"Empowerment through quality technical education"
Dr. D. Y. Patil School of Engineering
Dr. Ajeenkya DY Patil Knowledge City, Charholi Bk., Via. Lohegaon,
Pune – 412 105

A.Y 2021-22

(Criteria 2.6.1)

Course Outcomes (COs), Program Outcomes (POs), Program Specific Outcomes (PSOs)

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Course Outcomes(COs)
Engineering Science (FE)

2019 course

A.Y. 2021-22
Engineering Science
Semester-I(2019 PATTERN)

107001 – Engineering Mathematics – I

1. Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.

2. The Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.

3. To deal with derivative of functions of several variables that are essential in various branches of Engineering

4. To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.

5. The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems

102003 - Systems in Mechanical Engineering

1. Describe and compare the conversion of energy from renewable and non-renewable energy sources

2. Explain basic laws of thermodynamics, heat transfer and their applications

3. List down the types of road vehicles and their specifications

4. Illustrate various basic parts and transmission system of a road vehicle

5. Discuss several manufacturing processes and identify the suitable process

6. Explain various types of mechanism and its application

103004: Basic Electrical Engineering

1. Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.

2. Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic

3. Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram

4. Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions

5. Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.

6. Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.

110005: Programming and Problem Solving

1. Inculcate and apply various skills in problem solving.

2. Choose most appropriate programming constructs and features to solve the problems in
diversified domains.

3. Exhibit the programming skills for the problems those require the writing of well documented
programs including use of the logical constructs of language, Python.

4. Demonstrate significant experience with the Python program development environment.

111006 -Workshop Practice

1. Familiar with safety norms to prevent any mishap in workshop.

2. Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.

3. Able to understand the construction, working and functions of machine tools and their parts.

4. Able to know simple operations (Turning and Facing) on a center lathe.

101007: Environmental Studies-I

1. Demonstrate an integrative approach to environmental issues with a focus on sustainability.

2. Explain and identify the role of the organism in energy transfers in different ecosystems.

3. Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.

4. Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.

A.Y. 2021-22
Engineering Science
Semester-II(2019 PATTERN)

107008 – Engineering Mathematics – II

1. The effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.

2. Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.

3. To trace the curve for a given equation and measure arc length of various curves.

4. The concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.

5. Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

107009: Engineering Chemistry

1. Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.

2. Select appropriate electro-technique and method of material analysis.

3. Demonstrate the knowledge of advanced engineering materials for various engineering applications.

4. Analyze fuel and suggest use of alternative fuels.

5. Identify chemical compounds based on their structure.

6. Explain causes of corrosion and methods for minimizing corrosion.

104010: Basic Electronics Engineering

1. Explain the working of P-N junction diode and its circuits.

2. Identify types of diodes and plot their characteristics and also can compare BJT with

MOSFET.

3. Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.

4. Use different electronics measuring instruments to measure various electrical parameters.

5. Select sensors for specific applications.

6. Describe basic principles of communication systems.

101011: Engineering Mechanics

1. Determine resultant of various force systems.

2. Determine centroid, moment of inertia and solve problems related to friction

3. Determine reactions of beams, calculate forces in cables using principles of equilibrium

4. Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space

5. Calculate position, velocity and acceleration of particle using principles of kinematics

6. Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy

102012: Engineering Graphics

1. Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.

2. Construct the various engineering curves using the drawing instruments.

3. Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.

4. Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.

5. Draw the development of lateral surfaces for cut section of geometrical solids.

6. Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.

110013: Project Based Learning

1. Project based learning will increase their capacity and learning through shared cognition.

2. Students able to draw on lessons from several disciplines and apply them in practical way.

3. Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

101014: Environmental Studies-II Mandatory Non-Credit Course

1. Have an understanding of environmental pollution and the science behind those problems and potential solutions.

2. Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.

3. Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.

4. Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues.

Course Outcomes(COs)
Second Year Engineering(SE)

A.Y. 2021-22

SE Artificial Intelligence and Data Science Engineering (2020 pattern)
Semester I

210241: Discrete Mathematics

1. **Formulate** problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.

2. **Apply** appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.

3. **Design and analyze** real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.

4. **Specify, manipulate and apply** equivalence relations; construct and use functions and apply these concepts to solve new problems.

5. **Calculate** numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.

6. **Model and solve** computing problem using tree and graph and solve problems using appropriate algorithms

7. **Analyze** the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures**.**

210242: Fundamentals of Data Structures

1. **Design** the algorithms to solve the programming problems, **identify** appropriate algorithmic strategy for specific application, and **analyze** the time and space complexity.

2. **Discriminate** the usage of various structures, **Design/Program/Implement** the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.

3. **Demonstrate** use of sequential data structures- Array and Linked lists to store and process data.

4. **Understand** the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.

5. **Compare** and **contrast** different implementations of data structures (dynamic and static).

6. **Understand, Implement and apply** principles of data structures-stack and queue to solve computational problems.

210243: Object Oriented Programming(OOP)

1. **Apply** constructs- sequence, selection and iteration; classes and objects, inheritance, use
of predefined classes from libraries while developing software.

2. **Design** object-oriented solutions for small systems involving multiple objects.

3. **Use** virtual and pure virtual function and complex programming situations.

4. **Apply** object-oriented software principles in problem solving.

5. **Analyze** the strengths of object-oriented programming

6. **Develop** the application using object oriented programming language(C++).

210244: Computer Graphics

1. **Identify** the basic terminologies of Computer Graphics and interpret the mathematical foundation
of the concepts of computer graphics.

2. **Apply** mathematics to develop Computer programs for elementary graphic operations.

3. **Illustrate** the concepts of windowing and clipping and **apply** various algorithms to fill and clip polygons.

4. **Understand** and **apply** the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.

5. **Understand** the concepts of color models, lighting, shading models and hidden surface elimination.

6. **Create** effective programs using concepts of curves, fractals, animation and gaming.

217521: Operating Systems

1. **Enlist** functions of OS and types of system calls
2. **Apply** process scheduling algorithms to solve a given problem
3. **Illustrate** deadlock prevention, avoidance and recovery
4. **Explain** memory management technique
5. **Illustrate** I/O and file management policies
6. **Describe** Linux process management

A.Y. 2021-22

SE Artificial Intelligence and Data Science Engineering (2020 pattern)
Semester II

217528 : Statistics

1. Identify the use of appropriate statistical terms to describe data
2. Use appropriate statistical methods to collect, organize, display, and analyze relevant data.
3. Use distribution functions for random variables.
4. Distinguish between correlation coefficient and regression
5. Understand tests for hypothesis and its significance

217529: Internet of Things

1. Have a thorough understanding of the structure, function and characteristics of computer systems and Understand the structure of various number systems and its application in digital design.
2. Develop the skill set to build IoT systems and sensor interfacing.
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3. Explain the concept of Internet of Things and identify the technologies that make up the
internet of things
4. Analyze trade-offs in interconnected wireless embedded device networks. Select Appropriate
Protocols for IoT Solutions
5. Design a simple IoT system comprising sensors by analyzing the requirements of IoT
Application
6. Identify the Application of IoT in automation of Commercial and Real World examples

210252: Data Structures and Algorithms

1. **Identify and articulate** the complexity goals and benefits of a good hashing scheme for real- world applications.
2. **Apply** non-linear data structures for solving problems of various domain.
3. **Design and specify** the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
4. **Analyze** the algorithmic solutions for resource requirements and optimization.
5. **Use** efficient indexing methods and multiway search techniques to store and maintain data.
6. U**se** appropriate modern tools to understand and analyze the functionalities confined to the secondary storage

210253: Software Engineering

1. **Analyze** software requirements and formulate design solution for a software.
2. **Design** applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
3. **Apply** new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
4. **Model** and design User interface and component-level.
5. **Identify** and handle risk management and software configuration management.
6. **Utilize** knowledge of software testing approaches, approaches to verification and validation.
7. **Construct** software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.

217530: Management Information Systems

1. **Explain** the concepts of Management Information System and Business intelligence for MIS.

2. **Illustrate** the need of information systems in global business and ethical issues.

3. **List** the IT infrastructure components and **explain** security in the Information System.

4. **Demonstrate** the importance of project management and **extend** its use in the international
information system balancing

5. **Illustrate** the concepts of decision support systems for business applications.

6. **Relate** artificial intelligence and data science for Management Information System.

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SE Civil Engineering (2019 pattern) Semester I

201001: Building Technology and Architectural Planning

1. Identify types of building and basic requirements of building components.
2. Make use of Architectural Principles and Building byelaws for building construction.
3. Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.
4. Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
5. Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
6. Understand different services and safety aspects

201002: Mechanics of Structures

1. Understand concept of stress-strain and determine different types of stress, strain in determinate homogeneous and composite structures.
2. Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
3 Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
4. Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
5. Analyze axially loaded and eccentrically loaded column.
6. Determine the slopes and deflection of determinate beams and trusses.

201003 : Fluid Mechanics

1. Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.

2. Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
3. Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity &Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
4. Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Crossmethod.
5. Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
6. Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged

207001: Engineering Mathematics III

1. Understand concept of stress-strain and determine different types of stress, strain in determinate homogeneous and composite structures.
2. Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
3 Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
4. Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
5. Analyze axially loaded and eccentrically loaded column.
6. Determine the slopes and deflection of determinate beams and trusses.

207009: Engineering Geology

1. Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions
2. Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
3. Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
4. Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site /alignment/ level free from geological defects.
5. Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
6. Explain geological hazards and importance of ground water and uses of common building stones.

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SE Civil Engineering (2019 pattern) Semester II

201008: Geotechnical Engineering

1. Identify and classify the soil based on the index properties and its formation process.
2. Explain permeability and seepage analysis of soil by construction of flow net.
3. Illustrate the effect of compaction on soil and understand the basics of stress distribution.
4. Express shear strength of soil and its measurement under various drainage conditions.
5. Evaluate the earth pressure due to backfill on retaining structures by using different theories.
6. Analysis of stability of slopes for different types of soils.

201009: Surveying

1. Define and Explain basics of plane surveying and differentiate the instruments used for it**.**
2. Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
3. Describe different methods of surveying and find relative positions of points on the surface of Earth.
4. Execute curve setting for civil engineering projects such as roads, railways etc.
5. Articulate advancements in surveying such as space based positioning systems

201010: Concrete Technology

1. Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
2. Able to check the properties of concrete in fresh and hardened state.
3. Get acquainted to concreting equipments, techniques and different types of special concrete.

4. Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.

201011: Structural Analysis

1. Understand the basic concept of static and kinematic indeterminacy and analysis of in determinate beams.
2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
3. Implement application of the slope deflection method to beams and portal frames.
4. Analyze beams and portal frames using moment distribution method.
5. Determine response of beams and portal frames using structure approach of stiffness matri method.
6. Apply the concepts of plastic analysis in the analysis of steel structures.

201012: Project Management

1. Describe project life cycle and the domains of Project Management.
2. Explain networking methods and their applications in planning and management
3. Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
4. Demonstrates resource allocation techniques and apply it for manpower planning.
5. Understand economical terms and different laws associated with project management
6. Apply the methods of project selection and recommend the best economical project.

201017: Project Based Learning

1. Identify the community/ practical/ societal needs and convert the idea into a product/ process/service.
2. Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project.
3. Create, work in team and applying the solution in practical way to specific problem.

SE Computer Engineering (2019 pattern) Semester I

210241: Discrete Mathematics

1. Formulate problems precisely, solve the problems, apply formal proof techniques, andexplain the reasoning clearly.
2. Apply appropriate mathematical concepts and skills to solve problems in both familiar andunfamiliar situations including those in real-life contexts.
3. Design and analyze real world engineering problems by applying set theory, propositionallogic and to construct proofs using mathematical induction.
4. Specify, manipulate and apply equivalence relations; construct and use functions and applythese concepts to solve new problems.
5. Calculate numbers of possible outcomes using permutations and combinations; to modeland analyze computational processes using combinatorics.
6. Model and solve computing problem using tree and graph and solve problems usingappropriate algorithms.
7. Analyze the properties of binary operations, apply abstract algebra in coding theory andevaluate the algebraic structures.

210242: Fundamentals of Data Structures

1. Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
2. Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.
3. Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
4. Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
5. Compare and contrast different implementations of data structures (dynamic and static).
6. Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.

210243: Object Oriented Programming

1. Apply constructs- sequence, selection and iteration; classes and objects, inheritance, useof predefined classes from libraries while developing software.
2. Design object-oriented solutions for small systems involving multiple objects.
3. Use virtual and pure virtual function and complex programming situations.
4. Apply object-oriented software principles in problem solving.
5. Analyze the strengths of object-oriented programming.
6. Develop the application using object oriented programming language(C++).

210244: Computer Graphics

1. Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
.
2. Apply mathematics to develop Computer programs for elementary graphic operations.
3. Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clippolygons..
4. Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
5. Understand the concepts of color models, lighting, shading models and hidden surfaceelimination.
6. Create effective programs using concepts of curves, fractals, animation and gaming.

210245: Digital Electronics and Logic Design

1. Simplify Boolean Expressions using K Map.
2. Design and implement combinational circuits.
3. Design and implement sequential circuits.
4. Develop simple real-world application using ASM and PLD.
5. Choose appropriate logic families IC packages as per the given design specifications.
6. Explain organization and architecture of computer system

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SE Computer Engineering (2019 pattern) Semester II

207003: Engineering Mathematics III

1. Solve Linear differential equations, essential in modelling and design of computer-basedsystems.
2. Apply concept of Fourier transform and Z-transform and its applications to continuous anddiscrete systems and image processing.
3. Apply Statistical methods like correlation and regression analysis and probability theory fordata analysis and predictions in machine learning.
4. Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
5. Obtain Interpolating polynomials, numerical differentiation and integration, numericalsolutions of ordinary differential equations used in modern scientific computing.

210252: Data Structures and Algorithms

1. Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications.
2. Apply non-linear data structures for solving problems of various domain.
3. Design and specify the operations of a nonlinear-based abstract data type and implement themin a high-level programming language.
4. Analyze the algorithmic solutions for resource requirements and optimization
5. Use efficient indexing methods and multiway search techniques to store and maintain data.
6. Use appropriate modern tools to understand and analyze the functionalities confined to thesecondary storage.

210253: Software Engineering

1. Analyze software requirements and formulate design solution for a software.
2. Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.

3. Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into theircontinuous professional development.

4. Model and design User interface and component-level.

5. Identify and handle risk management and software configuration management.

6. Utilize knowledge of software testing approaches, approaches to verification and validation.

7. Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.

210254: Microprocessor

1. Exhibit skill of assembly language programming for the application.

2. Classify Processor architectures.

3. Illustrate advanced features of 80386 Microprocessor.

4. Compare and contrast different processor modes.

5. Use interrupts mechanism in applications

6. Differentiate between Microprocessors and Microcontrollers.

7. Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.

210255: Principles of Programming Languages

1. Make use of basic principles of programming languages.

2. Develop a program with Data representation and Computations.

3. Develop programs using Object Oriented Programming language : Java.

4. Develop application using inheritance, encapsulation, and polymorphism.

5. Demonstrate Multithreading for robust application development.

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SE Electronics & Telecommunication Engineering (2019 pattern)
Semester I

207005: Engineering Mathematics –III

1. Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
2. Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems
3. Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing
4. Perform vector differentiation & integration, analyze the vector fields and apply to electro- magnetic fields & wave theory
5. Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

204181: Electronic Circuits

1. Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
2. Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
3. Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies
4. Explain internal schematic of Op-Amp and define its performance parameters.
5. Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications
6. Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications

204182: Digital Circuits

1. Identify and prevent various hazards and timing problems in a digital design.

2. Use the basic logic gates and various reduction techniques of digital logic circuit.
3. Analyze, design and implement combinational logic circuits.
4. Analyze, design and implement sequential circuits.
5. Differentiate between Mealy and Moore machines.
6. Analyze digital system design using PLD

204183: Electrical Circuits

1. Analyze the simple DC and AC circuit with circuit simplification techniques.
2. Formulate and analyze driven and source free RL and RC circuits.
3. Formulate & determine network parameters for given network and analyze the given network
using Laplace Transform to find the network transfer function.
4. Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
5. Explain construction, working and applications of special purpose motors & understand
motors used in electrical vehicles.
6. Analyze and select a suitable motor for different applications.

204184: Data Structures

1. Solve mathematical problems using C programming language.
2. Implement sorting and searching algorithms and calculate their complexity.
3. Develop applications of stack and queue using array.
4. Demonstrate applicability of Linked List.
5. Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
6. Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.

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SE Electronics & Telecommunication Engineering (2019 pattern)
Semester II

204191: Signals & Systems

1. Identify, classify basic signals and perform operations on signals.
2. Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
3. Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
4. Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
5. Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
6. Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

204192: Control Systems

1. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
2. Determine the (absolute) stability of a closed-loop control system.
3. Perform time domain analysis of control systems required for stability analysis.
4. Perform frequency domain analysis of control systems required for stability analysis.
5. Apply root-locus, Frequency Plots technique to analyze control systems.
6. Express and solve system equations in state variable form.
7. Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

204193: Principles of Communication Systems

1. To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.

2. Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
3. Explain generation and detection of FM systems and compare with AM systems.
4. Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM,PWM, and PPM).
5. Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DMand ADM).
6. Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

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204194: Object Oriented Programming

1. Describe the principles of object oriented programming.
2. Apply the concepts of data encapsulation, inheritance in C++.
3. Understand Operator overloading and friend functions in C++.
4. Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
5. Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
6. Describe and use of File handling in C++.

204199: Employability Skills Development

1. Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
2. Develop effective communication skills (listening, reading, writing, and speaking), self – management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
3. Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
4. Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
5. Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.

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SE Mechanical Engineering (2019 pattern) Semester I

202041 - Solid Mechanics

1. DEFINE various types of stresses and strain developed on determinate and indeterminate members
2. DRAW Shear force and bending moment diagram for various types of transverse loading and support.
3. COMPUTE the slope & deflection, bending stresses and shear stresses on a beam.
4. CALCULATE torsional shear stress in shaft and buckling on the column.
5. APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-Delement
6. UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems

202042 - Solid Modeling and Drafting

1. UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management
2. UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry
3. CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system
4. APPLY geometric transformations to simple 2D geometries
5. USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
6. USE PMI & MBD approach for communication

202043 - Engineering Thermodynamics

1. DESCRIBE the basics of thermodynamics with heat and work interactions
2. APPLY laws of thermodynamics to steady flow and non-flow processes
3. APPLY entropy, available and non-available energy for an Open and Closed System
4. DETERMINE the properties of steam and their effect on performance of vapour power cycle
5. ANALYSE the fuel combustion process and products of combustion.
6. SELECT various instrumentations required for safe and efficient operation of steam generator.

202044 - Engineering Materials and Metallurgy

1. COMPARE crystal structures and ASSESS different lattice parameters
2. CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
3. DIFFERENTIATE and DETERMINE mechanical properties using destructive and non destructive testing of materials.
4. IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
5. ANALYSE effect of alloying element & heat treatment on properties of ferrous & Nonferrous alloy.
6. SELECT appropriate materials for various applications

203156 - Electrical and Electronics Engineering

1. APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
2. DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board

3. UNDERSTAND the operation of DC motor, its speed control methods and braking.

4. DISTINGUISH between types of three phase induction motor and its characteristic features

5. EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems

6. CHOOSE energy storage devices and electrical drives for EVs

202045 - Geometric Dimensioning and Tolerancing Lab

1. SELECT appropriate IS and ASME standards for drawing

2. READ & ANALYSE variety of industrial drawings

3. APPLY geometric and dimensional tolerance, surface finish symbols in drawing

4. EVALUATE dimensional tolerance based on type of fit, etc.

5. SELECT an appropriate manufacturing process using DFM, DFA, etc.

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SE Mechanical Engineering (2019 pattern) Semester II

207002 - Engineering Mathematics – III

1. SOLVE higher order linear differential equations and its applications to model and analyse mass spring systems
2. APPLY Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.
3. APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control
4. PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
5. SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations..

202047 - Kinematics of Machinery

1. APPLY kinematic analysis to simple mechanisms
2. ANALYZE velocity and acceleration in mechanisms by vector and graphical method.
3. SYNTHESIZE a four bar mechanism with analytical and graphical methods
4. APPLY fundamentals of gear theory as a prerequisite for gear design
5. CONSTRUCT cam profile for given follower motion

202048 - Applied Thermodynamics

1. DETERMINE COP of refrigeration system and ANALYZE psychrometric processes.
2. DISCUSS basics of engine terminology, air standard, fuel air and actual cycles.
3. IDENTIFY factors affecting the combustion performance of SI and CI engine

4. DETERMINE performance parameters of IC Engines and emission control.
5. EXPLAIN working of various IC Engine systems and use of alternative fuels.
6. CALCULATE performance of single and multi-stage reciprocating compressors and DISCUSS rotary positive displacement compressors

202049 - Fluid Mechanics

1. DETERMINE various properties of fluid
2. APPLY the laws of fluid statics and concepts of buoyancy
3. IDENTIFY types of fluid flow and terms associated in fluid kinematics
4. APPLY principles of fluid dynamics to laminar flow
5. ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
6. CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws

202050 - Manufacturing Process

1. SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process
2. UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling
3. DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
4. CLASSIFY and EXPLAIN different welding processes and EVALUATE welding Characteristics
5. DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
6. UNDERSTAND the principle of manufacturing of fibre-reinforce composites and metal matrix composites

202051 - Machine Shop

1. PERFORM welding using TIG/ MIG/ Resistance/Gas welding technique
2. MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
3. PERFORM cylindrical/surface grinding operation and CALCULATE its machining time
4. DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
5. PREPARE industry visit report
6. UNDERSTAND procedure of plastic processing

202052 - Project Based Learning - II

1. IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
2. ANALYZE the results and arrive at valid conclusions.
3. PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge
4. CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures
5. USE of technology in proposed work and demonstrate learning in oral and written form.
6. DEVELOP ability to work as an individual and as a team member

Course Outcomes(COs)
Third Year Engineering(TE)

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TE Civil Engineering (2019 pattern) Semester I

301001: Hydrology and Water Resource Engineering

1. Understand government organizations, apply & analyze precipitation & its abstractions.
2. Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
3. Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
4. Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics
5. Understand water logging & water management, apply & analyze ground water hydrology
6. Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement

301002: Water Supply Engineering

1. Define identify, describe reliability of water sources, estimate water requirement for various sectors
2. Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
3. Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
4. Explain internal schematic of Op-Amp and define its performance parameters.
5. Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
6. Understand and compare the principles of various data conversion techniques and PLL with their applications.

301003: Design of Steel Structures

1. Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.
2. Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
3. Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
4. Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
5. Analyze the industrial truss for dead, live and wind load and design of gantry girder for Moving load.
6. Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.

301004: Engineering Economics and Financial Management

1. Understand basics of construction economics.
2. Develop an understanding of financial management in civil engineering projects.
3. Prepare and analyze the contract account.
4. Decide on right source of fund for construction projects.
5. Understand working capital and its estimation for civil engineering projects.
6. Illustrate the importance of tax planning & understand role of financial regulatory bodies

301005 (a): Elective I: Advanced Fluid Mechanics and Hydraulic Machines

1. Determine discharge using notches and weirs, and energy loss in hydraulic jump in open channel flow.
2. Describe simple super positions of basic ideal fluid flows; and determine velocity and shear stress distribution for laminar flow between parallel plates.

3. Understand flow through openings under varying head, and determine rise in pressure due to water hammer effect in pipe flow.
4. Calculate force exerted by free jet on stationary and moving, flat and curved vanes using impulse momentum principle.
5. Design Pelton wheel and Francis turbines and predict their performance characteristics.
6. Estimate performance characteristics of Centrifugal pump

301005 (b): Elective I: Research Methodology and IPR

1. Understand a research problem for civil engineering domain.
2. Analyze the available literature for given research problem and illustrate different techniques of literature survey thereby gap identification.
3. Recognize the importance of data collection and investigate the statistical and reliability methods of preliminary data analysis.
4. Explain the important concept of interpretation and develop technical writing and presentation skills.
5. Comprehend the various forms of the intellectual property, its relevance and business impact in the changing global business environment.
6. Realize the importance of patents, trademark and copyright and follow research ethics.

301005 (c): Elective I: Construction Management

1. Understand the overview of construction sector.
2. Illustrate construction scheduling, work study and work measurement.
3. Acquaint various labor laws and financial aspects of construction projects.
4. Explain elements of risk management and value engineering.
5. State material and human resource management techniques in construction.
6. Understand basics of artificial intelligence techniques in civil engineering.

301005 (d): Elective I: Advanced Concrete Technology

1. To understand the structural behavior of bars and trusses and analyze it by using flexibility method of analysis.
2. To understand the structural behavior of beams and plane frames and analyze it by using flexibility method of analysis.
3. To analyze bars, springs and truss by member approach of stiffness matrix method.
4. To analyze beams by member approach of stiffness matrix method and to develop transformation matrix and global/structure stiffness matrix for plane frame and thereby analyze it by member approach of stiffness matrix method.
5. To develop transformation matrix and global/structure stiffness matrix for grid and analyze the grid by structure and member approach of stiffness matrix method.
6. To develop the member stiffness matrix of space truss and space frame and develop the flow chart /algorithm to write the program for analysis of skeletal structures with reference to computer application.

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301005 (f): Elective I: Advanced Mechanics of Structures

1. Apply moment area and conjugate method to find slope and deflection.
2. Evaluate stresses and strain in thin and thick cylinder.
3. Analyze the beam and trusses by influence line diagram.
4. Analyze the beam for moving load by influence line diagram.
5. Understand and analyze beam curved in plan and elevation.
6. Analyze three and two hinged arches for axial thrust, shear and moment.

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TE Civil Engineering (2019 pattern) Semester II

301012: Waste Water Engineering

1. Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
2. Design preliminary and primary unit operations in waste water treatment plant
3. Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
4. Understand and design suspended and attached growth wastewater treatment systems
5. Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
6. Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment

.

301013: Design of Reinforced Concrete Structures

1. Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete.
2. Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections.
3. Design & detailing of rectangular one way and two-way slab with different boundary conditions
4. Design & detailing of dog legged and open well staircase
5. Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
6. Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings. .

301014: Remote Sensing and Geographic Information System

1. Articulate fundamentals and principles of RS techniques.
2. Demonstrate the knowledge of remote sensing and sensor characteristics.
3. Distinguish working of various spaces-based positioning systems.
4. Analyze the RS data and image processing to utilize in civil engineering
5. Explain fundamentals and applications of RS and GIS
6. Explain fundamentals and applications of RS and GIS
7. Acquire skills of data processing and its applications using GIS

301015 (a): Elective II: Advanced Engineering Geology with Rock Mechanics

1. Illustrate seismic zones, plate tectonics and civil engineering significance of major rock formations of India with their characteristics.
2. Explain soil profile, geo-hydrological characters of various rock formations and necessity of geological studies in water conservation.
3. Apply knowledge of geology in Infrastructural, Urban development and demonstrate importance of national wealth.
4. Validate the suitability of rocks based on mechanical properties, R.Q.D. and geophysical exploration.
5. Explore subsurface Geology for civil engineering projects to suggest foundation treatments for various geological defects and channel erosion.
6. Illustrate the suitability of proposed alignments for tunnels and bridges on the basis of Geological investigations.

301015 (b): Elective II: Soft Computing Techniques

1. Understand AI techniques, soft computing techniques and basic concepts Artificial Neural Network

2. Understand components of ANN, training algorithms and implement the back propagation algorithm
3. Design the feed forward back propagation neural network.
4. Understand types of neural networks and their applications
5. Understand working of genetic algorithm, support vector regressions, model tree and random forest along with their applications
6. Develop models for time series applications using support vector regressions, model tree and random forest.

301015 (c): Elective II: Advanced Surveying

1. Recognize the concept of triangulation for fixing the ground control points.
2. Differentiate most probable values for different measurement and adjust those in a given figure.
3. Summarize the concepts of astronomical and hydro graphic surveying.
4. Demonstrate the use of aerial photographs for mapping.
5. Analyze use of modern surveying instruments in the field.
6. Execute GPS and the associated software for different applications in civil engineering.

301015 (d): Elective II: Advanced Geotechnical Engineering

1. Classify the soil and understand the soil structure and role of water in clay.
2. Calculate lateral pressure on retaining structures and carry out design the retaining structures.
3. Interpret the results of triaxial tests under different drainage conditions.
4. Draw the stress paths for different conditions.
5. Select and implement soil stabilization techniques based on field conditions.
6. Explain different ground improvement techniques.

301015 (e): Elective II: Architecture and Town Planning

1. Apply the principles of architectural planning and landscaping for improving quality of life
2. Understand the confronting issues of the area and apply the acts.
3. Evaluate and defend the proposals.
4. Appraise the existing condition and to develop the area for betterment.

301015 (f): Elective II: Solid Waste Management

1. Outline solid waste management systems with respect to its generation rate (quantity), sampling, characteristics and regulatory/legal requirements.
2. Explain and suggest relevant method of storage, collection and transportation of solid waste for the given site condition with justification.
3. Develop understanding of technological applications for processing and material recovery from solid waste with its economics and design composting system for organic waste.
4. Describe the fundamental and technological aspects of waste to energy systems from solid waste and to design anaerobic digester and incineration system.
5. Outline the design, operation, and maintenance of sanitary landfill and management of legacy waste.
6. Explain the functional element for management of special waste and suggest the relevant method of reuse and recycling for the given type of waste in the given situation.

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TE Computer Engineering (2019 pattern) Semester I

310241: Database Management Systems

1. Analyze and design Database Management System using ER model
2. Implement database queries using database languages
3. Normalize the database design using normal forms
4. Apply Transaction Management concepts in real-time situations
5. Use NoSQL databases for processing unstructured data
6. Differentiate between Complex Data Types and analyze the use of appropriate data types

310242: Theory of Computation

1. Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
2. Construct regular expression to present regular language and understand pumping lemma for RE
3. Design Context Free Grammars and learn to simplify the grammar
4. Construct Pushdown Automaton model for the Context Free Language
5. Design Turing Machine for the different requirements outlined by theoretical computer science
6. Understand different classes of problems, classify and analyze them and study concepts of NP completeness

310243: Systems Programming and Operating System

1. Analyze and synthesize basic System Software and its functionality
2. Identify suitable data structures and Design & Implement various System Software

3. Compare different loading schemes and analyze the performance of linker and loader
4. Implement and Analyze the performance of process scheduling algorithms
5. Identify the mechanism to deal with deadlock and concurrency issues
6. Demonstrate memory organization and memory management policies

310244: Computer Networks and Security

1. Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
2. Illustrate the working and functions of data link layer
3. Analyze the working of different routing protocols and mechanisms
4. Implement client-server applications using sockets
5. Illustrate role of application layer with its protocols, client-server architectures .
6. Comprehend the basics of Network Security

310245(A): Internet of Things and Embedded Systems

1. Understand the fundamentals and need of Embedded Systems for the Internet of Things
2. Apply IoT enabling technologies for developing IoT systems
3. Apply design methodology for designing and implementing IoT applications
4. Analyze IoT protocols for making IoT devices communication
5. Design cloud based IoT systems
6. Design and Develop secured IoT applications

310245(B): Human Computer Interface

1. To design effective Human-Computer-Interfaces for all kinds of users .
2. To apply and analyze the user-interface with respect to golden rules of interface

3. To analyze and evaluate the effectiveness of a user-interface design
4. To implement the interactive designs for feasible data search and retrieval
5. To analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality ,multi-media, World wide web related environments
6. To analyze and identify user models, user support, and stakeholder requirements of HCI systems

310245(C): Distributed Systems

1. Analyze Distributed Systems types and architectural styles
.
2. Implement communication mechanism in Distributed Systems
3. Implement the synchronization algorithms in Distributed System applications
4. Build fault tolerant Distributed Systems
5. Develop the components of Distributed File System
6. Apply replication techniques and consistency model in Distributed Systems

310245(D): Software Project Management

1. Comprehend Project Management Concepts
.
2. Use various tools of Software Project Management
3. Schedule various activities in software projects
4. Track a project and manage changes
5. Apply Agile Project Management
6. Analyse staffing process for team building and decision making in Software Projects and Management

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TE Computer Engineering (2019 pattern) Semester II

310251: Data Science and Big Data Analytics

1. Analyze needs and challenges for Data Science Big Data Analytics
2. Apply statistics for Big Data Analytics
3. Apply the lifecycle of Big Data analytics to real world problems
4. Implement Big Data Analytics using Python programming
5. Implement data visualization using visualization tools in Python programming
6. Design and implement Big Databases using the Hadoop ecosystem

310252: Web Technology

1. Implement and analyze behavior of web pages using HTML and CSS
2. Apply the client side technologies for web development
3. Analyze the concepts of Servlet and JSP
4. Analyze the Web services and frameworks
5. Apply the server side technologies for web development
6. Create the effective web applications for business functionalities using latest web development platforms

310253: Artificial Intelligence

1. Identify and apply suitable Intelligent agents for various AI applications
2. Build smart system using different informed search / uninformed search or heuristic approaches
3. Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem

4. Apply the suitable algorithms to solve AI problems
5. Implement ideas underlying modern logical inference systems
6. Represent complex problems with expressive yet carefully constrained language of representation

310254(A): Information Security

1. Model the cyber security threats and apply formal procedures to defend the attacks
2. Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography
3. Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms
4. Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios
5. Demonstrate the use of standards and cyber laws to enhance Information Security in the development process and infrastructure protection

310254(B): Augmented and Virtual Reality

1. Understand the basics of Augmented and Virtual reality systems and list their applications
2. Describe interface to the Virtual World with the help of input and output devices
3. Explain representation and rendering system in the context of Virtual Reality
4. Analyze manipulation, navigation and interaction of elements in the virtual world
5. Summarize the basic concepts and hardware of Augmented Reality system
6. Create Mobile Augmented Reality using Augmented Reality techniques and software

310254(C): Cloud Computing

1. Understand the different Cloud Computing environment

2. Use appropriate data storage technique on Cloud, based on Cloud application
3. Analyze virtualization technology and install virtualization software
4. Develop and deploy applications on Cloud
5. Apply security in cloud applications
6. Use advance techniques in Cloud Computing

310254(D): Software Modelling and Architecture

1. Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
2. Design and analyze an application using UML modeling as fundamental tool
3. Evaluate software architectures
4. Use appropriate architectural styles and software design patterns
5. Apply appropriate modern tool for designing and modeling

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TE Electronics & Telecommunication Engineering (2019 pattern)
Semester I

304181: Digital Communication

1. Apply the statistical theory for describing various signals in a communication system.

2. Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.

3. Describe and analyze the digital communication system with spread spectrum modulation.

4. Analyze a communication system using information theoretic approach.

304182: Electromagnetic Field Theory

1. Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.

2. Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.

3. State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Pointing Theorem, Retarded magnetic vector potential.

4. Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.

5. Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.

6. Carry out a detailed study, interpret the relevance and applications of Electromagnetics

304183: Database Management

1. Ability to implement the underlying concepts of a database system.
2. Design and implement a database schema for a given problem-domain using data model.
3. Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
4. Implement transactions, concurrency control, and be able to do Database recovery.
5. Able to understand various Parallel Database Architectures and its applications.
6. Able to understand various Distributed Databases and its applications.

304184: Microcontroller

1. Understand the fundamentals of microcontroller and programming.
2. Interface various electronic components with microcontrollers.
3. Analyze the features of PIC 18F XXXX.
4. Describe the programming details in peripheral support.
5. Develop interfacing models according to applications.
6. Evaluate the serial communication details and interfaces.

304185 (A): Digital Signal Processing (Elective-I)

1. Interpret and process discrete/ digital signals and represent DSP system.
2. Analyze the digital systems using the Z-transform techniques.
3. Implement efficient transform and its application to analyze DT signals.
4. Design and implement IIR filters.
5. Design and implement FIR filters.
6. Apply DSP techniques for speech/ biomedical/ image signal processing.

304185 (B): Electronic Measurements (Elective-I)

1. Understand the metrics for the measurement system
2. Select and use the instruments for measurement & analysis of basic electronic parameters
3. Identify and use the different signal generators for specific applications
4. Understand the principles of different Oscilloscopes for specific applications
5. Identify the use of other display devices, recorders and timer/counter in measurement systems

304185 (C): Fundamentals of JAVA Programming (Elective-I)

1. Understand the basic principles of Java programming language
2. Apply the concepts of classes and objects to write programs in Java
3. Demonstrate the concepts of methods & Inheritance
4. Use the concepts of interfaces & packages for program implementation .
5. Understand multithreading and Exception handling in Java to develop robust programs
6. Use Graphics class, AWT packages and manage input and output files in Java

304185 (D): Computer Networks (Elective-I)

1. Design LAN using appropriate networking architecture, topologies, transmission media, and networking devices.
2. Understand the working of controlling techniques for flawless data communication using data link layer protocols.
3. Learn the functions of network layer, various switching techniques and internet protocol addressing

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T.E Electronics & Telecommunication Engineering (2019 pattern)
Semester II

304192: Cellular Networks

1. Understand fundamentals of wireless communications
2. Discuss and study OFDM and MIMO concepts.
3. Elaborate fundamentals mobile communication.
4. Describes aspects of wireless system planning.
5. Understand of modern and futuristic wireless networks architecture.
6. Summarize different issues in performance analysis.

304193: Project Management

1. Apply the fundamental knowledge of project management for effectively handling the projects.
2. Identify and select the appropriate project based on feasibility study and undertake its effective planning
3. Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.
4. Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.
5. Identify and assess the project risks and manage finances in line with Project Financial Management Process.
6. Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

304194: Power Devices & Circuits

1. To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.

2. To design triggering / driver circuits for various power devices.

3. To evaluate and analyze various performance parameters of the different converters and its topologies.

4. To understand significance and design of various protections circuits for power devices.

5. To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.

6. To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

304195 (A): Digital Image Processing (Elective - II)

1. Apply knowledge of mathematics for image understanding and analysis.

2. Implement spatial domain image operations.

3. Design and realize various algorithms for image segmentation.

4. Design and realize various algorithms for image Compression.

5. Apply restoration to remove noise in the image.

6. Describe the object recognition system.

304195 (B): Sensors in Automation (Elective -II)

1. Understand the Concepts of Sensors/Transducers, classify and evaluate static and Dynamic Characteristics of Measurement Systems.

2. Choose the proper sensor comparing different standards and guidelines for measurements of Displacement, Vibration, Acceleration and Level

3. Choose the proper sensor comparing different standards and guidelines for measurements of Force, Pressure, Stress and Flow

4. Choose the proper sensor comparing different standards and guidelines for measurements of Temperature and Humidity.

5. Explore sensors to profound areas like environmental, Agricultural and bio-medical equipment and sustainability.

6. Explore IoT based applications of Sensors and Transducers.

304195 (C): Advanced JAVA Programming (Elective - II)

1. Design and develop GUI applications using Applets.
2. Apply relevant AWT/ swing components to handle the given event.
3. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
4. Learn to access database through Java program, using Java Database Connectivity (JDBC)
5. Invoke the remote methods in an application using Remote Method Invocation (RMI)
6. Develop program for client /server communication using Java Networking class

304195 (D): Embedded Processors (Elective - II)

1. Understand basics of Embedded C Programming and usage of Embedded C and study different software tools for programming microcontrollers.
2. Get acquainted with various Embedded Processor architectures related to industrial application.
3. Know about the programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.
4. Understand the architectures of ARM Cortex M4 Microcontrollers and its advantages over ARM 7 Microcontrollers.
5. Implement the real world programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.
6. Recognize the interfacing of real world sensors and standard buses. Will also able to design different case studies.

304195 (E): Network Security (Elective-II)

1. Analyze attacks on computers and computer security.
2. Demonstrate knowledge of cryptography techniques.
3. Illustrate various Symmetric and Asymmetric keys for Ciphers
4. Evaluate different Message Authentication Algorithms and Hash Functions
5. Get acquainted with various aspects of E-Mail Security
6. Assimilate various aspects of Web Security

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TE Mechanical Engineering (2019 pattern) Semester I

302041: Numerical and Statistical Methods

1. SOLVE system of equations using direct and iterative numerical methods
2. ESTIMATE solutions for differential equations using numerical techniques
3. DEVELOP solution for engineering applications with numerical integration.
4. DESIGN and CREATE a model using a curve fitting and regression analysis.
5. APPLY statistical Technique for quantitative data analysis
6. DEMONSTRATE the data, using the concepts of probability and linear algebra

302042: Heat and Mass Transfer

1. ANALYZE & APPLY the modes of heat transfer equations for one dimensional thermal system.
2. DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction
3. EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results
4. INTERPRET heat transfer by radiation between objects with simple geometries, for black and grey surfaces
5. ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
6. DESIGN & ANALYSIS of heat transfer equipment's and investigation of its performance

302043: Design of Machine Elements

1. DESIGN AND ANALYZE the cotter and knuckle Joints, levers and components subjected to eccentric loading.
2. DESIGN shafts, keys and couplings under static loading conditions
3. ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack.
4. EVALUATE dimensions of machine components under fluctuating loads.
5. EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints.
6. APPLY the design and development procedure for different types of springs.

302044: Mechatronics

1. DEFINE key elements of mechatronics, principle of sensor and its characteristics.
2. UTILIZE concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O.
3. DETERMINE the transfer function by using block diagram reduction technique.
4. EVALUATE Poles and Zero, frequency domain parameter for mathematical modeling
for mechanical system.
5. APPLY the concept of different controller modes to an industrial application.
6. DEVELOP the ladder programming for industrial application.

302045-A: Advanced Forming & Joining Processes

1. ANALYSE the effect of friction in metal forming deep drawing and IDENTIFICATION of surface defects and their remedies in deep drawing operations
2. ASSESS the parameters for special forming operation and SELECT appropriate special forming operation for particular applications

3. ANALYSE the effect of HAZ on microstructure and mechanical properties of materials

4. CLASSIFY various solid state welding process and SELECT suitable welding processes for particular applications

5. CLASSIFY various advanced welding process and SELECT suitable welding processes for particular applications.

6. INTERPRET the principles of sustainable manufacturing and its role in manufacturing industry

302045-B:Machining Science &Technology

1. DEFINE metal cutting principles and mechanics of metal cutting and tool life.
.
2. DESCRIBE features of gear and thread manufacturing processes.
.
3. SELECT appropriate grinding wheel and demonstrate the various surface finishing processes

4. SELECT appropriate jigs/fixtures and to draw the process plan for a given component.

5. SELECT & EVALUATE various parameters of process planning

6. GENERATE CNC program for Turning / Milling processes and generate tool path using CAM software.

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TE Mechanical Engineering (2019 pattern) Semester II

302049: Artificial Intelligence & Machine Learning

1. DEMONSTRATE fundamentals of artificial intelligence and machine learning.
2. APPLY feature extraction and selection techniques.
3. APPLY machine learning algorithms for classification and regression problems
4. DEVISE AND DEVELOP a machine learning model using various steps.
5. EXPLAIN concepts of reinforced and deep learning.
6. SIMULATE machine learning model in mechanical engineering problems.

302050: Computer Aided Engineering

1. DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.
2. APPLY the various meshing techniques for better evaluation of approximate results.
3. APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.
4. ANALYZE and APPLY various numerical methods for different types of analysis.
5. EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method.
6. GENERATE the results in the form of contour plot by the USE of CAE too

302051: Design of Transmission Systems

1. APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.
2. EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards
3. SELECT & DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.
4. DEFINE and DESIGN various types of Clutches, Brakes, used in automobile.
5. APPLY various concept to DESIGN Machine Tool Gear box, for different applications
6. ELABORATE various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.

302052-A: Composite Materials

1. DEFINE & COMPARE composites with traditional materials.
2. IDENTIFY & ESTIMATE different parameters of the Polymer Matrix Composite
3. CATEGORISE and APPLY Metal Matrix Process from possessions landscape.
4. DETERMINE volume/weight fraction and strength of Composites.
5. SELECT appropriate testing and inspection method for composite materials.
6. SELECT composites materials for various applications.

302052-B: Surface Engineering

1. DEFINE the basic's principle & mechanism of surface degradation.
2. ANALYSE & SELECT correct corrosion prevention techniques for a different service condition
3. DEMONSTRATE the role of surface engineering of materials to modify/improve the surface properties

4. SELECT the suitable surface heat treatments to improve the surface properties.

5. APPLY the surface modification technique to modify surface properties.

6. ANALYSE & EVALUTE various surface coating defects using various testing/characterization method.

Course Outcomes(COs)
Final Year Engineering (BE)

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BE Civil Engineering (2015 pattern) Semester I

401001: Foundation Engineering

1. Perform subsurface investigations for foundations using different methods.
2. Estimate the bearing capacity of shallow foundations.
3. Calculate immediate and primary consolidation settlement of shallow foundations.
4. To acquired skill to design non-conventional system of treatment of sewage
5. Decide the capacity of a pile and pile group.
.
6. Understand the steps in geotechnical design of shallow foundations and well foundations.
7. Analyze problems related to expansive soil and overcome them using design principles, construction techniques in black cotton soil.

401002: Transportation Engineering

1. Understand principles and practices of transportation planning.
2. Demonstrate knowledge of traffic studies, analysis and their interpretation
3. Design Geometric Elements of road pavement.
4. Evaluate properties of highway materials as a part of road pavement.
5. Appraise different types of pavements and their design.
6. Understand the fundamentals of Bridge Engineering and Railway Engineering

401003 (a) Elective III: Coastal Engineering

1. Understand basic of ocean waves including wave generation, classification, propagation, wave theories, wave diffraction, wave refection and wave breaking.
2. Understand and apply short term and long-term wave analysis.
3. Understand basic characteristics of tides, tide producing forces, dynamic theory of tides.
4. Understand coastal process of erosion/accretion due to waves, bed forms, long shore transport
(Littoral drift) and estimation of wave induced sediment quantity.

5. Understand the coastal structures and shore protection methods.

6. Understand coastal zone management activities, issues related to integrated coastal zone Management and regulation of coastal zone.

401 003 (b) Elective III: Advanced Design of Concrete Structures

1. Understand yield line theory and apply it to analyze and design slabs of different shapes having different edge conditions.

2. Understand the concepts of ductile detailing

3. Analyze and design of flat slab.

4. Analyze and design of retaining walls.

5. Analyze and design of liquid retaining structures.

6. Analyze and design of RC frames and shear walls.

401 003 (c) Elective III: Integrated Water Resources Planning and Management

1. Understand concerned organizations, IWRP & M objectives, principles, challenges, application & analysis of IWRP&M approaches & principles in a case study.

2. Understand PIM, WDS, WALMI, agriculture in the concept of integrated water resources, apply and analyse water requirements for food production

3. Understand assessment of surface and ground water quality, EIA, CPCB regulations, application & analysis of effluent quality standards as per CPCB

4. Understand water economics and funding, application & analysis of planning for a sustainable water future

5. Understand legal regulatory settings of IWRP & M, application & analysis of inter-basin water transfers and IWRP & M

6. Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M

401 003 (d) Elective III: Finite Element Method

1. To understand the basics of solid mechanics prior to learn finite element analysis.
2. Solve simple Engineering problems using 1D, 2D and 3D elements
3. Write shape functions of 1D, 2D and 3D elements
4. Determine the stresses in three dimensional finite elements using isoparametric formulation.
5. Analyze the truss and beam elements using stiffness matrix and finite element procedure.
6. Evaluate the forces and stresses in rigid jointed portal frame and grid elements using stiffness matrix and finite element procedure

401003 (e) Elective III: Data Analytics

1. Understand the basic concepts of Statistics and its analysis and applications
2. Solve the problems related to probability and various probability distributions.
3. Apply the concept of sampling and distribution and interpret problems using correlation
4. Analyze and test of hypothesis
5. Examine and prepare the data and use develop regression
6. Understand and Apply machine learning algorithms for Regression, Classification and Clustering

401003 (f) Elective III: Operation Research

1. Ccorrelate applications of Operations Research in Civil Engineering field
2. Solve the problems related to stochastic programming
3. Optimize transportation and assignment problems
4. Optimize linear problems
5. Optimize non-linear problems
6. Suggest solution for the problems related to dynamic models, games theory and replacement of items

401 004 (a) Elective IV: Air Pollution and Control

1. Recall air pollution, legislation and regulations.
2. Evaluate air pollutant concentrations as a function of meteorology.
3. Interpret sampling results with prescribed standards.
4. Assess emission inventory and air quality models.
5. Compare the air pollution control equipments.
6. Infer indoor air pollution and its mitigation.

401 004 (b) Elective IV: Advanced Design of Steel Structures

1. Understand the behavior and design of members subjected to combined forces
2. Design moment resisting connection
3. Design component / structure using cold form light gauge section
4. Design members of truss and scaffolding using tubular section
5. Design castellated beam
6. Analyze and design components of industrial structure such as Portal frame and gable frame

401 004 (c) Elective IV: Statistical Analysis and Computational Methods

1. Understand the basic concepts of Statistics and perform statistical data analysis
2. Understand the concept of probability and fit Binomial, or Poisson or Normal distribution to the given data
3. Understand concept of sampling and perform chi-square test, z test, Student T test
4. Perform hypothesis test
5. Carry out correlation and regression analysis for the given data
6. Calculate variance and perform K-S test for goodness of fit

401 004 (d) Elective IV: Airport and Bridge Engineering

1. Understand the fundamental of airport.
2. Understand and design the runway and taxiway and drainage systems
3. Understand the BIM, AR and VR in airport planning and pavement design.
4. Plan the lighting and marking of airport and heliport.
5. Estimate various components of bridge and loads on bridges.
6. Study and design of bridge structures.

401004 (e) Elective IV: Design of Prestressed Concrete Structures

1. Know the prestressed members.
2. Determining the stresses and various losses in prestressed concrete members.
3. Design the prestressed concrete structures
.
4. Design the prestressed concrete slab
5. Design the prestressed concrete flat slab
6. Analysis and design the prestressed continuous beams

401004 (f) Elective IV: Formwork and Plumbing Engineering

1. Select appropriate material and type of formwork
2. Analyze the formwork for various loadings.
3. Illustrate the design aspects of formwork under various requirements.
4. Understand requirement of plumbing in a building.
5. Understand plumbing hydraulics and its components in plumbing system.
6. Illustrate the design aspects as per the requirement of Indian Standards.

BE Civil Engineering (2015 pattern) Semester II

401009: Computer Programming in Civil Engineering

1. Understand basics of Python Programming
2. Write Python codes for variety of problems in civil Engineering

401011: Dams and Hydraulics Structures

1. Understand types of dams and instrumentation working
2. Execute stability analysis of Gravity Dam
3. Understand types of spillways & Design of Ogee spillway
4. Illustrate the failures and analyze stability of earthen dam
5. Design Canals and understand the canal structures
6. Analysis of the Diversion headwork and Cross Drainage work

401012: Quantity Surveying, Contracts and Tenders

1. Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
2. Describe tendering process, construction contracts, and aspects of Arbitration and prepare
   tender documents**.**
3. Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule.
4. Apply engineering knowledge to prepare estimate for roads, culverts, and water tank (Elevated storage tank)
5. Apply concepts of specification to draft brief specification, detailed specification and prepare
   detailed rate analysis report.
6. Evaluate depreciation and valuation of property on the basis of present condition, specifications and market trend.

401 013 (a) Elective V: Earthquake Engineering

1. Define the concepts of earthquakes, seismology and vibrations.
2. Model physical structures and develop equations of motion.
3. Solve the equations of motion for SDOF systems.
4. Solve the equations of motion for MDOF systems.
5. Perform static seismic analysis for buildings.
6. Perform dynamic seismic analysis for buildings

401013 (b) Elective V: Structural Design of Bridges

1. Identify loads on bridges and selection of type of bridge for the site condition as per Indian
standards.
2. Design the reinforced concrete deck slab, culvert slab and T beam deck slab for highway bridges.
3. Analysis and design of reinforced concrete and post tension pre stressed concrete girders.
4. Classify the types of rail bridges and design the plate girder steel bridges
5. Analyse and design the steel trussed bridges.
6. Study different types of bearing and thereby design the bearings for reinforced concrete highway bridges.

401013 (c) Elective V: Irrigation and Drainage

1. Summarize types of irrigation methods.
2. Estimate evapotranspiration and crop-water requirement.
3. Understand component parts and their design considerations of lift irrigation system.
4. Design drip and sprinkler irrigation systems.
5. Understand basics of salt affected soils and estimate leaching requirement.
6. Design surface and subsurface drainage systems.

401013 (d) Elective V: Design of Precast and Composite Structures

1. Achieve knowledge of design and development of problem solving skills.
2. Explore the concept of precast construction
3. Learn the principles and design of precast structures
.
4. Understand the need, advantages and limitations of composite material.
5. Apply basic mechanical principles in analysis of composite structures like beams, columns, floors, shear connectors.
6. Understand and apply various provisions as per Indian standards in design of structural components using composite materials.

401013 (e) Elective V: Hydropower Engineering

1. Understand the classification of power resources & trends in energy use patterns.
2. Identify the components of hydro power plant.
3. Analyze the load assessment for turbines.
4. Prepare the layout of power house based on the various structures need for it.
5. Design the turbines and surge tank s.
6. Understand the laws and regulatory aspects of hydroelectric power.

401013 (f) Elective V: Structural Audit and Retrofitting of Structures

1. Identify causes of deterioration in RC and steel structures.
2. Explore entire process of structural audit.
3. Explore necessity and methods of structural health monitoring.
4. Explain method of retrofitting for RC, steel and historical structures.
5. Design retrofitting using FRP for RC column.
6. Design retrofitting using FRP for RC beams.

401014 (a) Elective VI: TQM and MIS

1. Recognize quality and contribution of quality gurus for evaluation of best practices
2. Relate the functioning and application of TQM & Six Sigma in the domain of construction sector
3. Recommend ISO 9001 principles in preparation of quality manual to construction business
4. Apply management control & certification systems for construction industry
5. Choose TQM process implementation and various quality awards for construction sector
6. Propose MIS for allied fields in construction sector

401014 (b) Elective VI: Advanced Transportation Engineering

1. Analyze travel demand model and forecasting.
2. Analyze travel demand model and forecasting.
3. Design facilities required for non-motorized transportation and pedestrians.
4. Estimate basic characteristics of traffic stream and signal design.
5. Design flexible pavements.
6. Design rigid pavements and overlays.

4010 14 (c) Elective VI: Geo-Synthetic Engineering

1. Explain types of Geo-synthetic material and its application in construction industry
2. Define physical and engineering properties of geo-synthetics material
3. Describe function of geo-synthetics material and its application in geo environment engineering
4. Analyse effect of geo-synthetics in design of flexible pavements
5. Design the reinforced soil retaining structures
6. Explain mechanism of soil reinforcement to improve bearing capacity of soil

401 014 (d) Elective VI: Structural Design of Foundations

1. Judge suitable type of shallow foundation based on the available soil category.
2. Decide suitable type of pile foundation for different soil stratum and evaluation of group capacity by formulation.
3. Design Raft foundations
4. Design well and caissons Foundations.
5. Design different types of Machine foundations.
6. Design Retaining Structures.

401014 (e): Elective VI: Green Structures and Smart Cities

1. Students should be able to describe the importance of energy and minimization by altering the building materials.
2. Students should be able to understand the importance green construction and green rating system
3. Students should be able to introduce the applications of energy conservation and efficiency
practices in buildings.
4. Students should be able to understand phases and approval involved in smart city project.
5. Students should be able to assess the national and global experience of smart cities.
.
6. Students should be able to understand the importance of sustainable development and current protocol of sustainable development goals.

401014 (f): Elective VI: Rural Water Supply Engineering

1. Understand issues related to rural water supply with respect to source, water related issues in
rural areas.
2. Understand role of various government departments and importance of participatory approach.

3. Understand various types of rural water supply scheme and infrastructure requirements therein.

4. Understand interdisciplinary requirements in RWS including Software

5. Understand Automation requirements for a Water Supply Project

6. Understand Documentation and O and M issues related Water Supply Project including Leak
Detection.

BE Computer Engineering (2015 pattern) Semester I

410241: High Performance Computing

1. Describe different parallel architectures, inter-connect networks, programming models
2. Develop an efficient parallel algorithm to solve given problem
3. Analyse and measure performance of modern parallel computing systems.
4. Build the logic to parallelize the programming task

410242: Artificial Intelligence and Robotics

1. Identify and apply suitable Intelligent agents for various AI applications
2. Design smart system using different informed search / uninformed search or heuristic approaches
3. Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
4. Apply the suitable algorithms to solve AI problems

410243: Data Analytics

1. Write case studies in Business Analytic and Intelligence using mathematical models
2. Present a survey on applications for Business Analytic and Intelligence
3. Provide problem solutions for multi-core or distributed, concurrent/Parallel environments
4. Apply the suitable algorithms to solve AI problems

410244(A): Digital Signal Processing

1. Understand the mathematical models and representations of DT Signals and Systems
2. Apply different transforms like Fourier and Z-Transform from applications point of view

3. Understand the design and implementation of DT systems as DT filters with filter structures and different transforms

4. Demonstrate the knowledge of signals and systems for design and analysis of systems

5. Apply knowledge and use the signal transforms for digital processing applications

410244(B): Software Architecture and Design

1. Express the analysis and design of an application

2. Specify functional semantics of an application

3. Evaluate software architectures

4. Select and use appropriate architectural styles and software design patterns

410244(C): Pervasive and Ubiquitous Computing

1. Design and implement primitive pervasive applications

2. Analyse and estimate the impact of pervasive computing on future computing applications and society

3. Develop skill sets to propose solutions for problems related to pervasive computing system

4. Design a preliminary system to meet desired needs within the constraints of a particular problem space

410244(D): Data Mining and Warehousing

1. Apply basic, intermediate and advanced techniques to mine the data

2. Analyze the output generated by the process of data mining

3. Explore the hidden patterns in the data

4. Optimize the mining process by choosing best data mining technique

410245(A): Distributed Systems

1. Able to learn and apply the concept of remote method invocation and Remote Procedure Calls

2. Able to analyze the mechanism of peer to peer systems and Distributed File Systems

3. Demonstrate an understanding of the challenges faced by current and future distributed systems

410245(B): Software Testing and Quality Assurance

1. Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance

2. Design and develop project test plan, design test cases, test data, and conduct test operations

3. Apply recent automation tool for various software testing for testing software

4. Apply different approaches of quality management, assurance, and quality standard to software system

5. Apply different approaches of quality management, assurance, and quality standard to software system

410245(C): Operations Research

1. Identify the characteristics of different types of decision-making environments

2. Use appropriate decision making approaches and tools

3. Build various dynamic and adaptive models

4. Develop critical thinking and objective analysis of decision problems

5. Apply the OR techniques for efficacy

410245(D): Mobile Communication

1. Justify the Mobile Network performance parameters and design decisions

2. Choose the modulation technique for setting up mobile network

3. Formulate GSM/CDMA mobile network layout considering futuristic requirements which conforms to the technology

4. Use the 3G/4G technology based network with bandwidth capacity planning

5. Percept to the requirements of next generation mobile network and mobile applications

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BE Computer Engineering (2015 pattern) Semester II

410250: Machine Learning

1. Distinguish different learning based applications
2. Apply different preprocessing methods to prepare training data set for machine learning
3. Design and implement supervised and unsupervised machine learning algorithm.
4. Implement different learning models
5. Learn Meta classifiers and deep learning concepts

410251: Information and Cyber Security

1. Gauge the security protections and limitations provided by today's technology
2. Identify information security and cyber security threats.
3. Analyze threats in order to protect or defend it in cyberspace from cyber-attacks
4. Build appropriate security solutions against cyber-attacks

410252(A): Advanced Digital Signal Processing

1. Understand and apply different transforms for the design of DT/Digital systems
2. Explore the knowledge of adaptive filtering and Multi-rate DSP
3. Design DT systems in the field/area of adaptive filtering, spectral estimation and multi-rate DSP
4. Explore use of DCT and WT in speech and image processing

5. Develop algorithms in the field of speech , image processing and other DSP applications

410252(B): Compilers

1. Design and implement a lexical analyzer and a syntax analyzer
2. Specify appropriate translations to generate intermediate code for the given programming language construct
3. Compare and contrast different storage management schemes
4. Identify sources for code optimization

410252(C): Embedded and Real Time Operating System

1. Recognize and classify embedded and real-time systems
2. Explain communication bus protocols used for embedded and real-time systems
3. Classify and exemplify scheduling algorithms
4. Apply software development process to a given RTOS application
5. Design a given RTOS based application

410252(D): Soft Computing and Optimization Algorithms

1. Apply soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzy logic, fuzzy inference systems and genetic algorithms
2. Design and development of certain scientific and commercial application using computational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified applications.

410253(A): Software Defined Networks

1. Interpret the need of Software Defined Networking solutions
2. Analyze different methodologies for sustainable Software Defined Networking solutions

3. Select best practices for design, deploy and troubleshoot of next generation networks

4. Develop programmability of network elements

5. Demonstrate virtualization and SDN Controllers using OpenFlow protocol

410253(B): Human Computer Interface

1. Evaluate the basics of human and computational abilities and limitations

2. Inculcate basic theory, tools and techniques in HCI.

3. Apply the fundamental aspects of designing and evaluating interfaces

4. Apply appropriate HCI techniques to design systems that are usable by people

410253(C): Cloud Computing

1. To install cloud computing environments

2. To develop any one type of cloud

3. To explore future trends of cloud computing

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BE Electronics & Telecommunication Engineering (2015 pattern)

Semester I

404181 VLSI Design & Technology

1. Write effective HDL coding for digital design.
2. Apply knowledge of real time issues in digital design.
3. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
4. Design CMOS circuits for specified applications.
5. Analyze various issues and constraints in design of an ASIC
6. Apply knowledge of testability in design and build self test circuit.

404182 Computer Networks & Security

1. Understand fundamental underlying principles of computer networking
2. Describe and analyze the hardware, software, components of a network and their interrelations.
3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
4. Have a basic knowledge of installing and configuring networking applications.
5. Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
6. Have a basic knowledge of the use of cryptography and network security.

404183 Radiation and Microwave Techniques

1. Differentiate various performance parameters of radiating elements.
2. Analyze various radiating elements and arrays.
3. Apply the knowledge of waveguide fundamentals in design of transmission lines.
4. Design and set up a system consisting of various passive microwave components.
5. Analyze tube based and solid state active devices along with their applications.

6. Measure various performance parameters of microwave components.

404184 Digital Image and Video Processing (Elective-I)

1. Develop and implement basic mathematical operations on digital images.
2. Analyze and solve image enhancement and image restoration problems.
3. Identify and design image processing techniques for object segmentation and recognition.
4. Represent objects and region of the image with appropriate method.
5. Apply 2-D data compression techniques for digital images.
6. Explore video signal representation and different algorithm for video processing.

404184 Industrial Drives and Control (Elective-I)

1. Understand the basic principles of power electronics in drives and its control, types of drives and basic requirements placed by mechanical systems on electric drives for various applications

2. Understand the operation of 1ϕ & 3ϕ converter drives for separately excited & series DC motors, dual converter drives, 2 quadrant and 4 quadrant DC chopper drives, Open-loop & closed-loop control of DC drives with transfer function, Dynamic and regenerative braking. Protection circuits for DC drives.

3. Learn speed control of induction motor drives in an energy efficient manner using power electronics. To study and understand the operation of both classical and modern induction motor drives like FOC or Vector control
.
4. Learn and understand working of various types of synchronous motors and their drive systems
5. Learn stepper motors & drives, BLDC and SRM motors and drives
6. Understand modern control techniques of Fuzzy logic and ANN in motor drive application

404184 Embedded Systems and RTOS(Elective-I)

1. Understand design of embedded system
2. Use RTOS in embedded application
3. Use modern architecture for embedded system
4. Use Linux for embedded system development
5. Use open platform for embedded system development

404184 Internet of Things (Elective-I)

1. On completion of the course, student will be able to
2. Understand the various concepts, terminologies and architecture of IoT systems.
3. Use sensors and actuators for design of IoT.
4. Understand and apply various protocols for design of IoT systems
5. Use various techniques of data storage and analytics in IoT
6. Understand various applications of IoT

404185 Wavelets (Elective-II)

1. On completion of the course, student will be able to
2. Explore and learn the basics of linear algebra.
3. Identify the need of Wavelet transform and its properties.
4. Analyze the 1-D and 2-D signal using discrete wavelet transform.
5. Analyze the signal using Multi resolution analysis
6. Use wavelet transform in different applications like data compression, denoising, enhancement etc.

404185 Electronic Product Design (Elective-II)

1.Understand various stages of hardware, software and PCB design.

2.Importance of product test &test specifications.

3.Special design considerations and importance of documentation.

404185 Artificial Intelligence (Elective II)

1. Design and implement key components of intelligent agents and expert systems.
2. To apply knowledge representation techniques and problem solving strategies to common AI applications.
3. Applyand integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
4. Build rule-based and other knowledge-intensive problem solvers.

404185 Optimization Techniques (Elective II)

1. Describe clearly a problem, identify its parts and analyze the individual functions.
2. Perform mathematical translation of the verbal formulation of an optimizationproblem.
3. Design algorithms, the repetitive use of which will lead reliably to finding an approximate solution
4. Discover, study and solve optimization problems.
5. Investigate, study, develop, organize and promote innovative solutions for various applications.

404185 Electronics in Agriculture (Elective II)

1. Understand Role of computers & virtual instrumentation.

2. Provide communication solution for interpreting environmental parameters with Electronics systems.

3. Describe Instrument technology used in agriculture.

4. Apply knowledge of Electronics in Agriculture.

5. Understand Greenhouse Technology & Role of Electronics Governance.

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BE Electronics & Telecommunication Engineering (2015 pattern)

Semester II

404189 Mobile Communication

1. Apply the concepts of switching technique and traffic engineering to design multistage networks.

2. Explore the architecture of GSM.

3. Differentiate thoroughly the generations of mobile technologies.

404190 Broadband Communication Systems

1. Perform Link power budget and Rise Time Budget by proper selection of components and check its viability.

2. Perform Satellite Link design for Up Link and Down Link.

404191 Machine Learning (Elective III)

1. To compare and contrast pros and cons of various machine learning techniques and to get an in sight of when to apply a particular machine learning approach.

2. To mathematically analyze various machine learning approaches and paradigms.

3. To implement convolution neural networks in recognition applications.

404191 PLC & Automation (Elective III)

1. Understand PLC architecture
2. Develop PLC ladder programs for simple industrial applications
3. Design Automation systems for industrial applications
4. Implement the Engineering Automation using PLC approach

404191Audio and Speech Processing (Elective III)

1. Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.

2. Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
3. Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
4. Apply the knowledge of speech and audio signal analysis to build speech processing applications like speech coding, speech recognition, speech enhancement and speaker recognition/verification.

404191 Software Defined Radio (Elective III)

1. Compare SDR with traditional Hardware Radio HDR.
2. Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
3. Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio
4. Work on open projects and explore their capability to build their own communication System.

404191 Audio Video Engineering (Elective III)

1. Apply the fundamentals of Analog Television and Colour Television standards.
2. Explain the fundamentals of Digital Television, DTV standards and parameters.
3. Study and understand various HDTV standards and Digital TV broadcasting systems and acquainted with different types of analog, digital TV and HDTV systems.
4. Understand acoustic fundamentals and various acoustic systems.

404192 ROBOTICS (Elective-IV)

1. Familiar with the history, concept development and key components of robotics technologies.
2. Implement basic mathematics manipulations of spatial coordinate representation and transformation.
3. Solve basic robot forward and inverse kinematic problems

4. Understand and able to solve basic robotic dynamics, path planning and control problems

404194 Biomedical Electronics (Elective-IV)

1. Model a biomedical system.
2. Understand various methods of acquiring biosignals.Understand various sources of bio signal distortions and its remedial techniques.
4. Get an Overview of major Devices currently used in Medical field
5. The students will have an understanding of analyzing bio-signal and classifying them

404194 Wireless Sensor Networks (Elective-IV)

1. Explain various concepts and terminologies used in WSN
2. Describe importance and use of radio communication and link management in WSN
3. Explain various wireless standards and protocols associated with WSN
4. Recognize importance of localization and routing techniques used in WSN
5. Understand techniques of data aggregation and importance of security in WSN
6. Examine the issues involved in design and deployment of WSN

404194 Renewable Energy Systems (Elective-IV)

1. Interpret energy reserves of India and potential of different energy sources.
2. Measure the solar radiation parameters and performance of different solar collectors.
3. Calculate different parameters of wind turbine rotor.
4. Implicit the importance and applications of geothermal and ocean energy.
5. Demonstrate knowledge in field of fuel cell and potential for power generation.

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BE Mechanical Engineering (2015 pattern) Semester I

402041 : Hydraulics and Pneumatics

1. Understand working principle of components used in hydraulic & pneumatic systems
2. Identify various applications of hydraulic & pneumatic systems
3. Selection of appropriate components required for hydraulic and pneumatic systems
4. Analyse hydraulic and pneumatic systems for industrial/mobile applications
5. Design a system according to the requirements
6. Develop and apply knowledge to various applications

402042 : CAD CAM and Automation

1. Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
2. Use analytical and synthetic curves and surfaces in part modeling.
3. Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
4. Generate CNC program for Turning / Milling and generate tool path using CAM software.
5. Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology
6. Understand the robot systems and their applications in manufacturing industries.

402043 : Dynamics of Machinery

1. Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
2. Estimate natural frequency for single DOF undamped & damped free vibratory systems.
3. Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces

4. Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.

5. Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.

6. Explain noise, its measurement & noise reduction techniques for industry and day today life problems.

402044 A : Finite Element Analysis

1. Understand the different techniques used to solve mechanical engineering problems.

2. Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

3. Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
.
4. Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis

5. Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

6. Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.
.

402044 B : Computational Fluid Dynamics

1. Analyze and model fluid flow and heat transfer problems.

2. Generate high quality grids and interpret the correctness of numerical results with physics.

3. Conceptualize the programming skills

4. Use a CFD tool effectively for practical problems and research.

402044 C :Heating, Ventilation, Air Conditioning and Refrigeration Engineering

1. Determine the performance parameters of trans-critical & ejector refrigeration systems
2. Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
.
3. Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system
4. Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
5. Estimate heat transmission through building walls using CLTD and decrement factor &time lag methods with energy-efficient and cost-effective measures for building envelope.
6. Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.

402045 A :Automobile Engineering

1. To compare and select the proper automotive system for the vehicle.
2. To analyse the performance of the vehicle.
3. To diagnose the faults of automobile vehicles.
4. To apply the knowledge of EVs, HEVs and solar vehicles

402045 B :Operation Research

1. Apply LPP and Decision Theory to solve the problems
2. Apply the concept of transportation models to optimize available resources.
3. Decide optimal strategies in conflicting situations.
.
4. Implement the project management techniques.
5. Minimize the process time
6. Optimize multi stage decision making problems

402045 C :Energy Audit and Management

1. Compare energy scenario of India and World.
2. Carry out Energy Audit of the Residence / Institute/ Organization.
3. Evaluate the project using financial techniques
.
4. Identify and evaluate energy conservation opportunities in Thermal Utilities.
5. Identify and evaluate energy conservation opportunities in Electrical Utilities.
6. Identify the feasibility of Cogeneration and WHR Use a CFD tool effectively for practical problems and research.

A.Y. 2021-22

BE Mechanical Engineering (2015 pattern) Semester II

402047 : Energy Engineering

1. Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
2. Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same
.
3. Recognize the layout, component details of hydroelectric power plant and nuclear power plant
4. Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
5. Emphasize the fundaments of non-conventional power plants
6. Describe the different power plant electrical instruments and basic principles of economics of power generation.

402048 : Mechanical System Design

1. Understand the difference between component level design and system level design.
2. Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
3. Learn optimum design principles and apply it to mechanical components.
4. Handle system level projects from concept to product.

402049 A : Tribology

1. The course will enable the students to know the importance of Tribology in Industry.
2. The course will enable the students to know the basic concepts of Friction, Wear, Lubrications and their measurements.
3. This course will help students to know the performance of different types of bearings and analytical analysis thereof.

402049 B: Industrial Engineering

1. Apply the Industrial Engineering concept
2. Understand, analyze and implement different concepts involved in method study.
.
3. Design and Develop different aspects of work system and facilities.
4. Understand and Apply Industrial safety standards, financial management practices.
5. Undertake project work based on modeling & simulation area.

402049 C: Robotics

1. Identify different type of robot configuration with relevant terminology
2. Select suitable sensors, actuators and drives for robotic systems.
3. Understand kinematics in robotic systems.
4. Design robot with desired motion with suitable trajectory planning.
5. Select appropriate robot programming for given application.
6. Understand need of IoT, machine learning, simulation in robotics.

402050 A: Advanced Manufacturing Processes

1. Classify and analyze special forming processes
2. Analyze and identify applicability of advanced joining processes
3. Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
4. Select appropriate micro and nano fabrication techniques for engineering applications
5. Understand and apply various additive manufacturing technology for product development
6. Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.

402050 B: Solar and Wind Energy

1. Design of solar food drier for domestic purpose referring existing system
2. Design of parabolic dish solar cooker for domestic purpose referring existing system
3. Design of solar photovoltaic system for domestic purpose referring existing system
4. Design miniature wind mill for domestic purpose referring existing system

402050 C: Product Design and Development

1. Understand essential factors for product design
2. Design product as per customer needs and satisfaction
3. Understand Processes and concepts during product development
4. Understand methods and processes of Forward and Reverse engineering
5. Carry various design processes as DFA, DFMEA, design for safety
6. Understand the product life cycle and product data management

Course Outcomes(COs)
Master of Engineering(PG)

Master of Computer Engineering
(Course 2017)

510101: Research Methodology

1. Carry out Literature Survey
2. Identify appropriate topics for research work in computer engineering
3. Select and define appropriate research problem and parameters
4. Design the use of major experimental methods for research
5. Use appropriate tools, techniques, and processes of doing research in Computer science
6. Demonstrate own contribution to the body of knowledge
7. Become aware of the ethics in research, academic integrity and plagiarism
8. Write a research report and thesis

510102 : Bio-Inspired Optimization Algorithms

1. Describe the natural phenomena that motivate the algorithms
2. Apply nature-inspired algorithms to optimization
3. Select the appropriate strategy or optimal solution based on bio-inspired algorithms

510103 : Software Development and Version Control

1. Select and apply the design patterns to software development.
2. Design software for real engineering Problems
3. Demonstrate team work for development of software in collaborative environment
4. Use of open source version control tool.

510104 : Embedded and Real Time Operating Systems

1. Recognize and classify embedded and real-time systems
2. Explain communication bus protocols used for embedded and real-time systems
3. Classify and exemplify scheduling algorithms
4. Apply software development process to a given RTOS application
5. Design a given RTOS based application

510105A : Advanced Digital Signal Processing

1. Apply various transforms for Digital signal Processing
2. Use appropriate filters to suit to the DSP application
3. Choose the best DS Processor for the application development
4. Design the DSP application for the practical use

510105B : Data Mining

1. Apply basic, intermediate and advanced techniques to mine the data
2. Analyze the output generated by the process of data mining
3. Explore the hidden patterns in the data
4. Optimize the mining process by choosing best data mining technique

510105C : Network Design and Analysis

1. Apply the knowledge to design computer networks
2. Analyze the performance of networks based on chosen metrics
3. Design routing schemes for optimized routing
4. Choose appropriate and advanced techniques to build the computer network

510105 D : Data Algorithms

1. Apply the concept of advanced algorithms for searching, sorting and network algorithms
2. Estimate the complexity of various algorithms and Measure the Choose appropriate algorithm to solve data centric problems

SEM II

510108 : Operation Research

1. Identify the characteristics of different types of decision-making environments
2. Use appropriate decision making approaches and tools
3. Build various dynamic and adaptive models
4. Develop critical thinking and objective analysis of decision problems
5. Apply the OR techniques for efficacy

510109 : System Simulation and Modeling

1. To apply modeling to understand system behavior
2. To design the simulation scheme for particular system
3. To analyze the modeled and simulated systems
4. To compare the results of simulations confined to real world application

510110 : Machine Learning

1. Acquire fundamental knowledge of learning theory
2. Design and evaluate various machine learning algorithms
3. Use machine learning methods for multivariate data analysis in various scientific fields
4. Choose and apply appropriate Machine Learning Techniques for analysis, forecasting, categorization and clustering of the data

510111A : Image Processing

1. Apply relevant mathematics required for image processing
2. Perform and analyze various image processing methods using appropriate tools
3. Use various image processing methods in spatial and frequency domain
4. Explore current trends and future scope in image processing applications

510111B : Web Mining

1. Transform Web Information into analytical form;
2. Use various means to analyze and synthesize Social Networking information
3. Use appropriate tools used in analyzing the web information

510111C : Pervasive and Ubiquitous Computing

1. Design and implement primitive pervasive applications
2. Analyze and estimate the impact of pervasive computing on future computing applications and society
3. Develop skill sets to propose solutions for problems related to pervasive computing system
4. Design a preliminary system to meet desired needs within the constraints of a particular problem space

510111D : Network Security

1. Design and choose appropriate security model
2. Apply security means to various applications
3. Apply security algorithms in various environments for network security
4. Design network security solutions
5. Select appropriate tools to thwart network attacks

510112 : Seminar I

1. To use multiple thinking strategies to examine real-world issues and explore creative avenues of expression,.
2. To acquire, articulate, create and convey intended meaning using verbal and non-verbal method of communication.
3. To learn and integrate, through independent learning in sciences and technologies, with disciplinary specialization and the ability to integrate information across

SEM III

610101 :Fault Tolerant Systems

1. Analyze the system for the requirement of fault tolerance
2. Simulate the fault tolerance algorithms
3. Implement diagnosis and recovery of the system
4. Assess the reliability of the system

610102: Information Retrieval

1. Implement the concept of Information Retrieval
2. Evaluate and Analyze retrieved information
3. Generate quality information out of retrieved information
4. Apply clustering and classification algorithms to analyze the information

610103A : Cloud Security

1. Use various services offered for cloud environment
2. Apply computing security fundamentals confined to cloud environment
3. Analyze the cloud system for vulnerabilities, threats and attacks
4. Propose feasible security solution for cloud security

610103B : Speech Signal Processing

1. Inculcate the characteristics of speech signal in relation to production and hearing of speech by humans
2. Apply various algorithms of speech analysis common to many applications
3. The students will be able to design a simple system for speech processing
4. Analyze the performance of speech signal processing system

610103C :Mobile Ad-hoc Networks

1. Assess Quality of Service in MANET
2. Evaluate the performance of various Protocols in MANET

3. Choose appropriate constituents and parameters to build MANET
4. Analyze the performance of MANET

610103 D : Pattern Recognition

1. Analyze various type of pattern recognition techniques
2. Identify and apply various pattern recognition and classification approaches to solve the problems
3. Evaluate statistical and structural pattern recognition
4. Percept recent advances in pattern recognition confined to various applications

610104 : Seminar II

1. To use multiple thinking strategies to examine real-world issues and explore creative avenues of expression,.
2. To acquire, articulate, create and convey intended meaning using verbal and non-verbal method of communication.
3. To learn and integrate, through independent learning in sciences and technologies, with disciplinary specialization and the ability to integrate information across

610105 : Dissertation Stage I

1. Conduct thorough literature survey confined to the domain of choice
2. Develop presentation skills to deliver the technical contents
3. Furnish the report of the technical research domain
4. Analyze the findings and work of various authors confined to the chosen domain

Sem IV

610107 : Seminar III

1. To use multiple thinking strategies to examine real-world issues and explore creative avenues of expression,.
2. To acquire, articulate, create and convey intended meaning using verbal and non-verbal method of communication
3. To learn and integrate, through independent learning in sciences and technologies, with disciplinary specialization and the ability to integrate information across

610108 : Dissertation Stage II

1. Show evidence of independent investigation
2. Critically analyze the results and their interpretation ; infer findings
3. Report and present the original results in an orderly way and placing the open questions in the right perspective.
4. Link techniques and results from literature as well as actual research and future research lines with the research.
5. Appreciate practical implications and constraints of the specialist subject

VLSI and Embedded Systems) (2017 pattern)

504201 : Digital CMOS Design

1. Understand the fundamentals of CMOS Technology in Digital Domain
2. Explore the skills of designing digital VLSI
3. Demonstrate the ability of using EDA tools in IC Design

504202 Reconfigurable Computing

1. Understand the concept of reconfigurable computing and its integration on computing platforms
2. Design, implement and analyze reconfigurable systems in the recent application domains using HDL
3. Use advanced EDA tools to simulate and synthesize HDL codes for reconfigurable architectures

504203 Embedded System Design

1. Design ARM Processor based Embedded Systems
2. Carry out programming in Embedded programming in C, C++
3. Port Linux operating system and device drivers
4. Understand attributes of functional units of Network Protocol
5.

504204 Research Methodology

1. Outline research problem, its scope, objectives and errors
2. Understand basic instrumentation schemes and its data collection methods
3. Learn various statistical techniques
4. Develop model and can predict the performance of experimental system
5. Write research proposals of their own domain

504205 Micro Electromechanical Systems (Elective I)

1. Understand concepts of MEMS and material science
2. Gain knowledge of design and testing of MEMS devices
3. Develop different MEMS based systems

504205 NANOTECHNOLOGY (Elective I)

1. Choose suitable material based on the properties for Nanotechnology
2. Learn techniques ofnano-structures and fabrication
3. Gain knowledge of designing and developing NEMS based systems

504205 Processor Design (Elective I)

1. Visualize probable Problems, fallacies and Pitfalls in Processor Design
2. Understand Extreme CISC and RISC, Very Long Instruction Word (VLIW), overly aggressive pipelining, unbalanced processor
3. Gain skills to implement Processor functional components like MAC

504205 Wireless Sensor Network (Elective I)

1. Gain knowledge of Architecture of WSN network
2. Understand Physical, Data link and Network layer aspects with their protocols
3. Learn different techniques of power management and security
4. Exhibit the knowledge of operating systems in WSN systems

504205 MOS Device Modeling and Characterization (Elective I)

1. Analyze MOSFET models
2. Learn MOSFET characterization using SPICE simulation
3. Gain information about advanced MOSFET models
4. Understand non-classical MOS structures

504207 Analog CMOS Design

1. Understand design concepts and issues of CMOS amplifiers
2. Learn different Compensation techniques
3. Acquire the knowledge of designing of HF and Low Noise Amplifiers

504208 System on Chip

1. Learn Design flow graphs and flow modeling
2. Understand SoC modeling and interfacing
3. Gain knowledge of SoC memory system design, embedded software and energy management techniques for SoC design, SoC prototyping, verification, testing and physical design
4. Design , implement and test SoC

504209 Embedded Automotive Systems

1. Understand the fundamentals of different Automotive Systems
2. Learn utility of sensors and instrumentation in vehicle systems
3. Design control system for various vehicular modules
4. Acquire knowledge of various automotive protocols
5. Provide technical embedded solutions for the development of automotive Systems

504210 Embedded Product Design (Elective II)

1. Learn specifications and design challenges of embedded products
2. Estimate cost of embedded product
3. Understand the aspects of Mechanical Packaging, Testing, reliability and failure analysis, EMI/RFI Certification and Documentation
4. Demonstrate the knowledge of embedded product design related hardware and software design tools

504210 High Speed ICs (Elective II)

1. Acquire knowledge about High Speed VLSI Circuits Design
2. Identify the basic need of high speed digital logic families
3. Understand various types VLSI interconnections

4. Analyze various interconnection delay models
5. Acquire insights of nanotechnology circuits interconnections

504210 Mixed Signal IC Design(Elective II)

1. Understand the mixed signal issues in circuit design
2. Learn modeling different ADC and DAC
3. Apply methods to improve SNR
4. Explore the operation of delta-sigma/ sigma-delta converterand their issues

504210 Embedded Signal Processor Architectures (Elective II)

1. Designing system with linear filters using DFT
2. Develop technical abilities of designing any applications with FIR and IIR filters
3. Port algorithms on DSP Processor Platforms
4. Design Adaptive filters
5. Analyze filter structures

504210 Real Time Operating Systems (Elective II)

1. List Embedded Software Developments Tools
2. Learn Software Development Process Life Cycle
3. Gain knowledge of Real Time Operating Systems with respect to uCOS
4. Understand RT Linux operating System

604201 Testing and Verification of VLSI Circuits

1. Accept challenges in VLSI Testing at different abstraction levels
2. Understand fault models for generation of test vectors
3. Calculate observability and controllability parameters of circuit
4. Enhance testability of a circuit
5. Use simulation techniques for designing and testing of VLSI circuits

6. Identify characteristics of verificationmethods

604202 ASIC Design

1. Understand concepts and techniques of ASIC modeling and synthesis
2. Perform static timing analysis, delay estimation and synchronization
3. Learn ASIC Construction and testing techniques

ME Mechanical Design Engineering Course

(Course 2017)

SEM-I

507201: Advanced Mathematics

1. Understand vector spaces of infinite dimension and to add structure to vector spaces. Inner products are often related to a notion of "distance" within the space, due to their positive-definite property.

2. Understand the applications of Residue for evaluation of definite and improper integrals occurring in Real analysis and Applied mathematics.

3. Analyze the use of Laplace transform in system modeling, digital signal processing, process control, solving Boundary Value Problems and also use Fourier transform in communication theory and signal analysis, image processing and filters, data processing and analysis, solving partial differential equations for problems on gravity.

4. Understand the theory of ordinary differential equations through applications, methods of solution, and numerical approximations.

5. Apply numerical methods for a variety of multidisciplinary applications. Establishing the limitations, advantages, and disadvantages of numerical methods.

6. Analyze functions using limits, derivatives, and integrals. Recognize the appropriate tools of calculus to solve applied problems.

502202: Material Science & Mech. Behavior of Materials

1. SELECT appropriate modern materials for particular applications of Design Engineering by checking their properties.

2. ANALYZE the response of metals and alloys to applied load in terms of stress strain transformations and various yield criteria's.

3. PERFORM Material testing under complex loading.

4. CHECK the plastic behavior i.e. deformations under simple and complex loading, strain hardening, through isotropic, kinematic and combined hardening models.
5. DERIVE Elastic-Plastic Equilibrium equations, residual stresses and strains of plastic rigid body.
6. COMPARE different rheological models used in Elasto- Visco - Plasticity

502203: Advanced Stress Analysis

1. SOLVE planar problems using Airy stress function in rectangular and polar co-ordinates.
2. ANALYZE the structural sections subjected to torsion.
3. APPLY linear elasticity in the analysis of beams.
4. ANALYZE contact stresses in components forced against each other.
5. APPLY experimental techniques for stress analysis.

502104: Research Methodology

1. Search for, select and critically analyse research articles and papers
2. Prepare a literature review
3. Formulate and evaluate research questions
4. Develop a research proposal or industry project plan
5. Gain experience with instrument development and data collection methods
6. Gain experience with ethics proposal

SEM-II

502207: Analysis & Synthesis of Mechanisms

1. APPLY concepts related to kinematic analysis to simple mechanisms.
2. ANALYZE velocity and acceleration to Complex Mechanisms by vector and graphical method.
3. CONSTRUCT Inflection Circle, Bobillier Curvature, and Cubics of Stationary Curvatures.
4. SYNTHESIZE Planer Mechanisms like four bar mechanism and slider Crank Mechanism by graphical methods.
5. SYNTHESIZE Planer Mechanisms like four bar mechanism and slider Crank Mechanism by Analytical methods.
6. IDENTIFY & ESTIMATE Kinematic transformations & Matrix Method of analysis of Spatial Mechanisms

502208: Advance Mechanical Vibrations

1. Understand the concept of multi degree of freedom vibration systems
2. Understand the concept of vibration of continuous systems
3. Understand the concept of transient vibrations
4. Analyse the balancing of rotating machines and methods of control
5. Apply the vibration measurement techniques
6. Understand the concept of Random vibrations

502209: Finite Element Method

1. To understand the philosophy and general procedure of Finite Element Method as applied to solid mechanics and thermal analysis problems.
2. To familiarize students with the displacement-based finite element method for displacement and stress analysis for one dimensional problems.
3. To familiarize students with the displacement-based finite element method for displacement and stress analysis for two dimensional problems.
4. To familiarize students with the displacement-based finite element method for displacement and stress analysis for three dimensional problems.
5. To study approximate nature of the finite element method for Plate and Shell Elements.
6. To understand the philosophy and general procedure of Finite Element Method for Nonlinear Problems.

SEM-III

602213: Optimization Techniques

1. Understand different types of Optimization Techniques in engineering problems. Learn Optimization methods such as mathematical modelling.
2. Learn Optimizations Techniques in single variables, multivariable and equality constraint problems.
3. Learn optimization problems for Linear Programming problems such as simplex method.
4. Learn optimization problems for Non-Linear Programming problems such as exhaustive search, golden section method, quasi-newton method, random search methods, Powell's method.
5. Understand different types of Modern Methods of Optimization.

602214: Mech. Measurements and Controls

1. STATE the specifications of sensors and choose suitable sensors for real-time applications.
2. UNDERSTAND interfacing of sensors with Microcontroller/computer
3. DESIGN a Mechatronics system considering poles, zeros, and stability
4. DESIGN mathematical model of system/process for standard input responses
5. ANALYSE the problems associated with stability
6. IDENTIFY the controller requirements and its stability

Program Outcomes (POs)

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

Vision,

Mission,

Program Specific Outcomes (PSOs),

Program Educational Objectives (PEOs)

Department of Civil Engineering

Vision:

Strive for technical excellence in civil engineering

Mission:

1. To impart practical based learning through consultancy to meet the needs of industry
2. To establish center of excellence by imparting software based skills in civil engineering.
3. To inculcate social and ethical values among the students.

Program Specific Outcomes (PSOs)

1) Plan and design any type of Civil Engineering structure like buildings, roads, bridges, dams, tunnels, canals etc., using modern methods of analysis subject to statutory provisions and Indian standards.
2) To address and give engineering solutions to environmental issues related to control of air and water pollution, treatment and disposal of wastes likes solid, sewage and industrial waste etc., which crop up during and after execution of the development works.
3) Execute any civil engineering projects using new construction management techniques to achieve timely delivery with high quality standards.

Program Educational Objectives: (PEOs)

Our graduates will able to develop.

1) Developed professional ability to give quality engineering solutions to address civil engineering related societal burning issues like traffic congestion, equitable public water distribution, household disposal of solid waste etc.
2) Ability to start own entrepreneurship fulfilling the requirement of Civil Engineering products, testing and consultancy services, simultaneously maintaining high quality values, moral and ethical standards.
3) Developed ability to undertake high positions in the professional organisations and lead a team from front.

HoD
Civil Dept

Dr. D. Y. Patil School of Engineering Lohegaon Pune

Principal
DYPSOE

Department of Computer Engineering

VISION: "To achieve excellence in technical and socio-economic fields."

MISSION:

M1: To develop excellent learning center through continuous up gradation in technologies in proximity with Academia, R&D centers and Industries.
M2: To pursue research of local and global relevance.
M3: To encourage students to consider "startups" as a career option through Entrepreneurship Development Cell.
M4: Uplift and groom the learners to emerge as committed professionals.

Program Specific Outcomes (PSOs)

A students of the Computer Engineering Program will demonstrate-

PSO1: Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Entrepreneurship skills- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to become an entrepreneur, and a zest for higher studies.

Program Educational Objectives: (PEOs)

Our graduates will be able to,

PEO1: be globally competent having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.

PEO2: Work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.

PEO3: be committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.

HoD
Computer Dept

Dr. D. Y. Patil School of Engineering Lohegaon Pune

Principal
DYPSOE

Department of E&TC Engineering

Vision:

Imparting quality technical education to meet the needs of industry & society

Mission:

M1. To create center of learning through an integrated, interdisciplinary approach
M2. To impart employability skill among students
M3. To establish Industry linkages

Program Specific Objectives (PSO's)

Our Students will

PSO 1: Understand the fundamentals of designing electronic systems for applications like communication systems, signal processing, embedded and VLSI systems and automation.

PSO 2: Strengthen the ability to use open source tools for modeling and simulation to solve technical problems.

PSO 3: Inculcate the skills to manage and lead a team contributing to development of prototype, application, and product in next generation technologies.

Program Educational Objectives (PEO's)

Our graduate will be

PEO 1: able to apply engineering principles to design and develop a hardware / software / firmware to solve engineering problems for successful career in E&TC engineering / higher education / research.

PEO 2: acquire leadership qualities with strong communication skills along with professional and ethical values.

PEO 3: able to become entrepreneur / innovators to design and develop manufacturing systems and services to address social, technical and business challenges.

HoD
E&TC Dept

Dr. D. Y. Patil School of Engineering Lohegaon Pune

Principal
DYPSOE

Department of Mechanical Engineering

VISION: "EMPOWERMENT THROUGH ACADEMIC EXCELLENCE"

MISSION:

M1: Imparting Value Base Education
M2: Integrating Engineering and Industry
M3: Enhancing Employability and Entrepreneurship
M4: Developing Research Culture

Program Specific Outcomes (PSOs)

Our students will,

PSO1: have competencies in usage of modern tools to optimally design, develop and manufacture product and process

PSO2: have incremental skills to enhance employability in the automotive and thermal engineering fields

PSO3: develop industry oriented attributes through effective training and continuous monitoring

Program Educational Objectives: (PEOs)

Our graduates will be,

PEO1: able to apply engineering principles to develop products, processes or knowledge to solve mechanical and associated engineering problems for successful careers in mechanical engineering/higher education/research

PEO2: acquire leadership qualities with strong communication skills along with professional and ethical values

PEO3: able to become entrepreneur / innovators to design and develop manufacturing systems and services to address social, technical and business challenges.

HoD
Mechanical Dept

Dr. D. Y. Patil School of Engineering Lohegaon Pune

Principal
DYPSOE

Department of Artificial Intelligence and Data Science

Vision:
Imparting quality education in the field of Artificial Intelligence & Data Science.

Mission:
M1: To include the culture of R&D to meet future challenges in AI & DS.
M2: To develop technical skills among students for building intelligent systems to solve problems.
M3: To develop skills for entrepreneur & business skills in engineering areas among the students.
M4: To include moral, social & ethical values to make students best citizen of country.

Program Specific Outcomes (PSOs):
PSO1: Professional Skills- The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, networking, artificial intelligence and data science for efficient design of computer-based systems of varying complexities.

PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.

Program Educational Objectives (PEOs):
- To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.
- To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
- To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
- To prepare the graduates with strong managerial and communication skills to work effectively as individuals as well as in teams.

HOD
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