

5. Plan self-development and practice self-assessment to function on multi-disciplinary teams.

**Essence of Indian Knowledge Tradition (MC-501)**

**Course Outcomes:**

After completion of the course, students will be able to:

1. Understand the concept of Traditional knowledge and its importance

2. Know the need and importance of protecting traditional knowledge.

3. Know the various enactments related to the protection of traditional knowledge.

4. Understand the concepts of Intellectual property to protect the traditional knowledge.

**Financial Management & Accounts (HU701)**

1. Demonstrate an understanding of the overall role and importance of the finance function.
2. Demonstrate basic finance management knowledge.
3. Communicate effectively using standard business terminology.

**Advanced Manufacturing Technology (ME 701)**

1. Students will be able to categorize different material removal, joining processes as per the requirements of material being used to manufacture end product.
2. Students will be able to select material processing technique with the aim of cost reduction, reducing material wastage & machining time.
3. Students will be able to identify the process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.
4. Students will be able to combine & develop novel hybrid techniques from the state of art techniques available.
5. Students will be able to perform process analysis taking into account the various responses considered in a process.

**Metrology & Measurement (ME 702)**

**Course outcomes:**

Students will be able to design tolerances and fits for selected product quality. They can choose

appropriate method and instruments for inspection of various gear elements and thread elements.

They can understand the standards of length, angles, they can understand the evaluation of

surface finish and measure the parts with various comparators. The quality of the machine tool

with alignment test can also be evaluated by them.

**Advanced Welding Technology (ME 703A)**

**Course outcomes:**

CO 1: Explain metal transfer mechanism and classify different types of welding process on the basis of heat sources.

CO 2: Explain the mechanism of modern welding process and their Parameters and control.

CO 3: Explain different Non Destructive Testing methods for welds.

CO 4: Explain different Inspection codes for weldments.

CO 5: Design and failure analysis of Weldment for pressure vassels, Off-shore structures and Submarine Pipe lines, Heavy structures.

**Operation Research (ME 704A)**

**Course outcomes:**

1. Identify and develop operational research models from the verbal description of the real system.
2. Understand the mathematical tools that are needed to solve optimisation problems.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

**Production Management (PTM-101)**

**Course outcomes:**

Upon completion of the course students should be able to:

1. Apply the fundamental concepts of product and brand development and management.
2. Use the brand positioning framework to develop a brand, keep it relevant, expand a brand internationally, and reposition a brand.
3. Use tools and metrics to analyze competitors and develop positioning strategies.
4. Recognize the importance of using teams and organization to coordinate multiple interdisciplinary tasks in order to create and manage products within an organization.
5. Use portfolio analysis and the product life cycle to understand how a firm manages its product mix.
6. Apply an understanding of the product manager’s role in product pricing, sales, and promotion.

**Production Planning & Control (PTM-102)**

**COURSE OUTCOMES:**

Upon completion of this course the student will be able to:

1. Recognize the objectives, functions, applications of PPC and forecasting techniques.

2. Explain different Inventory control techniques.

3. Solve routing and scheduling problems

4. Summarize various aggregate production planning techniques.

5. Describe way of integrating different departments to execute PPC functions

**Theory of Metal Forming (PTM 103D:)**

OUTCOMES :

At the end of this course the students are expected to upgrade their knowledge on plasticity, surface treatment for forming of various types of metal forming process.

**Operations Research (PTM-104B)**

**Course outcomes:**

1. Identify and develop operational research models from the verbal description of the real system.
2. Understand the mathematical tools that are needed to solve optimisation problems.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

**Research Methodology & IPR(RMI- 101)**

**COURSE OUTCOMES (COs):**

CO 1: Understand the research problem and research process.

CO 2: Understand research ethics .

CO 3: Prepare a well-structured research paper and scientific presentations

CO 4: Explore on various IPR components and process of filing.

CO5 : Understand the adequate knowledge on patent and rights

**Robot Application & Design (PTM-301A)**

**Course Outcomes (COs)**

CO1 : Upon completion of this course, the students can able to apply the basic engineering

CO2 : To learn about knowledge for the design of robotics.

CO3 : Will understand robot kinematics and robot programming.

CO4 : Will understand application of Robots

CO5 :To learn about force and torque sensing

CO6 : To learn about application of robot

**Composite Materials (OEL-301D)**

**COURSE OUTCOMES:**

**Upon completion of this course the student will be able to:**

1. Explain the mechanical behavior of layered composites compared to isotropic

materials.

2. Apply constitutive equations of composite materials and understand mechanical

behavior at micro and macro levels.

3. Determine stresses and strains relation in composites materials.

**Engineering Graphics & Design(ES-ME 191)**

**Upon completion of the course students should be able to:**

1. Sketch two-dimensional orthographic drawings and three-dimensional isometric views.
2. Create and modify two-dimensional orthographic drawings using AutoCAD software, complete with construction lines, dimensions, and layers, conforming to industry standards.
3. Create three-dimensional solid models using AutoCAD software, and generate paper space layouts from model space geometry.

**Workshop/Manufacturing Practices (ES-ME 192)**

CO1: Understand the appropriate tools, materials, instruments required for specific operations in workshop.

CO2: Apply techniques to perform basic operations with hand tools and power tools such as center lathe machine, drilling machine using given job drawing.

CO3: Understand the figures of the hand tools used in fitting, carpentry, foundry, welding shop and machine tools such as lathe machine and drilling machine.

CO4: Understand a report related to hand tools and machine tools description referring to library books and laboratory manuals.

CO5: Understand report of procedures followed for a given task in fitting, carpentry, foundry, sheet metals, welding and machine shops.

CO6: Apply safety consciousness and show team work.

**Practice of Manufacturing Processes (PC- ME391)**

1. The student will be having the capability of selecting suitable manufacturing processes to manufacture the products optimally.
2. The student will be able to recommend the appropriate design of gating systems, forming processes, welding process and NDT technique.
3. The student will be able to develop simplified manufacturing processes with the aim of reduction of cost and manpower.
4. The student will be able to identify/control the appropriate process parameters, and possible defects of manufacturing processes so as to remove them.
5. The student will be able to make use of the softwaresand CAD/Cam tools meant for optimizing manufacturing processes.

**Mechanical Engineering Laboratory I (Thermal)( PC-ME 591)**

1. Calculate the mean effective pressure and air standard efficiency of different gas power cycles.
2. Calculate the performance test on IC engines.
3. Sketch the velocity diagrams of single and multi-stage turbines.
4. Explain the classification and working principle of various types of air compressors.
5. Calculate properties of moist air and COP of vapor refrigeration systems by using refrigeration table and chart.

**Machine Drawing II(PC-ME 592)**

**After successful completion of the course, the student would be able to**

1. Run Computer Aided Drafting software like AutoCAD independently.
2. Model basic two dimensional objects, modify and dimension them to form more complex machine parts of engineering importance.
3. Understand geometric construction, Solid Modeling concepts and techniques.
4. Design three dimensional views of important machine parts and explore the plotting techniques for standard presentation.

**Materials Engineering (ES- ME401)**

1. Student will be able to identify crystal structures for various materials and understand the defects in such structures

3. Understand how to tailor material properties of ferrous and non-ferrous alloys

4. 3.How to quantify mechanical integrity and failure in materials

**Applied Thermodynamics (PC- ME401)**

1. After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles.

2. They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors

3. They will be able to understand phenomena occurring in high speed compressible flows

**Fluid Mechanics & Fluid Machines (PC- ME402)**

Course Outcomes:

1. Upon completion of this course, students will be able to mathematically analyze simple flow situations

2. They will be able to evaluate the performance of pumps and turbines.

**Strength of Materials (PC-ME403)Course Outcomes:**

1. After completing this course, the students should be able to recognise various types loads applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components

2. The students will be able to evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading

**Metrology and Instrumentation (PC-ME404)**

**Course Outcomes:**

Upon successful completion of the course, student will have

1. Understand the working of linear and angular measuring instruments.

2. Know the fundamentals of limits and limit gauges, various methods for measurement of screw thread and surface roughness parameters and the working of optical measuring instruments.

3. Acquire an overview of mechanical measurement systems and principle of instruments for motion and dimension measurement.

4. Get basic idea about working principle and applications of devices for measurement of force and torque; strain and stress and temperature.

**Environmental Science (MC401)**

Course Outcomes:

After the completion of the course, the student would be able to

CO 1: Get the information about ecosystem and also about its functions like Food chain,

Ecological pyramids etc.,

CO 2: Get the knowledge about the different types of resources like land, water, mineral and

energy and also about the effects of environment by the usage of these resources.

CO 3: Gain the knowledge about the ecosystem diversity, its values and also about the

importance of the endemic species and different techniques involved in its conservation

CO 4: Gain the knowledge about the different types of pollutions and their control technologies,

Waste water treatment, Bio medical waste management etc.,

CO 5: Get the complete information about EIA- Environmental Impact Assessment,

Sustainable developmental activities, environmental policies and regulations, awareness among

people about protection of wild life, forest and other natural resources.

**Manufacturing Technology (PC-ME601)**

**Course Outcomes:**

1. To describe machines and related tools for manufacturing various components.

2. To understand the relationship between process and system in manufacturing domain.

3. To experiment on CNC machine tools. 4. To demonstrate rapid prototyping methods.

**Design of Machine Elements (PC-ME601)**

**Course Outcomes:**

Upon completion of this course, students will get an overview of the design methodologies employed for the design of various machine components.

**Power Plant Engineering (PE-ME601A10)**

Course Outcomes:

At the end of the course, student will be able to

1. Understand functions of the various components of power plant.

2. Illustrate the working of nuclear, thermal and gas based power plants.

3. Evaluate the design layout and working of hydroelectric power plants.

4. Estimate the feasibility and its implications on power generating units.

**Internal Combustion Engines and Gas Turbines(PE-ME602A1)**

Course Outcomes:

1. Explained basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles.

 2. Described the combustion phenomenon in SI and CI engines.

3. Evaluated the performance of IC engines and the importance of alternate fuels.

4. Classified the essential components of gas turbine along with its performance improving methods.

5. Illustrated the working principle of different types of Jet propulsive engines and Rockets.

**Constitution of India (MC601)**

**Course Outcomes:**

**On completion of the course student will**

1. Have general knowledge and legal literacy and thereby to take up competitive examinations.

2. Understand state and central policies, fundamental duties.

3. Understand Electoral Process, special provisions.

4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.

5. Understand Engineering ethics and responsibilities of Engineers

6. Understand Engineering Integrity & Reliability

**Humanities II (OR) (HM-HU601)**

**Course Outcome:**

**At the end of this course students will be able to**

1. Apply forecasting methods for predicting demands.

2. Make decisions under certainty, uncertainty and conflicting situations.

3. Apply linear programming tools for optimal utilization of resources in various types of industries.

4. Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment polices.

5. Understand the basic elements of a Queuing model

6. Apply PERT/CPM for project scheduling and resource allocation in an optimal way.

7. Manage inventory with cost effectiveness.

**Industrial Engg. & Management (ME801)**

1. An ability to apply knowledge of mathematics, science, and engineering;
2. An ability to design and conduct experiments, as well as to analyze and interpret data;
3. An ability design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
4. An ability to function on a multidisciplinary team;
5. An ability to identify, formulate, and solve engineering problems;
6. An understanding of professional and ethical responsibility;
7. An ability to communicate effectively;
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social context;
9. A recognition of the need for, and an ability to engage in lifelong learning;
10. A knowledge of contemporary issues; and
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Renewable Energy Studies (ME802A)**

1. Make interpretation about the energy sources.
2. Comprehend the energy and energy types.
3. Make interpretation about the solar energy.
4. Explain the solar energy power plants.
5. Explain the solar energy collectors.
6. Make interpretation about the geothermal energy.
7. Explain the production of electricity from geothermal fluid.
8. Explain the potential of geothermal energy.
9. Make interpretation about the wind energy.
10. Explain the production of electricity from wind energy.
11. Make interpretation about the hydrogen energy.
12. Explain the production of energy method from hydrogen.

**Automobile Engineering (ME803C)**

**The student will be able to**

1. Identify the different parts of the automobile
2. Explain the working of various parts like engine, transmission, clutch, brakes
3. Describe how the steering and the suspension systems operate.
4. Understand the environmental implications of automobile emissions
5. Develop a strong base for understanding future developments in the automobile industry

**Automation in Manufacturing System & Process (PTM-201)**

**Upon completion of this course the student will be able to:**

1. Illustrate the basic concepts of automation in machine tools.

2. Analyze various automated flow lines, Explain assembly systems and line balancing methods.

3. Describe the importance of automated material handling and storage systems.

4. Interpret the importance of adaptive control systems, automated inspection systems.

**Non Traditional machining Processes (PTM-202)**

**COURSE OUTCOMES (CO’s)**

CO 1. Compare non-traditional machining, classification, material applications in material removal process

CO 2. Summarize the principle and processes of abrasive jet machining.

CO 3. Understand the principles, processes and applications of thermal metal removal processes.

CO 4. Identify the principles, processes and applications of EBM.

CO 5. Understand the principles, processes and applications of Plasma Machining.

**Quality Assessment & Control (PTM-203C)**

**Course Outcomes**

On completion of this course, the students will be able to:

CO1. To realize the importance of significance of quality

CO2. Manage quality improvement teams

CO3. Identify requirements of quality improvement programs

**Energy Management &Audit (PTM-204 B)**

**Course Outcomes**

**On completion of this course, the students will be able to exhibit**

CO1. Conceptual knowledge of the technology, economics and regulation related issues associated with energy conservation and energy auditing

CO2. Ability to analyse the viability of energy conservation projects

CO3. Capability to integrate various options and assess the business and policy environment regarding energy conservation and energy auditing

CO4. Advocacy of strategic and policy recommendations on energy conservation and energy auditing

**Disaster Management (AUD -201B)**

1. To provide basic conceptual understanding of disasters and its relationships with development.

2. To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

3. To understand Medical and Psycho-Social Response to Disasters.

4. To prevent and control Public Health consequences of Disasters

5. To enhance awareness of Disaster Risk Management institutional processes in India

6. To build skills to respond to disasters.

**Practice of Manufacturing Processes and Systems Laboratory (PC-ME491)**

1. To build practical knowledge about Pattern Making; pattern material, pattern allowances and types of patterns casting processes
2. To apply practical understanding for use of moulding tools: green sand moulding, gating system, risering system, core making;
3. To plan and create jobs using forging processes;
4. To understand and plan for machining of gears;
5. To relate the job manufactured from practical relevance point of view;
6. To prepare a sheet metal Job.

**Machine Drawing-I (PC-ME492)**

**Upon successful completion of this course, the student will be able to:**

1. Demonstrate the isometric view of a given three dimensional object/part.

2. Apply the concept of orthogonal projection of a solid body and assemble drawing using part drawings.

3. Evaluate various materials and Mechanical components conventionally.

4. Classify the shape and structure of different types of screws, keys and Couplings.

**Thermal Power Engg Lab(ES (ME) 491)**

1. Estimation of uncertainty in experiments and the obtained results.

2. Exposure to inverse heat conduction technique

**Industrial Engg. Lab (ME 891)**

CO 1 : Perform experiments related to time study and flow charts and analyze to improve the existing process

CO 2 : Analyze existing workstation with respect to controls and displays and suggest improved design from ergonomic viewpoint for workers safety.

CO 3 : Perform case studies on MRP, BOM, capacity planning, CPM & PERT, and plant location & layout.

CO 4 : Solve the operations research problems using OR software’s like TORA/LINGO/LINDO/SAS/EXCEL SOLVER etc.

CO 5 : Communicate effectively, work in groups, search literature and analyze the data.

**Modelling & Analysis Lab (PTM-292)**

**Course outcomes:**

Upon successful completion of this course student should be able to:

1. The student will be able to appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems.

2. Use of these tools for any engineering and real time applications.

3. Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.

**Electrical Engineering**

|  |  |
| --- | --- |
| **DEPARTMENT NAME: ELECTRICAL ENGINEERING DEPARTMENT** | |
| Programme: | B.Tech / UG |
| Programme Outcomes (Pos) | 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 specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations. 4. Conduct investigations of complex problems: using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of 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 contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. 7. Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development. 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. 9. Individual and Team Work |

|  |  |
| --- | --- |
|  | 1. Communication 2. Project Management and Finance 3. Life-long Learning |
| Programme Specific Outcomes (PSOs) | 1. Students will be able to demonstrate an ability to analyze, design and provide engineering solutions in the areas related to Electrical Drives, Electrical Machines,  Power Electronics, Control Systems and Power Systems. |
| 2. Students of EEE are able to develop and design the electrical and electronic circuits using simulation software’s such as P-SPICE, MATLAB and will be able to utilize the techniques and participate to succeed in competitive examinations like GATE, TOFEL, GRE and  GMAT etc. |

**Basic Electrical Engineering (ES-EE101)**

**Course Outcome**

On completion of the course students will be able to

1. Predict the behavior of any electrical and magnetic circuits.

2. Formulate and solve complex AC, Dc circuits.

3. Identify the type of electrical machine used for that particular application.

4. Realize the requirement of transformers in transmission and distribution of electric power and other applications.

5. Function on multi-disciplinary teams.

**Electric Circuit Theory (PC-EE 301)**

**Course Outcome: After completion of this course, the learners will be able to**

1. Describe different type of networks, sources and signals with examples.

2. Explain different network theorems, coupled circuit and tools for solution of networks.

3. Apply network theorems and different tools to solve network problems.

4. Select suitable techniques of network analysis for efficient solution.

5. Estimate parameters of two-port networks.

6. Design filter circuits.

**Analog Electronics (PC-EE 302)**Course Outcome: After completion of this course, the learners will be able to

1. Describe analog electronic components and analog electronics circuits

2. Explain principle of operation of analog electronic components, filters, regulators and analog electronic circuits.

3. Compute parameters and operating points of analog electronic circuits.

4. Determine response of analog electronic circuits.

5. Distinguish different types amplifier and different types oscillators based on application.

6. Construct operational amplifier based circuits for different applications.

**Electromagnetic field theory (PC-EE 303)**

Course Outcome: After completion of this course, the learners will be able to

1. Relate different coordinate systems for efficient solution of electromagnetic problems.

2. Describe mathematical s tools to solve electromagnetic problems.

3. Explain laws applied to electromagnetic field.

4. Apply mathematical tools and laws to solve electromagnetic problems.

5. Analyze electromagnetic wave propagation

6. Estimate transmission line parameters

**Mathematics-III (BS-M301)**

Course Outcome: After completion of this course, the learners will be able to

1. Explain basics of probability theories, rules, distribution and properties of Z transform

2. Describe different methods of numerical analysis.

3. Solve numerical problems based on probability theories, numerical analysis and Z transform

4. Apply numerical methods to solve engineering problems.

5. Solve engineering problems using z transform and probability theory.

**Biology for Engineers (BS-EE301)**

Course Outcome: After completion of this course, the learners will be able to

1. describe with examples the biological observations lead to major discoveries.

2. explain

 the classification of kingdom of life

 the building blocks of life

 different techniques of bio physics used to study biological phenomena.

 The role of imaging in the screening, diagnosis, staging, and treatments of cancer.

3. Identify DNA as a genetic material in the molecular basis of information transfer

4. Analyze biological processes at the reductionist level.

5. Apply thermodynamic principles to biological systems.

6. Identify microorganisms.

**Indian Constitution (MC-EE301)**

Course Outcome: After completion of this course, the learners will be able to

1. describe

 different features of Indian constitution..

 power and functioning of Union, state and local self-government.

 structure, jurisdiction and function of Indian Judiciary.

 basics of PIL and guideline for admission of PIL.

 Functioning of local administration starting from block to Municipal Corporation.

2. identify authority to redress a problem in the profession and in the society.

**Electric Circuit Theory Laboratory (PC-EE391)**

Build electronics circuits and characterize circuit behavior using the appropriate instruments and techniques.

**Electric machine-II (PC-EE501)**

**Course Outcome:**

**After completion of this course, the learners will be able to**

1. Describe the arrangement of winding of AC machines.

2. Explain the principle of operation of Induction machines, Synchronous machines and special machines.

3. Solve numerical problems of Induction machines, Synchronous machines and Special machines.

4. Estimate the parameters and efficiency of Induction machines and Synchronous machines.

5. Determine the characteristics of Induction machines and Synchronous machines.

6. Select appropriate methods for starting, braking and speed control of Induction machines.

**Power System-I (PC-EE502)**

**Course Outcome:**

After completion of this course, the learners will be able to

1. Explain the principle of generation of Electric power from different sources

2. Determine parameters of transmission lines and its performance

3. Explain the principle of formation of corona and methods of its reduction

4. Conduct electrical tests on insulators

5. Solve numerical problems related to overhead transmission line, cable, insulators and tariff

6. Analyze overhead transmission line based on short medium and long lines.

**Control system (PC-EE503)**

**Course Outcome:**

**After completion of this course, the learners will be able to**

1. Develop mathematical model of mechanical, electrical, thermal, fluid system and different control system components like servomotors, synchros, potentiometer, tacho-generators etc.

2. Analyse stability of LTI system using routh-hurtwitz (RH) criteria, root locus techniques in time domain and bode plot and nyquist technique in frequency domain.

3. Design different control law or algorithms like proportional control, proportional plus derivative (PD) control, proportional plus integration(PI) control, and proportional plus integration plus derivative (PID) control and compensators like lag, lead, lag-lead for LTI systems.

4. Apply state variable techniques for analysis of linear systems.

5. Analyze the stability of linear discrete system.

6. Solve numerical problems on LTI system modelling, responses, error dynamics and stability.

**Power Electronics (PC-EE 504)**

**After completion of this course, the learners will be able to**

1. Differentiate between signal level and power level devices.

2. Construct triggering and commutation circuits of SCR.

3. Explain the principle of operation of AC-DC, DC-DC and DC-AC converters.

4. Analyse the performance of AC-DC, DC-DC and DC-AC converters.

5. Apply methods of voltage control and harmonic reduction to inverters.

6. Solve numerical problems of switching devices, AC-DC, DC-DC and DC-AC converters.

**High Voltage Engineering (PE-EE 501A)**

**Course Outcome:**

After completion of this course, the learners will be able to

1. explain breakdown phenomenon of gas, liquid and solid and vacuum

2. suggest methods for generation and measurement of high voltage and currents.

3. determine the basic insulation level of substation equipment.

4. apply methods for protection of electrical apparatus against over voltage

5. test insulators,bushings, isolators, circuit breakers, cables and power transformers.

6. solve numerical problems of breakdown phenomena, generation and measurement of high voltage and currents, over voltage phenomena and high voltage testing.

**Power Plant Engineering(PE-EE 501B)**

**Course Outcome:**

After completion of this course, the learners will be able to

1. explain the principle of operational of Steam, Hydroelectric, Diesel, Gas turbine, Nuclear power and non-conventional power plant.

2. Identify the cause of pollution for power generation and its remedy.

3. suggest location to set up Steam, Hydroelectric, Diesel, Gas turbine and Nuclear power plant.

4. compare Steam, Hydroelectric, Diesel, Gas turbine, Nuclear power and non-conventional power plant.

5. suggest methods of maintenance of Steam, Gas and Hydroelectric power plants

6. solve numerical problems of load estimation and economics of power plants.

**Data Structure & Algorithm (OE-501A)**

**Course Outcome:**

After completion of this course, the learners will be able to

1. differentiate how the choices of data structure & algorithm methods enhance the performance of the program.

2. solve problems based upon different data structure & also write programs.

3. write programs based on different data structure

4. identify appropriate data structure & algorithmic methods in solving problem.

5. discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

6. compare the benefits of dynamic and static data structures implementations.

**OBJECT ORIENTED PROGRAMMING (OE-501B)**

Course Outcome:

After completion of this course, the learners will be able to

1. specify simple abstract data types.

2. Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.

3. apply common object-oriented design patterns

4. Specify uses of common object oriented design patterns with examples.

5. design applications with an event-driven graphical user interface.

**Electric Machine-II laboratory (PC-EE 591)**

Course outcome:

After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.

2. test the instrument for application to the experiment.

3. construct circuits with appropriate instruments and safety precautions.

4. validate different characteristics of single phase Induction motor, three phase Induction motor, Induction generator and synchronous motor , methods of speed control of Induction motors and parallel operation of the 3 phase Synchronous generator.

5. work effectively in a team

**Power system-I laboratory (PC-EE592)**

Course outcome: After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.

2. test the instrument for application to the experiment.

3. construct circuits with appropriate instruments and safety precautions.

4. validate different characteristics of transmission line.

5. determine earth resistance, dielectric strength of insulating oil, breakdown strength of solid insulating material and dielectric constant of transformer oil.

6. analyze an electrical transmission line circuit with the help of software

7. work effectively in a team

**Control system laboratory (PC-EE593)**

Course outcome: After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.

2. test the instrument for application to the experiment.

3. construct circuits with appropriate instruments and safety precautions.

4. use MAT-Lab control system tool box, MAT-Lab- simulink tool box & PSPICE for simulation of systems.

5. determine control system specifications of first and second order systems.

**Power Electronics laboratory (PC-EE594)**

Course outcome: After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.

2. test the instrument for application to the experiment.

3. construct circuits with appropriate instruments and safety precautions.4. validatecharacteristics of SCR, Triac, and performance of phase controlled converter, DC-DC converter, inverters and resonant pulse converters.

5. demonstrate the relation between the speed and firing angle of Universal motor.

6. work effectively in a team

**Electric Drive (EE-701)**

**Course Outcomes:**

At the end of the course, a student will be able to:

1. Examine various applications in industrial and domestic areas where use of electric drives are essential.

2. Classify types of electric drives systems based on nature of loads, control objectives, performance and reliability.

3. Combine concepts of previously learnt courses such as, electrical machines, Control and power electronics to cater to the need of automations in industries.

4. Select most suitable type and specification of motor drive combination for efficient conversion and control of electric power.

5. Identify the critical areas in application levels, and derive typical solutions.

6. Design and justify new control and power conversion schemes for implementing alternative solutions considering the critical and contemporary issues.

**Financial Management & Accounts (HU-701)**

**Upon successful completion of Financial Management, the student will be able to:**

1. Demonstrate an understanding of the overall role and importance of the finance function.
2. Demonstrate basic finance management knowledge.
3. Communicate effectively using standard business terminology.

**Power system-III (EE-702)**

**Course Outcomes:**

1. Identify and explain the different methods of generation, distribution, control and

compensation involved in the operation of power systems.

2. Design the mathematical models of the mechanical and electrical components

involved in the operation of power systems and demonstrate the understanding of

the open loop and closed loop control practices associated with the voltage and frequency control of single area or interconnected multi area power systems.

3. Specify the equivalent electrical parameters of transmission line to prepare and

analyze models to predict the range and ratings of the equipments to be used, the

protection required against line transients and determine the appropriate methods of

compensation required for operational stability

4. Solve the problems related to the economic dispatch of power, plant scheduling,

unit commitment and formulate strategies to minimize transmission line losses and

penalties imbibed.

5. Devise protection schemes required for the system to safeguard against transients after identifying and determining the severity of the transients occurring during the period of operation and design testing strategies to determine the performance characteristics of the compensating equipment to be used in the system

6. Assess the different methods of control and compensation to choose the best option

so that social and environmental problems are minimized and recognize the need to continuously follow the advancements in technology and incorporate them in the present system to improve efficiency and increase the flexibility and quality of operation.

**Power plant Instrumentation & Control (EE-703)**

COURSE OUTCOMES

On completion of this course, the students will be able to,

CO1. Understand the basic principles of power generation.

CO2. Understand about measurement of various parameters in power plant.

CO3. Know the various analyzers in power plant.

CO4. Understand about the turbine boiler control.

CO5. Understand about the turbine monitoring.

**RF & Microwave Engg (EC(EE)-701)**

**Course Outcomes:**

The student after undergoing this course will be able to:

1. Explain different types of waveguides and their respective modes of propagation.

2. Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations.

3. Design microwave matching networks using L section, single and double stub and quarter wave transformer.

4. Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc.

5. Describe and explain working of microwave tubes and solid state devices.

6. Perform measurements on microwave devices and networks using power meter and VNA.

7. Explain the operation of RADAR systems and recite their applications.

**Electric Drive Lab (EE-791)**

Course Outcomes:

At the end of the course, a student will be able to:

1. Identify relevant information to supplement to the Electric Drives (EE 701) course.

2. Set up control strategies to synthesize the voltages in dc and ac motor drives.

3. Develop testing and experimental procedures applying basic knowledge in electronics, electrical circuit analysis, electrical machines, microprocessors, and programmable logic

controllers.

4. An ability to use standard methods to determine accurate modeling/simulation parameters for various general‐purpose electrical machines and power electronics devices required for

designing a system and solve drives related problems

5. Estimate constraints, uncertainties and risks of the system (social, environmental, business,

safety issues etc.)

6. Combine the use of computer‐based simulation tools relevant to electrical Drives with practical laboratory experimentation.

**Digital Communication Lab (EC(EE)-791)**

**Course Outcomes:**

On completion of this lab course the students will be able to:

a. Able to understand basic theories of Digital communication system in practical.

b. Able to design and implement different modulation and demodulation techniques.

c. Able to analyze digital modulation techniques by using MATLAB tools.

d. Able to identify and describe different techniques in modern digital communications, in particular in source coding using MAT Lab tools.

e. Able to perform channel coding

**Power Electronic Converters (PED-101)**

**Course Outcomes:**

At the end of the course, a student will be able to:

1. Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non‐linear devices.

2. Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits

3. Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.

4. Formulate and analyze a power electronic design at the system level and assess the performance.

5. Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus.

6. Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.

**Electric Drives System (PED-102)**

**Course Outcomes (COs):**

At the end of this course students will demonstrate the ability to:

1. Understand the basics of electric drives and fundamentals of drive dynamics.

2. Learn and analyze DC drive.

3. Learn and analyze different steady state speed control methods for Induction motors, and understand the closed loop block diagrams for different methods.

4. Get introduced to modern synchronous motors and drives.

**Energy Management & Audit (PED-103)**

Course Outcomes (COs):

After learning this course the students will be able to:

CO1. Understand energy scenario and policy

CO2. Understand the significance and procedure for energy conservation and audit.

CO3. Understand causes and remedies for global energy issues.

CO4. Analyze, calculate and improve the energy efficiency and performance of electrical utilities.

CO5. Analyze, calculate and improve the energy efficiency and performance of mechanical utilities.

CO6. Understand the applications of Internet of Things (IoT) in the energy sector.

**English for Research Paper Writing (AUD-101)**

**-Students will be able to:**

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

**Electrical Engineering -I Laboratory (PED-191)**

CO-1: Execute the instructions by acquiring hands on experience of primary electrical lab instruments including DMM, Function Generator, Oscilloscope and electronic trainer.

CO-2: Implement the concept of different electrical circuits by building a project.

CO-3: Design and analyze an electrical project by applying the theoretical knowledge of different electric circuits.

**SCADA Systems and Applications (PED-301)**

**Course Outcomes**

CO1: Understand basics of SCADA systems and its various functions.

CO2: Acquire knowledge regarding SCADA System Components and Programmable Logic Controller (PLC).

CO3: Explore Various SCADA architectures, advantages and disadvantages.

CO4: Investigate various industrial communication technologies.

CO5: Learn and apply the SCADA Applications in Transmission and Distribution sector operations and industries.

**Business Analytics (OEL-301)**

1. Understand and critically apply the concepts and methods of business analytics
2. Identify, model and solve decision problems in different settings
3. Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity
4. Create viable solutions to decision making problems

**Advanced Power Electronic Circuits (PED-201)**

1. Evaluate different dc-dc voltage regulators
2. Simulate and analyze resonant converters
3. Select appropriate phase shifting converter for a multi-pulse converter
4. Evaluate various multi-level inverter configurations
5. Compare various FACTS devices for VAR compensation

**Modeling and Analysis of Electrical Machines (PED-202)**

**Course Outcomes (COs)**

CO1: To learn about the basic concepts of AC/ DC machine modeling.

CO2: To study about the dynamic modeling and phase transformation

CO3: To analyze various methodologies in small signal machine modeling.

CO4: To understand the modeling of synchronous machine modeling.

CO5: To learn the performance and dynamic modeling of synchronous machines.

**Advanced Digital Signal Processing (PED-207)**

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Comprehend the DFTs and FFTs.

CO2: Design and Analyze the digital filters.

CO3: Acquire the basics of multi rate digital signal processing.

CO4: Analyze the power spectrum estimation (4 or 5 methods).

CO5: Comprehend the Finite word length effects in Fixed point DSP Systems.

**FACTS & CUSTOM POWER DEVICES (PED-211)**

**Course Outcomes: At the end of the course, the student will be able to**

CO1: Distinguish the performance of Transmission line with and without FACTS Devices

CO2: Compare the SVC and STATCOM

CO3: Understand the operation and control of various Static Series Compensators

CO4: Understand the operation and control of Unified Power Flow Controller

CO5: Distinguish various power quality issues and how are they mitigated by various FACTS Devices

**Electric Machine-I (PC-EE401)**

1. The student can be acquired the basic knowledge of energy conversion principle and electrical machine thus being prepared to pursue any area of engineering spectrum in depth as desired.
2. The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use.

**Digital Electronics (PC-EE402)**

**At the end of the course, a student will be able to:**

1. Convert different type of codes and number systems which are used in digital communication and computer systems.

2. Employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.

3. Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.

4. Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

5. Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

6. Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

**Electrical and Electronics Measurement (PC-EE403)**

CO1: Recognize the evolution and history of units and standards in Measurements.

CO2 : Identify the various parameters that are measurable in electronic instrumentation.

CO3 : Employ appropriate instruments to measure given sets of parameters.

CO4 : Practice the construction of testing and measuring set up for electronic systems.

CO5: To have a deep understanding about instrumentation concepts which can be applied to Control systems.

CO6 : Relate the usage of various instrumentation standards.

**Thermal Power Engineering (ES-ME401)**

Course Outcome:

After completion of this course, the learners will be able to

1. describe the function of different components of boilers. Engines and turbines

2. explain the principle of operation of different types of boilers, turbines, IC engines and Gas

turbines.

3. solve numerical problems of boilers, turbines, IC engines and Gas turbines.

4. analyze the performance of boilers, engines and turbines.

5. determine efficiency of boilers, engines and turbines.

6. explain methods to control boiler, engines and turbines parameters.

**Values and Ethics in Profession (HM-401)**

Course Outcome:

After completion of this course, the learners will be able to

1. Illustrate different aspects of human values, ethics, engineers’ responsibility and duties

2. Explain different principles, different theories and laws of engineering ethics and social experimentation

3. Identify different factors in the light of Engineers’ responsibility towards safety and risk

4. Correlate ethics of different work environment.

5. Explain the need for intellectual property rights.

**Environmental Science (MC-EE401)**

**Course Outcome:**

**After completion of this course, the learners will be able to**

1. Understand the natural environment and its relationships with human activities

2. Apply the fundamental knowledge of science and engineering to assess environmental and health risk

3. Develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations

4. Acquire skills for scientific problem-solving related to air, water, noise& land pollution.

**Electric Machine-I Lab.( PC-EE491)**

**Course Outcome:**

After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment.

2. test the instrument for application to the experiment.

3. construct circuits with appropriate instruments and safety precautions

4. validate different characteristics of DC machine , methods of speed control of DC motor and parallel operation of the transformer

5. work effectively in a team

**Thermal Power Engineering Lab (ES-ME491)**

**Course Outcome:**

After completion of this course, the learners will be able to

1. identify appropriate equipment and instruments for the experiment

2. construct experimental setup with appropriate instruments and safety precautions

3. indentify different parts of Lanchashire Boiler, Bahcock & Willcox Boiler, Cochran Boiler, Vertical Tubular Boiler, Locomotive Boiler, 4S Diesel Engine, 4S Petrol Engine, 2S Petrol

engine

4. test 4 stroke petrol engine by electrical load box and diesel engine by electrical load box

and rope brake dynamometer

5. find calorific value, flash point, fire point, cloud point, pour point of fuel.

6. work effectively in a team

**Electrical Machine Design (PE-EE601)**  **Learning out comes:**

1. Upon completing the course, students is able to understand the design of various parts of DC machines and solve the problems of design

2. Student should be able to understand the design concepts of transformers and know about how to design the parts.

3. Student is able to understand the design concepts of synchronous machines and solve the problems related to design.

4. Student understands the importance of design of machines based on their applications.

**Utilization of Electric Power (EE-801)**

**Course Outcomes:**

At the end of the course, a student will be able to:

1. Illustrate working principle electric power utilization and their application in real life.

2. Choose proper traction systems depending upon application considering economic and technology up-gradation.

3. Employ mathematical and graphical analysis considering different practical issues to design of traction system; analyze the performance parameter of the traction system.

4. Examine various applications in indoor and outdoor application areas where use of light sources are essential.

5. Classify types of electric light sources based on nature of operation and their objectives, performance and reliability.

6. Select most suitable type and specification of illumination source for efficient conversion and Recognize different process of utilizing electric energy for heating and electrolytic process in industries purposes mostly in commercial along with few house hold applications.

**Power Generation and Economics (EE802)**

After learning the course the students will be able to:

CO1. Demonstrate the knowledge about the electric power generations and their impacts.

CO2. Assess the theory and practices of conventional and non-conventional power generation method.

CO3. Determine the operation, maintenance and working of power plants.

CO4. Determine the operation, maintenance and working of substations

CO5. Interpret the practices of various earthing systems.

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| **DEPARTMENT NAME: COMPUTER SCIENCE AND ENGINEERING** | |
| Programme: | B.Tech / UG |
| Programme Outcomes (Pos) | 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for 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 problemsand design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations. 4. Conduct investigations of complex problems: Use research- based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations. 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice. 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |

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|  | 1. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. 2. Communication: Communicate effectively on complex engineering activities with the engineering community and with the 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. 3. 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. 4. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long   learning in the broadest context of technological change. |
| Programme Specific Outcomes (PSOs) | 1. **Professional Skill**: The ability to understand, analyze and  develop software solutions. |
| 2. **Problem-Solving Skills**: The ability to apply standard principles,  practices and strategies for software development. |
| 3. **Successful Career**: The ability to become Employee,  Entrepreneur and/or Life Long Leaner in the domain of Computer Science. |

**Principal of Computer Programming (ES-CS201)**

Course Outcomes

The following are the official course goals agreed upon by the faculty for this course:

1. Knowledge of, and ability to use, language features used in current programming languages.
2. An ability to program in different language paradigms and evaluate their relative benefits.
3. An understanding of the key concepts in the implementation of common features of programming languages.

**Discrete Mathematics (PCC-CS401)**

**Course Outcome(s)**

On completion of the course students will be able to

1. Express a logic sentence in terms of predicates, quantifiers, and logical connectives

2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference

3. Classify its algebraic structure for a given a mathematical problem,

4. Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra

5. Develop the given problem as graph networks and solve with techniques of graph theory.

Computer Architecture(PCC-CS402)

Course Outcomes:

On completion of the course students will be able to

PCC-CS402.1 Learn pipelining concepts with a prior knowledge of stored program

methods

PCC-CS402.2 Learn about memory hierarchy and mapping techniques.

PCC-CS402.3 Study of parallel architecture and interconnection network

Formal Language and Automata Theory(PCC-CS403)

Course Outcomes:

On completion of the course students will be able to

PCC-CS403.1 Write a formal notation for strings, languages and machines.

PCC-CS403.2 Design finite automata to accept a set of strings of a language.

PCC-CS403.3 For a given language determine whether the given language is regular or

not.

PCC-CS403.4 Design context free grammars to generate strings of context free language.

PCC-CS403.5 Determine equivalence of languages accepted by Push Down Automata

and languages generated by context free grammars

PCC-CS403.6 Write the hierarchy of formal languages, grammars and machines.

PCC-CS403.7 Distinguish between computability and non-computability and

Decidability and undecidability.

Design and Analysis of Algorithms (PCC-CS404)

Course Outcomes

On completion of the course students will be able to

PCC-CS404.1 For a given algorithms analyze worst-case running times of algorithms

based on asymptotic analysis and justify the correctness of algorithms.

PCC-CS404.2 Describe the greedy paradigm and explain when an algorithmic design

situation calls for it. For a given problem develop the greedy algorithms.

PCC-CS404.3 Describe the divide-and-conquer paradigm and explain when an

algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive

and solve recurrence relation.

PCC-CS404.4 Describe the dynamic-programming paradigm and explain when an

algorithmic design situation calls for it. For a given problems of dynamic-programming and

PCC-CS404.5 develop the dynamic programming algorithms, and analyze it to determine

its computational complexity.

PCC-CS404,6 For a given model engineering problem model it using graph and write the

corresponding algorithm to solve the problems.

PCC-CS404.7 Explain the ways to analyze randomized algorithms (expected running

time, probability of error).

PCC-CS404.8 Explain what an approximation algorithm is. Compute the approximation

factor of an approximation algorithm (PTAS and FPTAS).

**Database Management System (PCC-CS601)**

Course Outcomes:

On completion of the course students will be able to

1. For a given query write relational algebra expressions for that query and

optimize the developed expressions

2. For a given specification of the requirement design the databases

using E R method and normalization.

3. For a given specification construct the SQL queries for Open source and

Commercial DBMS -MYSQL, ORACLE, andDB2.

4. For a given query optimize its execution using Query optimization algorithms

5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

**Computer Network (PCC-CS602)**

Course Outcomes:

On completion of the course students will be able to

1. Understand research problem formulation.

2. Analyze research related information

3. Follow research ethics

4. Understand that today’s world is controlled by Computer, Information

Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

**Image Processing (PEC-CS601D)**

Students are able to

CO1: understand the need for image transforms different types of image transforms and their properties.

CO2: develop any image processing application.

CO3: understand the rapid advances in Machine vision.

CO4: learn different techniques employed for the enhancement of images.

CO5: learn different causes for image degradation and overview of image restoration techniques.

CO6: understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.

CO7: learn different feature extraction techniques for image analysis and recognition

**Data Mining (PEC-CS602B)**

Course Outcomes:

After completion of course, students would be:

1. Study of different sequential pattern algorithms

2. Study the technique to extract patterns from time series data and it application in real world.

3. Can extend the Graph mining algorithms to Web mining

4. Help in identifying the computing framework for Big Data

**Numerical Methods (OEC-CS601)**

Course outcomes:

Name of the Course: Metric spaces

CO1.To study continuous functions on metric spaces.

CO2. To learn connected metric spaces.

CO3. To understand complete metric spaces.

CO4. To study compact metric spaces.

**Object Oriented Programming (OE-EC604C)**

Course Outcomes:

On completion of the course students will be able to

1. Specify simple abstract data types and design implementations, using abstraction functions to document them.

2. Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.

3. Name and apply some common object-oriented design patterns and give examples of their use.

4. Design applications with an event-driven graphical user interface.

**Cryptography and Network Security (CS801A)**

Course Outcomes:

The student who successfully completes this course will be able to:

1. Analyze and design classical encryption techniques and block ciphers.
2. Understand and analyze data encryption standard.
3. Understand and analyze public-key cryptography, RSA and other public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem, etc.
4. Understand key management and distribution schemes and design User Authentication Protocols.
5. Analyze and design hash and MAC algorithms, and digital signatures.
6. Design network application security schemes, such as PGP, S/MIME, IPSec, SSL, TLS, HTTPS, SSH, etc.
7. Know about Intruders and Intruder Detection mechanisms, Types of Malicious software,
8. Firewall Characteristics, Types of Firewalls, Firewall Location and Configurations.

**E-Commerce (CS802A)**

Upon completion of the course students should be able to:

1. Analyze the impact of E-commerce on business models and strategy.
2. Describe the major types of E-commerce.
3. Explain the process that should be followed in building an E-commerce presence.
4. Identify the key security threats in the E-commerce environment.
5. Describe how procurement and supply chains relate to B2B E-commerce.

**Analog and Digital Electronics (ESC 301)**

Course Outcomes:

At the end of the course, a student will be able to:

1. Identify relevant information to supplement to the Analog Electronic Circuit course.

2. Set up testing strategies and select proper instruments to evaluate performance characteristics of electronic circuit.

3. Choose testing and experimental procedures on different types of electronic circuit and analyze their operation different operating conditions.

4. Evaluate possible causes of discrepancy in practical experimental observations in comparison to theory.

5. Practice different types of wiring and instruments connections keeping in mind technical, Economical, safety issues.

6. Prepare professional quality textual and graphical presentations of laboratory data and Computational results, incorporating accepted data analysis and synthesis methods, Mathematical software and word‐processing tools.

**Data structure & Algorithm (PCC-CS301)**

Course Outcomes:

On completion of the course students will be able to

1. Differentiate how the choices of data structure & algorithm methods impact the performance of program.

2. Solve problems based upon different data structure & also write programs.

3. Identify appropriate data structure & algorithmic methods in solving problem.

4. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

5. Compare and contrast the benefits of dynamic and static data structures implementations.

**Data structure & Algorithm Lab (PCC-CS391)** Course Outcomes:

At the end of this lab session, the student will

1. Be able to design and analyze the time and space efficiency of the data structure
2. Be capable to identity the appropriate data structure for given problem
3. Have practical knowledge on the applications of data structures

**Computer Organization (PCC-CS302)**

Course Outcomes:

On completion of the course students will be able to

1. Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

2. Understand basic structure of different combinational circuitsmultiplexer, decoder, encoder etc.

3. Perform different operations with sequential circuits.

4. Understand memory and I/O operations.

**IT Workshop Lab (PCC-CS393)**

Course Outcomes:

After successful completion of this course, a successful student will be able to:

CO-1. Identify various hardware components of a system

CO-2. Assemble the computer.

CO-3. Use various Microsoft tools.

**Signals & Systems (ESC501)**

**Course Outcomes:**

On completion of the course students will be able to

1. Understand the concepts of continuous time and discrete time systems.
2. Analyze systems in complex frequency domain.
3. Understand sampling theorem and its implications.
4. Understand the concepts of continuous time and discrete time systems.

**Compiler Design (PCC-CS501)**

Course Outcomes:

On completion of the course students will be able to

1. Understand given grammar specification develop the lexical analyser

2. Design a given parser specification design top-down and bottom-up parsers

3. Develop syntax directed translation schemes

4. Develop algorithms to generate code for a target machine

**Operating Systems (PCC-CS502)**Course Outcomes:

On completion of the course students will be able to

1. Create processes and threads.

2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time. Design and implement file management system.

4. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

**Object Oriented Programming (PCC-CS503)**

Course Outcomes:

On completion of the course students will be able to

1. Specify simple abstract data types and design implementations, using abstraction functions to document them.

2. Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.

3. Name and apply some common object-oriented design patterns and give examples of their use.

4. Design applications with an event-driven graphical user interface.

**Advanced Computer Architecture (PEC-IT501C)**

CO1: Demonstrate concepts of parallelism in hardware/software.

CO2: Discuss memory organization and mapping techniques.

CO3: Describe architectural features of advanced processors.

CO4: Interpret performance of different pipelined processors.

CO5: Explain data flow in arithmetic algorithms

CO6: Development of software to solve computationally intensive problems.

**Artificial Intelligence (CS 702)**

Course outcomes:

Upon successful completion of this course, the student shall be able to:

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

2) Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

3) Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

4) Demonstrate profciency developing applications in an 'AI language', expert system shell, or data mining tool.

5) Demonstrate profciency in applying scientifc method to models of machine learning.

6) Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

**Cloud Computing (CS703B)**

1. Understand the concepts, characteristics, delivery models and benefits of cloud computing
2. Understand the key security and compliance challenges of cloud computing.
3. Understand the key technical and organisational challenges.
4. Understand the different characteristics of public, private and hybrid cloud deployment models.

**Web Technology (CS 705)**

Course Outcomes:

1. Students are able to develop a dynamic webpage by the use of java script and DHTML.
2. Students will be able to write a well formed / valid XML document.
3. Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
4. Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
5. Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

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| **DEPARTMENT NAME: CIVIL ENGINEERING** | |
| Programme: | **B.Tech / UG** |
| Programme Outcomes (POs) | The Civil Engineering program is committed to preparing students who will be thoughtful, responsible, and successful citizens. Within four years of graduation, the program expects that Civil Engineering graduates will have:   1. Become competent and engaged engineering professionals, applying their technical and managerial skills in the planning, design, construction, operation or maintenance of the built environment and global infrastructure, and utilizing their skills to analyze and design systems, specify project methods and materials, perform cost estimates and analyses, and manage technical activities in support of civil engineering projects. 2. Initiated an active program of life-long learning, including studies leading to professional licensure or an advanced degree in engineering that provides for continued development of their technical abilities and management skills, and attainment of professional expertise. 3. Developed their communication skills in oral, written, visual and graphic modes when working as team members or leaders, so they can actively participate in their communities and their profession. 4. Established an understanding of professionalism, ethics, quality performance, public policy, safety,   and sustainability that allows them to be |

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|  | professional leaders and contributors to society when solving engineering problems and producing civil engineering solutions. |
| Programme Specific Outcomes (PSOs) | Civil Engineering graduates will have:   1. An ability to apply knowledge of mathematics, science, and engineering. 2. An ability to design and conduct experiments, as well as to analyze and interpret data. 3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 4. An ability to function on multidisciplinary teams. 5. An ability to identify, formulates, and solves engineering problems. 6. An understanding of professional and ethical responsibility. 7. An ability to communicate effectively. 8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. 9. Recognition of the need for, and an ability to engage in life-long learning. 10. a knowledge of contemporary issues, and 11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. |

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|  | Civil Engineering graduates will have the additional ability to:   1. Apply knowledge of mathematics through differential equations, calculus-based physics, chemistry, and at least one additional area of science. 2. Apply knowledge of four technical areas appropriate to civil engineering, including but not limited to structural, geotechnical, transportation, geometrics, environmental, and water resources engineering. 3. Conduct civil engineering experiments and analyze and interpret the resulting data. 4. Design a system, component, or process in more than one civil engineering context. 5. explain basic concepts in management, business, public policy, and leadership, and 6. Explain the importance of professional licensure. |
| Course Outcomes (COs) | |
| Course | Outcomes |
| CE301; Engineering Geology and Rock Mechanics | 1. Develop understanding on impact of geological features on civil engineering projects. 2. Identify the problems associated with different geological features on civil engineering structures and suggest alternatives. 3. Able to understand the geological aspects of construction project. |

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| CE302; Solid Mechanics | 1. To understand the basics of material properties, stress and strain. 2. To apply knowledge of mathematics, science, for engineering applications 3. Ability to identify, formulate, and solve engineering & real life problems 4. Ability to design and conduct experiments, as well as to analyze and interpret data 5. Ability to design a component to meet desired needs within realistic constraints of safety. |
| CE303; Fluid Mechanics | 1. Identify and obtain the values of fluid properties and relationship between them and understand the principles of continuity, momentum, and energy as applied to fluid motions. 2. Recognize these principles written in form of mathematical equations. 3. Acquiring knowledge about Fluid Pressure and Its Measurement, Hydrostatic Forces on Surfaces, Buoyancy and Flotation, Flow through Orifice and Mouthpiece, Flow over Notches and Weir. 4. Apply dimensional analysis to predict physical parameters that influence the flow in fluid mechanics. |

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| CE304; Building Material and Construction | 1. Describe the physical characteristics and properties of Building materials- Brick, cement, aggregates, concrete, and classification systems. 2. Describe the physical characteristics of aggregates, sources and manufacturing processes for gravels, engineering properties of aggregates, and how aggregates are classified. 3. Name the constituents of Portland cement concrete and proportion concrete mix designs. 4. Describe the fieldwork and inspections necessary for successful results in concrete construction. 5. Conduct and document laboratory investigations. 6. Work in small teams with individuals of diverse cultural backgrounds. |
| CE305; Engineering Survey-I | 1. Carry out preliminary surveying in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering. 2. Plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse. 3. Use various conventional instruments involved in surveying with respect to utility and precision. 4. Plan a survey for applications such as road alignment and height of the building. 5. Undertake measurement and plotting in civil engineering. |
| CE391; Engineering Geology Lab | 1. Ability to categorize rocks and minerals by their origin and engineering properties. 2. Ability to apply geological principles to rock masses and discontinuities for use in engineering design e.g. rock slopes, foundation. 3. Study geological maps and symbols in maps. |

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| CE392; Survey Practice I Lab | 1. Use conventional surveying tools such as chain/tape, compass, plane table, level in the field of civil engineering applications such as structural plotting and highway profiling. 2. Apply the procedures involved in field work and to work as a surveying team. 3. Plan a survey appropriately with the skill to understand the surroundings. 4. Take accurate measurements, field booking, plotting and adjustment of errors can be understood. 5. Plot traverses / sides of building and determine the location of points present on field on a piece of paper |
| CE393; Building Design & Drawing | 1. Apply the principles of planning and by laws used for building planning. 2. Draw plan, elevation and section for various structures |
| CE401; Structural Analysis- I | 1. To acquire Advance knowledge of structural behavior under direct loading. 2. To Analyze Statically determinate structures like Beam, Column & Truss. 3. The Structural Analysis-I, will enable the student to analyze Steel & Concrete Structures used in Civil Engineering construction. 4. After successful completion of this course students will able to 5. Analyze simple statically determinate structures like beam, column and truss under loading conditions. 6. Analyze the behavior of structural members with   typical loading. |

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|  | 7. Evaluate the properties of materials of various members under direct loading. |
| CE402; Hydraulics & Hydraulic Machine | 1. To know the different types of flows and channels. 2. To learn the fundamentals of Uniform and Non- Uniform flow in open channels. 3. To understand the concepts of specific energy, critical flow and their applications. 4. To give an idea about the gradually varied flow and rapidly varied flow and their equations and computations. 5. To understand the performance of turbines and pumps. 6. To know the applications of momentum principles. 7. To make the student is expected to prepare models for prototypes of hydraulic structures. 8. To make the student is expected to have thorough knowledge on the selection of turbines and pumps for practical purposes. |
| CE403; Engineering Survey-II | 1. Set out curves; learn Theodolite Surveying and Tachometric Surveying. 2. Carry out a Hydrographic survey. 3. Apply mathematical adjustment of accidental errors involved in surveying measurements. 4. To understand remote sensing and photographic surveying. 5. Able to do triangulation. |
| CE491; Fluid Mechanics Lab. | The students will perform and understand the following experiments:   1. Determination of Orifice co-efficient. 2. Calibration of Orifice meter. 3. Calibration of V- Notch. |

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|  | 1. Measurement of velocity of water in an open channel using a Pitot tube. 2. Measurement of water surface profile for flow over Broad Crested Weir. 3. Preparation of Discharge Rating Curve for a sluice. 4. Measurement of water surface profile for a Hydraulic jump. 5. Determination of efficiency of a Centrifugal pump. 6. Determination of efficiency of a Reciprocating pump. 7. Determination of efficiency of a Pelton wheel Turbine. 8. Determination of efficiency of a Francis Turbine. 9. Measurement of Evaporation loss of water by using ISI Standard Pan. 10. Measurement of Rainfall by using Symon’sRaingauge . |
| CE492; Survey Practice -II | 1. Traversing with the theodolite along with chain/tape, compass on the field. 2. Traversing by using Total Station. 3. Use of Total Station for levelling and Contouring. 4. Setting out of Simple Curves. |
| CE501; Concrete Technology | 1. To be familiar with different ingredients of concrete. 2. To be familiar with properties of different ingredients of concrete. 3. To be familiar with different admixtures. 4. To be familiar with properties of fresh and harden concrete. 5. To be able to prepare concrete mix design. 6. To be familiar with special concretes. |

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| CE502; Design of RCC Structure | 1. Principles of design of reinforced concrete members: Working stress and Limit State method of design. Basic concepts and IS code provisions (IS: 456 2000)for design against bending moment and shear forces - Balanced, under reinforced and over-reinforced beam/ slab sections including design of singly and doubly reinforced sections; concepts of bond stress and development length including use of ‘design aids for reinforced concrete (SP:16). 2. Analysis, design and detailing of different component RCC structures viz. singly reinforced rectangular, ‘T’, ‘L’ and doubly reinforced beam sections, one-way and two-way slab panels, **staircase, short columns of rectangular and circular cross sections under axial load, short columns subjected to axial load with moments (uniaxial and biaxial bending), isolated square and rectangular footing for columns as per IS code provisions by limit state method.** 3. This course will prepare the base of students to build their capacity to contribute to sustainable development of infrastructures of the society as well as Nation and preparedness stage of disaster management. This course has immense potential to develop self entrepreneurship among students. |
| CE503; Soil Mechanics- I | 1. **The basics of soil mechanics, its defining criteria, characteristics etc.** 2. **Carry out soil classification.** 3. **Solve three phase system problems.** 4. **Solve any practical problems related to soil stresses estimation, permeability and seepage** |

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|  | **including flow net diagram.**   1. **Estimate the stresses under any system of foundation loads.** 2. **Solve practical problems related to consolidation settlement and time rate of settlement.** 3. **Estimate, analyze and determine different soil behavior under various types of conditions of**   **configurations.** |
| CE504; Water Supply Engineering | 1. **Explain the importance and necessity of water supply for various purposes** 2. **To select a suitable source for water supply for a particular region** 3. **Determine the capacity of water supply scheme** 4. **Classify and design the conveyance systems and the appurtenances used in water supply system** 5. **Acquire knowledge on chemistry and characteristics of water relevant to drinking water standards and determinethe necessity of treatment to be adopted and also able to differentiate it** 6. **Designvarious units of conventional water treatment plant and water supply system.** 7. **Design of distribution system** |
| CE505; Structural Analysis- II |  |
| CE591; Solid Mechanics Lab. | 1. **Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars).** 2. **Compression Test on Structural Materials: Timber, bricks and concrete cubes.** 3. **Bending Test on Mild Steel.** 4. **Torsion Test on Mild Steel Circular Bar.** 5. **Hardness Tests on Ferrous and Non-Ferrous Metals: Brinnel and Rockwell Tests.** |

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|  | 1. **Test on closely coiled helical spring.** 2. **Impact Test: Izod and Charpy.** 3. **Demonstration of Fatigue Test.** |
| CE592; Soil Mechanics Lab.- I | 1. Field identification of different types of soil as per Indian standards [collection of field samples and identifications without laboratory testing], determination of natural moisture content. 2. Determination of specific gravity of i) Cohesionless   ii) cohesive soil.   1. Determination of In-situ density by core cutter method & sand replacement method. 2. Grain size distribution of cohesion less soil by sieving & fine grained soil by hydrometer analysis. 3. Determination of Atterberg’s limits (liquid limit, plastic limit & shrinkage limit). 4. Determination of Relative Density of sand. 5. Determination of Differential Free-swell Test. 6. Determination of co- efficient of permeability by constant head permeameter (coarse grained soil) &   variable head parameter (fine grained soil). |
| CE593; Concrete Lab. | 1. Outline the importance of testing of cement and its properties and perform the different test of cement. 2. Assess the different properties of aggregate with relative tests. 3. Summaries the concept of workability and testing of concrete. 4. Describe the preparation of green concrete. 5. Describe the properties of hardened concrete. 6. Learn about test on bricks and tiles. |
| CE594; Structural design and drawing- I | 1. This course will build the capacity of students to execute planning, analysis and design all the components viz. slabs, beams, columns and footing  of simple RCC multistoried buildings for vertical |

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|  | loads only as per BIS. |
| CE601; Design of steel structure | 1. Apply the IS code of practice for the design of steel structural elements. 2. Design compression and tension members using simple and built-up sections. 3. Calculate forces on the various members of the truss and design them. 4. Analyze the behavior of bolted connections and design them. 5. design welded connections for both axial and eccentric forces 6. Design and analyze beams, plate girders and gantry   girders. |
| CE602; Soil Mechanics II | 1. Understand the principle of compaction, shear strength, stress, strain and failure of soil. 2. Estimate Compressibility and consolidation. 3. Analyze the stability of slope. 4. Design different types of retaining wall. 5. Familiar to understand the earth pressure in different state. |
| CE603; Transportation Engineering – I | 1. Acquire the knowledge of Indian Highway and transportation system and its gradual advancement with time to time 2. Exhibit the knowledge of highway planning and alignment of a newly constructed highway 3. Design the all geometric features of a highway 4. Design of flexible and rigid pavement depending upon the nature of topography and traffic characteristics, climate, soil properties etc. 5. Undertake various Traffic studies and apply the knowledge in planning and design of pavement and geometrics 6. Acquire the knowledge of fundamental properties of various highway materials and its various test to be conducted 7. Accustomed with various construction technique |

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|  | for different kind of road starting from Express way  to village roads. |
| CE604; Waste Water Engineering | 1. Explain the importance of wastewater treatment. 2. Identify and explain the main physical, chemical and biological characteristics of wastewater. 3. Understand and develop treatment plant layouts. 4. Explain and use the main design criteria for wastewater treatment processes. 5. Determine the design and operation of unit processes in wastewater treatment. 6. Acquire the knowledge of solid waste   characteristics and various treatment technologies. |
| CE604; Structural Dynamics & Earthquake Engineering | 1. Students will learn following topics: Theory of vibrations, Response of single degree freedom system due to harmonic loading, Response due to Transient loading, Generalized Coordinates and Rayleigh’s Method, Elements of seismology, and Principles of earthquake resistant design of structures as per IS 1893 and IS 13920. 2. This course will build capacity of students to contribute to sustainable development of infrastructures of the society as well as Nation and preparedness stage of earthquake disaster management. This course has immense potential to develop self entrepreneurship among students as well as to motivate students for higher studies and   research. |
| CE691; Soil Mechanics Lab- II | 1. Determination of compressibility characteristics of soil by Oedometer test (co-efficient of consolidation & compression Index) 2. Determination of unconfined compressive strength of soil. 3. Determination of Shear parameter of soil by Direct shear test. 4. Determination of un-drained shear strength of soil |

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|  | by Vane shear test.   1. Determination of shear parameter of soil by Tri- axial test (UU). 2. Determination of compaction characteristics of soil: Standard Proctor test. 3. Determination of compaction characteristics of soil: Modified Proctor test. 4. Determination of CBR value of compacted soil: Un-soaked. 5. Determination of CBR value of compacted soil: Soaked. 6. Auger boring, Bore-log writing & Standard   Penetration Test. |
| CE692; Concrete Lab- II | 1. Perform different tests on Fresh Concrete (Workability: Slump, Vee-Bee, Compaction factor tests) and Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure test. 2. Understand the Non-destructive testing (Rebound hammer & Ultrasonic pulse velocity), 3. Learn to Design of Concrete Mix. |
| CE693; Environmental Engineering Lab | 1. Perform common environmental experiments relating to water and wastewater to quantify the pollutant concentration. 2. Statistically analyze and interpret laboratorial results. 3. Apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions. 4. Understand and use the water and wastewater sampling procedures and sample preservations. 5. Demonstrate the ability to write clear technical   laboratorial reports. |

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|  | 1. Demonstrate the ability to work in groups. 2. Understand the impact of water and wastewater treatment on people and the environment. |
| CE694; Structural Design and Drawing- II | 1. This course will teach students general consideration and basic concepts on design of industrial steel buildings; estimation of wind load, dead load, live load and others as per IS875; analysis, design & drawing of the following components of industrial steel buildings: members of the roof truss, joints of the roof truss members, purlins, gable bracings, column with bracings, Column base plate, column foundation etc. 2. This course will develop confidence among students to carry out analysis and prepare design and design drawing of different components of industrial steel buildings. It will also help students to prepare themselves for entrepreneurship. |
| CE701; Foundation Engineering |  |
| CE702; Advanced Design of RCC  structure |  |
| CE703; Water Resource Engineering | 1. Able to understand about different aspect of precipitation and measurement of precipitation. 2. Learn about evaporation, evapo-transpiration and infiltration. 3. Acquire knowledge about stream flow measurement and runoff. 4. Understand different properties and uses of hydrograph. 5. Learn about different properties of flood and flood routing and water requirements of crops. 6. Understand canal irrigation and cross section of   irrigation canal and design unlined alluvial channels |

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|  | by silt theories.  7. Familiar about lining of irrigation canals and water logging of agricultural lands and land drainage. |
| CE704; Transportation Engineering- II | 1. Introduce an advance level of transportation system considering other modes, such as Railways, Waterways and Airways. 2. Acquire the knowledge of these transportation systems, their utilities, and basic considerations of their planning, designing and maintenance and would also compare their functions, cost   effectiveness etc. |
| CE791; Highway & Transportation Engineering Lab. | 1. Understand the properties of materials used for construction of highways and perform the relative tests. 2. Able to design BC and SDBC Mix by Marshal Method of mix design. 3. Acquire knowledge about Benkelman beam Test. 4. Able to prepare formal reports. |
| CE792: Computer Programming in Civil Engineering | The rapid advances occurring in computer science have provided the engineer with a powerful means of processing, storing, retrieving, and displaying data thereby increasing the role of computer science in nearly every engineering discipline. One of the dilemmas in engineering education today is how future engineers can best assimilate the advanced, yet fundamental, knowledge in computer methods and technology appropriate for their specific engineering discipline. Effective use of such technology in engineering processes and applications is the key to increased individual, company, and national productivity. In the future, an integrated combination of computer‐aided analysis and design techniques will need to be developed for all types of engineering design problems. The  implications of this development for the academic |

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|  | community are clear: Students must be prepared to use computer methods and applications as a pan of their fundamental education. These graduates will in turn be able to provide their increasingly important expertise to both the  engineering profession and the academic community. |
| CE793: Estimation Spec. & Departmental Procedure | Students will build their capacity to perform the following activities:   1. Measurement and estimation of quantities of various civil engineering works such as buildings, road, underground reservoir, Surface drain, Septic tank etc. 2. Quantity estimation of steels of RCC structures including bar bending schedule. 3. Preparation of specification of materials and works. 4. Valuation of real estate assets. 5. Departmental procedures **like** administration, technical and financial, and procurement related activities.   This course will develop confidence among students to prepare themselves for entrepreneurship. |
| CE794; Project- I | 1. An ability to understand carrying out preliminary / short project in different fields of Civil  Engineering. |
| CE781; Industrial training evaluation | 1. An ability to work in actual working environment. 2. An ability to utilize technical resources. 3. An ability to write technical documents and give oral presentations related to the work completed. |
| CE801; Construction Management &  Technique |  |
| CE802; Elective- I | 1. To know the different types of flows and channels. 2. To learn the fundamentals of Uniform and Non- Uniform flow in open channels. 3. To understand the concepts of specific energy,   critical flow and their applications. |

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|  | 1. To give an idea about the gradually varied flow and rapidly varied flow and their equations and computations. 2. To understand the performance of turbines and pumps. 3. To know the applications of momentum principles. 4. To make the student is expected to prepare models for prototypes of hydraulic structures. 5. To make the student is expected to have thorough knowledge on the selection of turbines and pumps   for practical purposes |
| CE803; Elective- II | * Air Pollution & Control Engineering  1. To be familiar with Environment Pollution and Pollution control. 2. Identify the sources of air and noise pollution and their Control mechanism. 3. To be familiar with Pollution Characteristics of Typical Industries and Suggested Treatments. 4. Able to understand the Global Environmental Issues. 5. Acquire knowledge of Administrative Control on Environment Environmental Laws.  * Ground Improvement technique  1. This topic introduce the modern methodologies for ground improvement techniques which are extremely essential in present days due to scarcity of competent land for any type of civil constructions. 2. The fundamentals of improvement and stabilization methods, their applicability and construction methods, precautions are described which will help   the student to adopt the mechanism when |

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|  | introduced to such cases in field.  3. A large portion of the subject is explained with the life time case studies so that student can correlate the problems, associated basic soil mechanics/geotechnical engineering and the remedial methods by the different improvement techniques.   * Advance Foundation Engineering |
| CE804; Groundwater Hydraulics |  |
| CE891; Grand viva-voce |  |
| CE892; Project- II |  |
| CE893; Seminar |  |
| CE894; Computer Application in Civil  Engineering |  |

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| **DEPARTMENT NAME: INFORMATION TECHNOLOGY** | |
| Programme: | B.Tech / UG |
| Programme Outcomes (Pos) | 2. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems. |
|  | 3. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
|  | 4. **Design/development of solutions:** Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations. |
|  | 5. **Conduct investigations of complex problems:** Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
|  | 6. **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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|  | 1. **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. 2. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. 3. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. 4. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. 5. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the 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. 6. **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. 7. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |
| Programme Specific Outcomes (PSOs) | 1. **Professional Skill:** The ability to understand, analyze and develop software solutions |
| 1. **Problem-Solving Skills:** The ability to apply standard principles, practices and  strategies for software development |
| 2. **Successful Career:** The ability to become Employee, Entrepreneur and/or Life Long  Leaner in the domain of Computer Science. |
| Course Outcomes (COs) | |
| CourseOutcomes | |
| Soft Computing(IT 702) | 1. Identify and describe soft computing techniques and their roles in building intelligent  machines. |
| 2. Recognize the feasibility of applying a soft computing methodology for a particular  problem |
| 3. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems |
| 4. Apply genetic algorithms to combinatorial optimization problems |
| 5. Apply neural networks to pattern classification and regression problems |
| 6. Artificial neural networks and its applications. |
| 7. Effectively use existing software tools to solve real problems using a soft computing  approach |
| 8. Evaluate and compare solutions by various soft computing approaches for a given  problem. |
| Database  Management | 1. To describe data models and schemas in DBMS. |
| 8. To understand the features of database management systems and Relational database. |

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| systems(IT 601) | 9. To use SQL- the standard language of relational databases. |
| 10. To understand the functional dependencies and design of the database |
| 11. To understand the concept of Transaction and Query processing. |
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