ALARD COLLEGE OF ENGINEERING AND MANAGEMENT, MARUNJE
DEPARTMENT OF MECHANICAL ENGINEERING
PROGRAM OUTCOMES

S.NO	NAME	DESCRIPTION
PO1.	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3.	**Design/development of solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
PO6	**The engineer and society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

DEPARTMENT OF MECANICAL ENGINEERING

Program Specific Outcomes

PSO.1	To apply design principles for providing optimum solutions in design and manufacturing using CAD tools.
PSO.2	To apply competency and proficiency in the field of core allied engineering

Program Educational Objectives

PEO.1	Provide Solution to application level Programme of Mechanical Engineering using knowledge of basic science and fundamentals of engineering.
PEO.2	Design mechanical system by using skills and knowledge of core competencies along with allied engineering skill.
PEO.3	Acquire the competency for interdisciplinary research in social technological area like environment and sustainability by inculcating profession, ethical, value, teamwork, leadership, and communication and managerial skill.
PEO.4	Develop attitude or lifelong learning to make graduate adaptable to ever changing dynamic industrial and social environment.

DEPARTMENT OF COMPUTER ENGINEERING

Program Specific Outcomes

PSO.1	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
PSO.2	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.

Program Educational Objectives

PEO.1	To prepare globally competent graduates having strong fundamentals and domain knowledge to provide effective solutions for engineering problems.
PEO.2	To prepare the graduates to work as a committed professionals with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
PEO.3	To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
PEO.4	To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.

DEPARTMENT OF CIVIL ENGINEERING

Program Specific Outcomes

PSO.1	Graduates of the program shall pursue civil engineering and advance to positions of greater responsibility and leadership and will meet the expectations of employers of Civil Engineers.
PSO.2	Graduates shall enter and successfully progress in, or complete, advanced degree programs within their fields of choice.

Program Educational Objectives

PEO.1	To create the knowledge of core areas related to the field of Civil Engineering.
PEO.2	To enable students to apply Civil Engineering principles to design, construct and implement the civil techniques to meet the customer satisfaction.
PEO.3	Graduates shall enter and successfully progress in, or complete, advanced degree programs within their fields of choice.
PEO.4	To sensitize students towards social issues and to introduce them to professional ethics and practices.

DEPARTMENT OF ELECTRICAL ENGINEERING

Program Specific Outcomes

PSO.1	Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments
PSO.2	Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

Program Educational Objectives

PEO.1	To provide students with the knowledge of Mathematics, Basic principles of Engineering and Computing, Basic Sciences and Social Sciences in general and Electrical Engineering in particular so as to develop necessary skill to analyse and synthesize electrical circuits, algorithms and complex apparatus.
PEO.2	To prepare students as competent to analyse and provide economically feasible and socially acceptable solutions of real life technical problems in industry, research and academics related to power, information and electronic hardware.
PEO.3	To prepare students to excel in professionalism, smart and ethical conduct, interpersonal skills and adoptability in communication to prevalent trends in technology as well as changing technology so as to work successfully in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.
PEO.4	To prepare and encourage students to undergo research work as well as to involve in scientific innovations for sustainable development

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program Specific Outcomes

PSO.1	The ability to absorb and apply fundamental knowledge of core Electronics and Communication Engineering subjects in the analysis, design, and development of various types of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions.
PSO.2	Competence in using electronic modern IT tools (both software and hardware) for the design and analysis of complex electronic systems in furtherance to research activities.

Program Educational Objectives

PEO.1	The graduate shall have successful professional carrier in electronics and telecommunication engineering with leadership and teamwork qualities.
PEO.2	Graduates shall utilize functional and disciplinary skill to address diversified engineering problems with social concern.
PEO.3	The graduates shall explore engineering capabilities to resolve technical problems and engage in lifelong learning and research.

ALARD COLLEGE OF ENGINEERING AND MANAGEMENT, MARUNJE

DEPARTMENT OF MECHANICAL ENGINEERING

Academic Year 2020-21 (SE 2019 Pattern)

Sr.No.	Year	Name of Subject	CO CODE	COURSE OUTCOMES
1	SE 2019	202041-Solid Mechanics	CO1	DEFINE various types of stresses and strain developed on determinate and indeterminate members.
			CO2	DRAW Shear force and bending moment diagram for various types of transverse loading and support.
			CO3	COMPUTE the slope & deflection, bending stresses and shear stresses on a beam.
			CO4	CALCULATE torsional shear stress in shaft and buckling on the column.
			CO5	APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
			CO6	UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.
2	SE 2019	202042 - Solid Modeling and Drafting	CO1	UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management
			CO2	UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry
			CO3	CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system
			CO4	APPLY geometric transformations to simple 2D geometries
			CO5	USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
			CO6	USE PMI & MBD approach for communication
3	SE 2019	202043 - Engineering Thermodynamics	CO1	DESCRIBE the basics of thermodynamics with heat and work interactions.
			CO2	APPLY laws of thermodynamics to steady flow and non-flow processes.
			CO3	APPLY entropy, available and non available energy for an Open and Closed System,
			CO4	DETERMINE the properties of steam and their effect on performance of vapour power cycle.
			CO5	ANALYSE the fuel combustion process and products of combustion.
			CO6	SELECT various instrumentations required for safe and efficient operation of steam generator.
4	SE 2019	202044 - Engineering Materials and Metallurgy	CO1	COMPARE crystal structures and ASSESS different lattice parameters.
			CO2	CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
			CO3	DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials.
			CO4	IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
			CO5	ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
			CO6	SELECT appropriate materials for various applications.
5	SE 2019	203156 - Electrical and Electronics	CO1	CO1. APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
			CO2	CO2. DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
			CO3	CO3. UNDERSTAND the operation of DC motor, its speed control methods and braking

5	SE 2019	Engineering	CO4	CO4. DISTINGUISH between types of three phase induction motor and its characteristic features
			CO5	CO5. EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems
			CO6	CO6. CHOOSE energy storage devices and electrical drives for EVs
6	SE 2019	202045 - Geometric Dimensioning and Tolerancing Lab	CO1	CO1. SELECT appropriate IS and ASME standards for drawing
			CO2	CO2. READ & ANALYSE variety of industrial drawings
			CO3	CO3. APPLY geometric and dimensional tolerance, surface finish symbols in drawing
			CO4	CO4. EVALUATE dimensional tolerance based on type of fit, etc.
			CO5	CO5. SELECT an appropriate manufacturing process using DFM, DFA, etc.
7	SE 2019	207002 - Engineering Mathematics - III	CO1	CO1. SOLVE higher order linear differential equations and its applications to model and analyze mass spring systems.
			CO2	CO2. 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
			CO3	CO3. APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control
			CO4	CO4. PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
			CO5	CO5. SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations.
8	SE 2019	202047 - Kinematics of Machinery	CO1	CO1. APPLY kinematic analysis to simple mechanisms
			CO2	CO2. ANALYZE velocity and acceleration in mechanisms by vector and graphical method
			CO3	CO3. SYNTHESIZE a four bar mechanism with analytical and graphical methods
			CO4	CO4. APPLY fundamentals of gear theory as a prerequisite for gear design
			CO5	CO5. CONSTRUCT cam profile for given follower motion
9	SE 2019	202048 - Applied Thermodynamics	CO1	CO1. DETERMINE COP of refrigeration system and ANALYZE psychrometric processes.
			CO2	CO2. DISCUSS basics of engine terminology,air standard, fuel air and actual cycles.
			CO3	CO3. IDENTIFY factors affecting the combustion performance of SI and CI engines.
			CO4	CO4. DETERMINE performance parameters of IC Engines and emission control.
			CO5	CO5. EXPLAIN working of various IC Engine systems and use of alternative fuels.
			CO6	CO6. CALCULATE performance of single and multi stage reciprocating compressors and DISCUSS rotary positive displacement compressors
10	SE 2019	202049 - Fluid Mechanics	CO1	CO1. DETERMINE various properties of fluid
			CO2	CO2. APPLY the laws of fluid statics and concepts of buoyancy
			CO3	CO3. IDENTIFY types of fluid flow and terms associated in fluid kinematics
			CO4	CO4. APPLY principles of fluid dynamics to laminar flow
			CO5	CO5. ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
			CO6	CO6. CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws

11	SE 2019	202050 - Manufacturing Processes	CO1	CO1. DETERMINE various properties of fluid
			CO2	CO2. APPLY the laws of fluid statics and concepts of buoyancy
			CO3	CO3. IDENTIFY types of fluid flow and terms associated in fluid kinematics
			CO4	CO4. APPLY principles of fluid dynamics to laminar flow
			CO5	CO5. ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
			CO6	CO6. CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws
12	SE 2019	202051 - Machine Shop	CO1	CO1. PERFORM welding using TIG/ MIG/ Resistance/Gas welding technique
			CO2	CO2. MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
			CO3	CO3. PERFORM cylindrical/surface grinding operation and CALCULATE its machining time
			CO4	CO4. DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
			CO5	CO5. PREPARE industry visit report
			CO6	CO6. UNDERSTAND procedure of plastic processing
13	SE 2019	202052 - Project Based Learning - II	CO1	CO1. IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
			CO2	CO2. ANALYZE the results and arrive at valid conclusions.
			CO3	CO3. PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge.
			CO4	CO4. CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures.
			CO5	CO5. USE of technology in proposed work and demonstrate learning in oral and written form.
			CO6	CO6. DEVELOP ability to work as an individual and as a team member.

ALARD COLLEGE OF ENGINEERING AND MANAGEMENT, MARUNJE

DEPARTMENT OF CIVIL ENGINEERING

Course Outcomes for SE 2019 Pattern

Sr.No.	Year	Name of Subject	CO CODE	COURSE OUTCOMES
1	SE	Building Technology and Architectural Planning	CO1	Identify types of building and basic requirements of building components.
			CO2	Make use of Architectural Principles and Building byelaws for building construction.
			CO3	Plan effectively various types of Residential Building forms according to their utility,functions with reference to National Building Code
			CO4	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
			CO5	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
			CO6	Understand different services and safety aspects
2	SE	Mechanics of Structures	CO1	Understand concept of stress-strain and determine different types of stress, strain in determinate ,indeterminate homogeneous and composite structures.
			CO2	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
			CO3	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
			CO4	Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
			CO5	Analyze axially loaded and eccentrically loaded column.
			CO6	Determine the slopes and deflection of determinate beams and trusses.
3	SE	Fluid Mechanics	CO1	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
			CO2	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
			CO3	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
			CO4	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 Cross method
			CO5	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
			CO6	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 body
4	SE	Engineering Mathematics III	CO1	Solve Higher order linear differential equations and its applications to modelling and analysing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems
			CO2	Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems
			CO3	Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
			CO4	Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems
			CO5	Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations
5	SE	Engineering Geology	CO1	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
			CO2	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
			CO3	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
			CO4	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

			CO5	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
			CO6	Explain geological hazards and importance of ground water and uses of common building stones.
6	SE	Geotechnical Engineering	CO1	Identify and classify the soil based on the index properties and its formation process
			CO2	Explain permeability and seepage analysis of soil by construction of flow net.
			CO3	Illustrate the effect of compaction on soil and understand the basics of stress distribution.
			CO4	Express shear strength of soil and its measurement under various drainage conditions.
			CO5	Evaluate the earth pressure due to backfill on retaining structures by using different theories.
			CO6	Analysis of stability of slopes for different types of soils.
7	SE	Surveying	CO1	Define and Explain basics of plane surveying and differentiate the instruments used for it.
			CO2	Express proficiency in handling surveying equipment and analyse the surveying data from these equipment
			CO3	Describe different methods of surveying and find relative positions of points on the surface of earth.
			CO4	Execute curve setting for civil engineering projects such as roads, railways etc.
			CO5	Articulate advancements in surveying such as space based positioning systems
			CO6	Differentiate map and aerial photographs, also interpret aerial photographs
8	SE	Concrete Technology	CO1	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
			CO2	Able to check the properties of concrete in fresh and hardened state.
			CO3	Get acquainted to concreting equipments, techniques and different types of special concrete.
			CO4	Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques
9	SE	Structural Analysis	CO1	Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
			CO2	Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
			CO3	Implement application of the slope deflection method to beams and portal frames.
			CO4	Analyze beams and portal frames using moment distribution method.
			CO5	Determine response of beams and portal frames using structure approach of stiffness matrix method.
			CO6	Apply the concepts of plastic analysis in the analysis of steel structures.
10	SE	Project Management	CO1	Describe project life cycle and the domains of Project Management.
			CO2	Explain networking methods and their applications in planning and management
			CO3	Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
			CO4	Demonstrates resource allocation techniques and apply it for manpower planning
			CO5	Understand economical terms and different laws associated with project management
			CO6	Apply the methods of project selection and recommend the best economical project

11	SE	Project Based Learning	CO1	Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service
			CO2	Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project
			CO3	Create, work in team and applying the solution in practical way to specific problem

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Course Outcomes for SE 2019 Pattern

Sr. No.	YEAR	SUBJECT	CO CODE	CO
1	SE	Engineering Mathematics -III	CO1	Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
			CO2	Transforms such as Fourier transform, Z-transform and applications to Communication systems and Signal processing.
			CO3	Vector differentiation and integration required in Electro-Magnetics and Wave theory.
			CO4	Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.
			CO5	Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.
2	SE	Electronic Circuit	CO1	Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
			CO2	Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
			CO3	Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
			CO4	Explain internal schematic of Op-Amp and define its performance parameters.
			CO5	Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
			CO6	Understand and compare the principles of various data conversion techniques and PLL with their applications
3	SE	Digital Circuit	CO1	Identify and prevent various hazards and timing problems in a digital design
			CO2	Use the basic logic gates and various reduction techniques of digital logic circuit.
			CO3	Analyze, design and implement combinational logic circuits.
			CO4	Analyze, design and implement sequential circuits.
			CO5	Differentiate between Mealy and Moore machines.
			CO6	Analyze digital system design using PLD.
4	SE	Electrical Circuit	CO1	Analyze the simple DC and AC circuit with circuit simplification techniques.
			CO2	Formulate and analyze driven and source free RL and RC circuits.
			CO3	Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
			CO4	Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
			CO5	Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
			CO6	Analyze and select a suitable motor for different applications
5	SE	Data Structure	CO1	Solve mathematical problems using C programming language
			CO2	Implement sorting and searching algorithms and calculate their complexity.
			CO3	Develop applications of stack and queue using array.
			CO4	Demonstrate applicability of Linked List.
			CO5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
			CO6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm

6	SE	Signals & Systems	CO1	Identify, classify basic signals and perform operations on signals.
			CO2	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.
			CO3	Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
			CO4	Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
			CO5	Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
			CO6	Compute the mean, mean square, variance and standard deviation for given random variables using PDF.
7	SE	Control Systems	CO1	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems
			CO2	Determine the (absolute) stability of a closed-loop control system.
			CO3	Perform time domain analysis of control systems required for stability analysis
			CO4	Perform frequency domain analysis of control systems required for stability analysis.
			CO5	Apply root-locus, Frequency Plots technique to analyze control systems.
			CO6	Express and solve system equations in state variable form.
			CO7	Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.
8	SE	Principles of Communication System	CO1	To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
			CO2	Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
			CO3	Explain generation and detection of FM systems and compare with AM systems.
			CO4	Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).
			CO5	Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
			CO6	Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission
9	SE	Object Oriented Programming	CO1	Describe the principles of object oriented programming
			CO2	Apply the concepts of data encapsulation, inheritance in C++.
			CO3	Understand Operator overloading and friend functions in C++.
			CO4	Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
			CO5	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
			CO6	Describe and use of File handling in C++.
10	SE	Employbilty skills development	CO1	Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
			CO2	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.
			CO3	Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
			CO4	Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
			CO5	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.

ALARD COLLEGE OF ENGINEERING AND MANAGEMENT, MARUNJE

DEPARTMENT OF COMPUTER ENGINEERING

Course Outcomes for SE 2019 Pattern

1	SE	Discrete Mathematics	CO1	CO1 - Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearlys
			CO2	CO2 - Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
			CO3	CO3 - Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction
			CO4	CO4 - Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
			CO5	CO5 - Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
			CO6	CO6 - Model and solve computing problem using tree and graph and solve problems using appropriate algorithms
2	SE	Fundamentals of Data Structure	CO1	CO1- Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity
			CO2	CO2- 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
			CO3	CO3- Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
			CO4	CO4- Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
			CO5	CO5- Compare and contrast different implementations of data structures (dynamic and static).
			CO6	CO6-Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.
3	SE	Object Oriented Programming	CO1	CO1 - Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
			CO2	CO2 - Design object-oriented solutions for small systems involving multiple objects.
			CO3	CO3 - Use virtual and pure virtual function and complex programming situations.
			CO4	CO4 -Apply object-oriented software principles in problem solving.
			CO5	CO5- Analyze the strengths of object-oriented programming
			CO6	CO6- Develop the application using object oriented programming language(C++).

4	SE	Computer Graphics	CO1	CO1-Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
			CO2	CO2 - Apply mathematics to develop Computer programs for elementary graphic operations
			CO3	CO3 - Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
			CO4	CO4 - Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
			CO5	CO5 - Understand the concepts of color models, lighting, shading models and hidden surface elimination.
			CO6	CO6 -Create effective programs using concepts of curves, fractals, animation and gaming
5	SE	Digital Electronics and Logic Design	CO1	CO1 - Simplify Boolean Expressions using K Map.
			CO2	CO2 - Design and implement combinational circuits.
			CO3	CO3 - Design and implement sequential circuits.
			CO4	
			CO5	CO5 - Differentiate and Choose appropriate logic families IC packages as per the given design specifications.
			CO6	CO6- Explain organization and architecture of computer system
6	SE	Engineering Mathematics III	CO1	CO1-Solve Linear differential equations, essential in modelling and design of computer-based systems.
			CO2	CO2-Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing
			CO3	CO3-Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
			CO4	CO4-Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals
			CO5	CO5-Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
			CO6	CO6-Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing
7	SE	Data Structures and Algorithms	CO1	CO 1 - Identify and articulate the complexity goals and benefits of a good hashing scheme for real- world applications.
			CO2	CO 2 - Apply non-linear data structures for solving problems of various domain.
			CO3	CO 3 - Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
			CO4	CO 4 - Analyze the algorithmic solutions for resource requirements and optimization
			CO5	CO 5 - Use efficient indexing methods and multiway search techniques to store and maintain data.
			CO6	CO 6 - Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.
8				
	SE	Software Engineering	CO1	CO1 - Analyze software requirements and formulate design solution for a software.
			CO2	CO2 - Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
			CO3	novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
			CO4	CO4 - Model and design User interface and component-level.
			CO5	CO5- Identify and handle risk management and software configuration management.
			CO6	CO6- Utilize knowledge of software testing approaches, approaches to verification and validation.

9	SE	Microprocessor	CO1	CO1-Exhibit skill of assembly language programming for the application.
			CO2	CO2-Classify Processor architectures.
			CO3	CO3-Illustrate advanced features of 80386 Microprocessor.
			CO4	CO4-Compare and contrast different processor modes.
			CO5	CO5-Use interrupts mechanism in applications
			CO6	CO6-Differentiate between Microprocessors and Microcontrollers
10	SE	Principles of Programming Languages	CO1	CO1-Make use of basic principles of programming languages.
			CO2	CO2-Develop a program with Data representation and Computations.
			CO3	CO3-Develop programs using Object Oriented Programming language : Java.
			CO4	CO4-Develop application using inheritance, encapsulation, and polymorphism.
			CO5	CO5- Demonstrate Multithreading for robust application development.
			CO6	CO6-Develop a simple program using basic concepts of Functional and Logical programming paradigm.

TE (E&TC) SEM I

Digital Communication (304181)	
CO304181.1	Understand working of waveform coding techniques and analyse their performance
CO304181.2	Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
CO304181.3	Perform the time and frequency domain analysis of the signals in a digital communication system.
CO304181.4	Design of digital communication system.
CO304181.5	Understand working of spread spectrum communication system and analyze its performance.
CO304181.6	Understand Signal space representation
Digital Signal Processing (304182)	
CO304182.1	Analyze the discrete time signals and system using different transform domain techniques.
CO304182.2	Design and implement LTI filters for filtering different real world signals.
CO304182.3	Develop different signal processing applications using DSP processor
CO304182.4	Analyse about various types of signals and their representation and their implementation on MAT LAB.
CO304182.5	Analyse various types of filters, their structures and their implementation on MAT LAB.
CO304182.6	Understand z-transform, its properties and their implementation on MAT LAB
Electromagnetics (304183)	
CO304183.1	Understand the basic mathematical concepts related to electromagnetic vector fields.
CO304183.2	Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
CO304183.3	Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
CO304183.4	Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.

CO304183.5	Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.
CO304183.6	Reflection losses on the unmatched Load, Problems solving using Smith chart.
Microcontrollers (304184)	
CO304184.1	Learn importance of microcontroller in designing embedded application.
CO304184.2	Learn use of hardware and software tools.
CO304184.3	Develop interfacing to real world devices.
CO304184.4	Basics of Serial Communication Protocol
CO304184.5	Develop embedded c programming for real world interfacing.
CO304184.6	Study of software development tool chain (IDE).
Mechatronics (304185)	
CO304185.1	Identification of key elements of mechatronics system and its representation in terms of block diagram
CO304185.2	Understanding basic principal of Sensors and Transducer.
CO304185.3	Able to prepare case study of the system given.
CO304185.4	Introduction to Hydraulic System
CO304185.5	Introduction to Pneumatic a Actuators
CO304185.6	Understanding Mechatronics Systems in Automobile engineering

TE (E&TC) SEM II

Power Electronics (304186)	
CO304186.1	Design & implement a triggering / gate drive circuit for a power device
CO304186.2	Understand, perform & analyze different controlled converters
CO304186.3	Evaluate battery backup time & design a battery charger.
CO304186.4	Design & implement over voltage / over current protection circuit.
CO304186.5	Identify the basic requirements for power electronics based design application

CO304186.6	Understand the analysis and design of various single phase and three phase power converter circuits and knowledge of their applications.
ITCT (304187)	
CO304187.1	Perform information theoretic analysis of communication system.
CO304187.2	Design a data compression scheme using suitable source coding technique.
CO304187.3	Design a channel coding scheme for a communication system.
CO304187.4	Understand and apply fundamental principles of data communication and networking.
CO304187.5	Apply flow and error control techniques in communication networks.
CO304187.6	Concept of Data Communication & Physical Layer
BM (304188)	
CO304188.1	Get overview of Management Science aspects useful in business.
CO304188.2	Get motivation for Entrepreneurship
CO304188.3	Get Quality Aspects for Systematically Running the Business
CO304188.4	To Develop Project Management aspect and Entrepreneurship Skills.
CO304188.5	Introduction to marketing, marketing environment
CO304188.6	Introduction to supply chain management and customer relationship management
Advanced Processors (304189)	
CO304189.1	Describe the ARM microprocessor architectures and its feature.
CO304189.2	Interface the advanced peripherals to ARM based microcontroller
CO304189.3	Design embedded system with available resources.
CO304189.4	Use of DSP Processors and resources
CO304189.5	Understanding of DSP applications in real world.
CO304189.6	Real World Interfacing with ARM7 Based Microcontroller
SPOS (304190)	

CO304190.1	Demonstrate the knowledge of Systems Programming and Operating Systems
CO304190.2	Formulate the Problem and develop the solution for same
CO304190.3	Compare and analyse the different implementation approach of system programming operating system abstractions.
CO304190.4	Interpret various OS functions used in Linux / Ubuntu
CO304190.5	Understanging of I/O management , Disk scheduling and File Management
CO304190.6	Understanding the concept of Concurrency control and deadlock

BE (E&TC) SEM I

VLSI Design & Technology (404181)	
CO404181.1	Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO404181.2	Understand chip level issues and need of testability.
CO404181.3	Learning digital CMOS logic design.
CO404181.4	Learning CMOS analog circuit designs.
CO404181.5	Understanding the concept of SoC
CO404181.6	Design analog & digital CMOS circuits for specified applications.
Computer Networks (404182)	
CO404182.1	Understand fundamental underlying principles of computer networking
CO404182.2	Describe and analyze the hardware, software, components of a network and the interrelations.
CO404182.3	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
CO404182.4	Have a basic knowledge of the use of cryptography and network security;
CO404182.5	Have a basic knowledge of installing and configuring networking applications.
CO404182.6	Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.

Microwave Engineering (404183)	
CO404183.1	Formulate the wave equation in wave guide for analysis.
CO404183.2	Identify the use of microwave components and devices in microwave applications.
CO404183.3	Understand the working principles of all the microwave tubes
CO404183.4	Understand the working principles of all the solid state devices
CO404183.5	Choose a suitable microwave tube and solid state device for a particular application
CO404183.6	Carry out the microwave network analysis
CO404183.7	Choose a suitable microwave measurement instruments and carry out the required measurements.
Digital Image Processing (404184)	
CO404184.1	Understanding the fundamental concepts of Digital Image Processing.
CO404184.2	Getting knowlegde of basic image processing operations
CO404184.3	Understanding the concept of Image compression & segmentation.
CO404184.4	Develop and implement algorithms for digital image processing
CO404184.5	Understanding concept of Spatial domain & Frequency domain enhancement.
CO404184.6	Apply image processing algorithms for practical object recognition applications.
Electronic Product Design (404185)	
CO404185.1	Understand various stages of hardware, software and PCB design.
CO404185.2	Learning the different considerations of analog, digital and mixed circuit design.
CO404185.3	Special design considerations and importance of documentation
CO404185.4	Understanding SDLC models.
CO404185.5	Getting knowledge of testing methods
CO404185.6	Importance of product test & test specifications.

Mobile Communication (404189)	
CO404189.1	Explain and apply the concepts telecommunication switching, traffic and networks
CO404189.2	Analyze the telecommunication traffic
CO404189.3	Analyze radio channel and cellular capacity
CO404189.4	Explain and apply concepts of GSM and CDMA system.
CO404189.5	Understanding the concept of call set up , cell splitting and handover in mobile communication
CO404189.6	Introduction to 3G mobile systems: W-CDMA and cdma-2000.
Broadband Communication Systems (404190)	
CO404190.1	Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.
CO404190.2	Carry out Satellite Link design for Up Link and Down Link.
CO404190.3	Analyze and calculate the basic characteristics of digital terrestrial and satellite broadcasting through appropriate simulation tools.
CO404190.4	Use tools to create and manage the digital content, the interface of digital subsystems, and the operation of the most widespread terrestrial and satellite transmission protocols,
CO404190.5	understanding the system design issues and the role of WDM components in advanced light wave systems
CO404190.6	understanding the basics of orbital mechanics and the look angles from ground stations to the satellite.
Speech and Audio Signal Processing (404191)	
CO404191.1	Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human
CO404191.2	Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
CO404191.3	Write a program for extracting LPC Parameters using Levinson Durbin algorithm
CO404191.4	Formulate and design a system for speech recognition and speaker recognition
CO404191.5	Extracting the information of the speech or audio signals in terms of cepstral features
CO404191.6	Understanding of speech & audio processing application in real time.

Wireless Networks (404192)	
CO404192.1	Keep himself updated on latest wireless technologies and trends in the communication field
CO404192.2	Understand the transmission of voice and data through various networks.
CO404192.3	Understanding various protocols and services provided by next generation netwoks
CO404192.4	Understanding the architectures of various access technologies such as 3G, 4G, WiFi .
CO404192.5	Getting knowledge on WiMAX
CO404192.6	Knowlegde of LTE Ecosystem Standards

DEPARTMENT OF MECANICAL ENGINEERING

Program Specific Outcomes

PSO.1	To apply design principles for providing optimum solutions in design and manufacturing using CAD tools.
PSO.2	To apply competency and proficiency in the field of core allied engineering

Program Educational Objectives

PEO.1	Provide Solution to application level Programme of Mechanical Engineering using knowledge of basic science and fundamentals of engineering.
PEO.2	Design mechanical system by using skills and knowledge of core competencies along with allied engineering skill.
PEO.3	Acquire the competency for interdisciplinary research in social technological area like environment and sustainability by inculcating profession, ethical, value, teamwork, leadership, and communication and managerial skill.
PEO.4	Develop attitude or lifelong learning to make graduate adaptable to ever changing dynamic industrial and social environment.

DEPARTMENT OF COMPUTER ENGINEERING

Program Specific Outcomes

PSO.1	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
PSO.2	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.

Program Educational Objectives

PEO.1	To prepare globally competent graduates having strong fundamentals and domain knowledge to provide effective solutions for engineering problems.
PEO.2	To prepare the graduates to work as a committed professionals with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
PEO.3	To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
PEO.4	To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.

DEPARTMENT OF CIVIL ENGINEERING

Program Specific Outcomes

PSO.1	Graduates of the program shall pursue civil engineering and advance to positions of greater responsibility and leadership and will meet the expectations of employers of Civil Engineers.
PSO.2	Graduates shall enter and successfully progress in, or complete, advanced degree programs within their fields of choice.

Program Educational Objectives

PEO.1	To create the knowledge of core areas related to the field of Civil Engineering.
PEO.2	To enable students to apply Civil Engineering principles to design, construct and implement the civil techniques to meet the customer satisfaction.
PEO.3	Graduates shall enter and successfully progress in, or complete, advanced degree programs within their fields of choice.
PEO.4	To sensitize students towards social issues and to introduce them to professional ethics and practices.

DEPARTMENT OF ELECTRICAL ENGINEERING

Program Specific Outcomes

PSO.1	Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments
PSO.2	Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

Program Educational Objectives

PEO.1	To provide students with the knowledge of Mathematics, Basic principles of Engineering and Computing, Basic Sciences and Social Sciences in general and Electrical Engineering in particular so as to develop necessary skill to analyse and synthesize electrical circuits, algorithms and complex apparatus.
PEO.2	To prepare students as competent to analyse and provide economically feasible and socially acceptable solutions of real life technical problems in industry, research and academics related to power, information and electronic hardware.
PEO.3	To prepare students to excel in professionalism, smart and ethical conduct, interpersonal skills and adoptability in communication to prevalent trends in technology as well as changing technology so as to work successfully in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.
PEO.4	To prepare and encourage students to undergo research work as well as to involve in scientific innovations for sustainable development

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program Specific Outcomes

PSO.1	The ability to absorb and apply fundamental knowledge of core Electronics and Communication Engineering subjects in the analysis, design, and development of various types of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions.
PSO.2	Competence in using electronic modern IT tools (both software and hardware) for the design and analysis of complex electronic systems in furtherance to research activities.

Program Educational Objectives

PEO.1	The graduate shall have successful professional carrier in electronics and telecommunication engineering with leadership and teamwork qualities.
PEO.2	Graduates shall utilize functional and disciplinary skill to address diversified engineering problems with social concern.
PEO.3	The graduates shall explore engineering capabilities to resolve technical problems and engage in lifelong learning and research.

CO of the Course "Engineering Metallurgy (EM)"	
CO1	Describe how metals and alloys formed and how the properties change due to microstructure
CO2	Apply core concepts in Engineering Metallurgy to solve engineering problems.
CO3	Conduct experiments, as well as to analyze and interpret data
CO4	Apply engineering Knowledge to prepare the heat treatment cycles, time & temp. required calculations for conduction of heat treatment as per requirement.
CO5	Possess the skills and techniques necessary for modern materials engineering practice.
CO6	Recognize how metals can be strengthened by alloying, cold-working, and heat treatment.
CO of the Course "Applied Thermodynamics (ATD)"	
CO1	Classify I.C engines construction and materials used, working principle and explain losses encountered in fuel air and actual cycle.
CO2	Analyze requirements of carburation, stages of combustion in SI engines, theory of abnormal combustion and combustion chambers for SI engine.
CO3	Evaluate fuel injection system, stages of combustion in CI engines, theory of abnormal combustion and combustion chambers for CI engine.
CO4	Evaluate performance of IC engines and results of the tests.
CO5	Explain systems necessary for efficient operation of IC engines and get familiar with emissions, norms and controlling techniques.
CO6	Explain the classification and working of air compressors and evaluate the performance of reciprocating air compressor.
Semester V	
CO of the Course "Design of Machine elements-I"	
CO1	Ability to analyze the stress-strain, of Machine Elements to understand, identify, quantify the failure modes.
CO2	Ability to Design Power Screw for Various Applications.
CO3	Ability to design fasteners and welded joints subjected to different loading conditions
CO4	Ability to design various Springs for strength and stiffness.
CO5	Select standard data and components by using Design Data Books, Codes and Standards for avoiding failure of machine components.

CO6	Ability to understand the actual mechanism of different failure of mechanical component
CO of the Course ”Heat Transfer”	
CO1	Analyze the various modes of heat transfer and implement the basic heat conduction equations for steady one dimensional thermal system.
CO2	Implement the general heat conduction equation to thermal systems with and without internal heat generation and transient heat conduction.
CO3	Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.
CO4	Interpret heat transfer by radiation between objects with simple geometries.
CO5	Analyze the heat transfer equipment and investigate the performance.
CO of the Course "Theory of Machines II”	
CO1	Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design..
CO2	Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear
CO3	The student to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
CO4	Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves
CO5	The student will synthesize a four bar mechanism with analytical and graphical method
CO6	a. The student will analyze the gyroscopic couple or effect for stabilization of Ship Aeroplane and Four wheeler vehicle.
CO of the Course “Turbo Machine”	
CO1	Classify turbo machines along with its applications and discuss impulse momentum principle to evaluate performance parameters for flat, inclined plate, curved vane and
CO2	Analyze impulse water turbine with design aspects, selection criteria, performance parameters and characteristics for its use in hydroelectric power plant
CO3	Differentiate reaction water turbines, draft tube types, governing mechanism, with design aspects, selection criteria and determine performance parameters and
CO4	Discuss steam nozzle, impulse, and reaction steam turbine with governing mechanism, selection criteria, losses and evaluate performance parameters for its use in thermal power plant.
CO5	Classifyrotodynamic, centrifugal pump, heads, cavitation, priming, along with multi staging, system resistance curve and evaluate performance with design aspects and selection criteria for household and industrial application.
CO6	Discuss the construction and working of centrifugal and axial flow compressor with its analysis.

CO of the Course ”Metrology & Quality Control”	
CO1	Understand the methods of measurements, selection of measuring instruments/ standards of measurements, carry out data collection and its analysis.
CO2	Explain tolerance, limits of size, fits, geometrics and position tolerances and gauge design.
CO3	Understand and use/apply quality control techniques/ statistical tools appropriately.
CO4	Develop an ability of problem solving decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.
CO of the Course ”Skill Devlopment”	
CO1	To develop the skill for required in shop floor working.
CO2	To have knowledge of the different tools and tackles used in machine assembly shop.
CO3	Use of theoretical knowledge in practice
CO4	Practical aspect of the each component in the assembly of the machine
Semester VI	
CO of the Course ”Numerical Methods and Optimization ”	
CO1	Understand the concept of errors and mathematical accuracy
CO2	Learn the basic concept of numerical solution of Algebraic and linear
CO3	simultaneous equations
CO4	Generate Solutions for real life problem using optimization techniques
CO5	Use appropriate Numerical Methods to solve complex mechanical engineering problems and analyze research problem
CO6	Understand the Numerical solution of ordinary differential equations and partial
CO of the Course “Design of Machine Element-II”	
CO1	Design and analyze Gears to avoid bending and pitting failure for constant speed gear box.
CO2	Design sliding contact bearing and Select rolling contact bearing on the basis of dynamic loading for various applications.

CO3	Ability to design belt drives and selection of belt, rope and chain drives.
CO4	Select standard data and components by using Design Data Books, Codes and Standards for avoiding failure of machine components.
CO5	Ability to import different application of gears for suitable industrial use.
CO6	Ability to import different applications of bearing for industrial use.
CO of the Course "Refrigeration and Air Conditioning"	
CO1	Demonstrate the fundamental Principles of Thermodynamics and working principal of R.A.C. methods
CO2	Analyze the performance of the different Refrigeration cycle using P-h chart & property table & select appropriate for application.
CO3	Select the appropriate refrigerant with respect to properties, application & environmental issues by comparative study.
CO4	Analyze & Design appropriate air-conditioning system for any application
CO5	Illustrate and analyze the principles and working of various equipment & safety controls & select in RAC system
CO6	Demonstrate duct system design methods by solving simple numerical.
CO of the Course "Mechatronics"	
CO1	Identification of key elements of mechatronics system and its representation in terms of block diagram
CO2	Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
CO3	Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
CO4	Time and Frequency domain analysis of system model (for control application)
CO5	PID control implementation on real time systems
CO6	Development of PLC ladder programming and implementation of real life system.
Semester VII	
CO of the Course "Hydraulics & Pneumatics"	
CO1	Understand the concept, basic working principle,basic energy conversion and storage units in hydraulic system.

CO2	Identify various applications of hydraulic & pneumatic systems
CO3	Selection of appropriate components required for hydraulic and pneumatic systems
CO4	Analyse hydraulic and pneumatic systems for industrial/mobile applications
CO5	Design a system according to the requirements
CO6	Develop and apply knowledge to various applications
CO of the Course "CADCAM and Automation"	
CO1	Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
CO2	Use analytical and synthetic curves and surfaces in part modeling
CO3	Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
CO4	Generate CNC program for Turning / Milling and generate tool path using CAM software
CO5	Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology
CO6	Understand the robot systems and their applications in manufacturing industries.
CO of the Course "Dynamic of Machinery"	
CO1	Implement balancing technique to complete balancing of rotating & reciprocating masses in multi cylinder inline & radial engines.
CO2	Express the fundamentals of vibrations and estimate natural frequencies for single DOF un-damped and damped free vibratory systems.
CO3	Formulate analytical competency to judge the response to forced vibrations due to harmonic excitation, base excitation and excitation due to reciprocating and rotary
CO4	Formulate mathematical model and estimate natural frequencies, mode shapes (Eigen values and Eigen vectors) for DOF undamped free longitudinal and transverse vibratory
CO5	Choose suitable vibration measuring instrument for industrial / real life applications and select suitable method for vibration control
CO6	Interpret noise, its measurement and reduction techniques for industry and day to day life problems
CO of the Course "Elective-I Finite Element Method"	
CO1	To explain the fundamentals of FEA pertaining to structural and heat transfer domain.

CO2	To formulate and solve 1D element structural problems involving bars, beams, trusses, frames and steady state heat transfer problems.
CO3	To construct and solve 2D element problems involving triangular, quadrilateral, axi-symmetric, Iso-parametric & higher order elements.
CO4	To evaluate appropriate FEA technique to solve dynamic vibrational problems.
CO5	To demonstrate the use of FEA software applied to solve structural and heat transfer problems.
CO of the Course "Elective-II Automobile Engineering"	
CO1	Classify I.C engines construction and materials used, working principle and explain losses encountered in fuel air and actual cycle.
CO2	Analyze requirements of carburetion , stages of combustion in SI engines, theory of abnormal combustion and combustion chambers for SI engine.
CO3	Evaluate fuel injection system, stages of combustion in CI engines, theory of abnormal combustion and combustion chambers for CI engine.
CO4	Evaluate performance of IC engines and results of the tests.
CO5	Explain systems necessary for efficient operation of IC engines and get familiar with emissions, norms and controlling techniques.
CO6	Explain the classification and working of air compressors and evaluate the performance of reciprocating air compressor.
Semester VIII	
CO of the Course "Energy Engineering"	
CO1	Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
CO2	Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same
CO3	Recognize the layout, component details of hydroelectric power plant and nuclear power plant
CO4	Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
CO5	Emphasize the fundaments of non-conventional power plants
CO6	Describe the different power plant electrical instruments and basic principles of economics of power generation.
CO of the Course "Mechanical System Design"	
CO1	The student will understand the difference between component level design and system level design.

CO2	Ability to design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
CO3	Ability to learn optimum design principles and apply it to mechanical components.
CO4	Ability to handle system level projects from concept to product.
CO of the Course "Industrial Engineering"	
CO1	Describe different aspect of industrial engineering and productivity improvement techniques.
CO2	Apply different concepts of method study to improve the work content
CO3	describe and analyze techniques of work measurement and time study
CO4	Illustrate different aspect of work system design and production planning control
CO5	Identify various cost accounting and financial management practices applicable in different industries
CO6	Apply concept of engineering economy, ergonomics and industrial safety practices.
CO of the Course "Advanced Manufacturing Process"	
CO 1	Classify and analyze special forming processes
CO 2	Analyze and identify applicability of advanced joining processes
CO 3	Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
CO4	Select appropriate micro and nano fabrication techniques for engineering applications
CO5	Understand and apply various additive manufacturing technology for product development
CO6	Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.
CO of the Course "Product Design and Development"	
CO1	Understand essential factors for product design
CO2	Design product as per customer needs and satisfaction
CO3	Understand Processes and concepts during product development

CO4	Understand methods and processes of Forward and Reverse engineering
CO5	Carry various design processes as DFA, DFMEA, design for safety
CO6	Understand the product life cycle and product data management

CO5- To use Object Oriented Programming concept in application development
CO6-To use Applet for Application development
Course Name: Theory of Computation Class: TE Computer Engineering
Course Code: 3101241 (2015 Pattern)
CO1 -Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars;notions of algorithm decidability, complexity, and computability
CO2 - Enhance/develop student's ability to understand and conduct,mathematical proofs for computation and algorithms
CO3 - Be exposed to a broad overview of the theoretical foundations of computer science
CO4 - To Study abstract computing models
CO5 - To learn Grammar and Turing Machine
CO6 - To learn about the theory of computability and complexity
Course Name: Database Management System Class: TE Computer Engineering
Course Code: 310242 (2015Pattern)
CO1 - Design E-R Model for given requirements and convert the same into database tables
CO2 - Use database techniques such as SQL & PL/SQL
CO3 - Use modern database techniques such as NOSQL
CO4 - Explain transaction Management in relational database System
CO5 - Describe different database architecture and analyses the use of
appropriate architecture in real time environment
CO6 - Students will be able to use advanced database Programming concepts Big Data - HADOOP
Course Name: Information Systems &Engineering Economics Class: TE Computer

Course Code: 310244 (2015Pattern)
CO1 - Understand the need, usage and importance of an Information System to an organization.
CO2 - Understand the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.
CO3 - Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organizations
CO4 - Outline the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry.
CO5 - Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
CO6 - Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
Course Name: Computer Networks Class: TE Computer Engineering
Course Code: 310245 (2015 Pattern)
CO1 - Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies
CO2 - Demonstrate design issues, flow control and error control
CO3 - Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.
CO4 - Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
CO5 - Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.
CO6 - Demonstrate different routing and switching algorithms
Course Name: Design and Analysis of Algorithm Class: TE Computer Engineering
Course Code: 310250 (2015Pattern)
CO1 - Argue the correctness of algorithms using inductive proofs and invariants.
CO2 - Find optimal solution by applying various methods.
CO3 - Design the algorithms to solve programming problems.

CO4 - Ability to analyze asymptotic runtime complexity of algorithms including formulating recurrence relations.
CO5-Write mathematical modeling of algorithm for problem solving
CO6-Make use of complexity theory in problem solving
Course Name: Systems Programming &Operating System Class: TE Computer Engineering
Course Code: 310251 (2015Pattern)
CO1 - Analyze and synthesize system software
CO2 - Understand the internal of language translator
CO3 - Use tools like LEX & YACC
CO4 - Understand the Operating System internals
CO5 - Implement Operating System functions
CO6 - Understand process scheduling for multi-cores Operating System
Course Name: Embedded Systems and Internet of Things Class: TE Computer Engineering
Course Code: 310252 (2015Pattern)
CO1 - To understand fundamentals of IoT and embedded system including essence, basic design strategy and process modeling
CO2 - To introduce students a set of advanced topics in embedded IoT and lead them to understand research in network.
CO3 - To develop comprehensive approach towards building small low cost embedded IoT system
CO4 - To understand fundamentals of security in IoT
CO5 - To learn to implement secure infrastructure for IoT
CO6 - To learn real world application scenarios of IoT along with its societal and economic impact using case studies
Course Name: Software Modeling and Design Class: TE Computer Engineering
Course Code: 310253 (2015 Pattern)

CO1 -Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
CO2 -Design and analyze an application using UML modelling as fundamental tool
CO3 -Apply design patterns to understand reusability in OO design
CO4 -Decide and apply appropriate modern tool for designing and modelling
CO5 -Apply proper architecture design technique for designing application
CO6 -Decide and apply appropriate modern testing tool for testing web-based/desktop application

Course Name: Web Technology Class: TE Computer Engineering
Course Code: 310254 (2015Pattern)
CO1 - Analyze given assignment to select sustainable web development design methodology
CO2 - Develop web based application using suitable client side and server side web technologies
CO3 - To decide the choice of web technology for designing the web site/Application
CO4 - To develop the interaction application
CO5-To develop reach the web based Application

Course Name:Artificial Intelligence & Robotics Class: BE Computer Engineering
Course Code:410242 (2015 Pattern)
CO1- Apply suitable Intelligent agents for various AI applications.
CO2-Design smart system using different search techniques like heuristic,informed and uninformed .
CO3-Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
CO4-Apply the suitable algorithms to solve AI problems. .
CO5-Describe various machine learning techniques and develop smart system application.
CO6-Relate machine learning techniques to embedded systems.

Course Name: High Performance Computing Class: BE Computer Engineering
Course Code: 410241 (2015 Pattern)
CO1-To transform algorithms in the computational area to efficient programming code for modern computer architectures
CO2-To write, organize and handle programs for scientific computations
CO3-To create presentation using tools for performance optimization and debugging.
CO4-To present analysis of code with respect to performance, suggest and implement performance improvements.
CO5-To present test cases to solve problems for multi-core or distributed, concurrent/Parallel environment.
CO6-To develop time and space efficient algorithms

Course Name:Data Analytics Class: BE Computer Engineering
Course Code: 410243 (2015 Pattern)
CO1-Students will be able to understand data analytic life cycle for the data science projects
CO2-Students will be able to write case studies in Business Analytics and Intelligence using mathematical models
CO3-Students will be able to present a survey and advanced analytical methods for clustering and classification
CO-4Students will be able to provide problem solutions for multi-core or distributed, concurrent/Parallel environments.

Course Name: ELECTIVE-I- Data Mining and warehousing Class: BE Computer Engineering
Course Code: 410244(D) (2015 Pattern)
CO1-To Understand the fundamentals of Data Mining
CO2-To Identify the appropriateness and need of mining the data along with models and data representation
CO3-To Learn the pre-processing minig, and post processing of the data
CO4-Use of Various clustering techniques
CO5-Apply concept of text and web mining

CO6-To understand various methods, techniques and algorithms in data minig

Course Name: ELECTIVE-II-Mobile Communication Class: BE Computer Engineering
Course Code: 410245(B) (2015 Pattern)
CO1-Justify the Mobile Network performance parameters and design decisions.
CO2-Choose the modulation technique for setting up mobile network.
CO3-Formulate GSM/CDMA mobile network layout considering futuristic requirements which conforms to the technology.
CO4-Use the 3G/4G technology based network with bandwidth capacity planning
CO5-Percept to the requirements of next generation mobile network and mobile applications.
CO6-Apply design parameters for setting up mobile network.

Course Name: Machine Learning Class: BE Computer Engineering
Course Code:410250 (2015 Pattern)
CO1-To Distinguish different learning based applications
CO2-To Apply different preprocessing methods to prepare training data set for machine learning.
CO3-To Implement different learning models and machine learning algorithms
CO4-To Use machine learning methods for multivariate data analysis in various scientific fields
CO5-To Design and implement supervised and unsupervised machine learning algorithm.
CO6-To Choose and apply appropriate Machine Learning Techniques for analysis, forecasting, categorization and clustering of the data

Course Name:Informtion and Cyber Security Class: BE Computer Engineering
Course Code:410251 (2015 Pattern)
CO1-To Gauge the security protections and limitations provided by today's technology.
CO2-To Identify information security and cyber security threats.

CO3-To Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
CO4-To Build appropriate security solutions against cyber-attacks.
CO5-To Analyze the working of Firewall.
CO6-To Detect the Intruders.

Course Name: ELECTIVE-III-Soft Computing and Optimization Algorithms Class: BE Computer Engineering
Course Code:410252 (D) (2015 Pattern)
CO1- Apply soft computing methodologies using artificial neural networks,
CO2-Apply soft computing methodologies using fuzzy sets and fuzzy logic
CO3-Apply soft computing methodologies using fuzzy inference systems and genetic algorithms
CO-4Design and development of certain scientific and commercial application using computational neural network models
CO5-Design and development of certain scientific and commercial application using fuzzy models, fuzzy clustering applications
CO-6Design and development of certain scientific and commercial application using genetic algorithms in specified applications.
Course Name: Cloud Computing Class: BE Computer Engineering
Course Code:410253 (C) (2015 Pattern)
CO1- To Install cloud computing environments.
CO2-To Develop any one type of cloud and evaluate the file storage and security aspect of developed cloud.
CO3-To Understand the use of virtualization in cloud computing and its impact on cloud services
CO4-To Understand and evaluate technical aspects of Amazon web services.
CO5-To Analyze the ubiquitous nature of cloud with enabling technologies like Internet of Things.
CO6-To Explore and analyze future trends of cloud computing

CO201007.4	Get acquainted to concrete handling equipments and different special concrete types.
CO201007.5	Design concrete mix of desired grade
CO201007.6	Predict deteriorations in concrete and repair it with appropriate methods and techniques.

Class	**TE (Civil)**
Semester	**V**
Course Name	**Fluid Mechanics II**
Course Code	**301005**
Course Outcomes	At the end of this course, the student will be able to:
CO301005.1	Define the concepts related to boundary layer theory and drag and lift forces.
CO301005.2	Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and its components including water hammer
CO301005.3	Utilize the concepts of uniform and critical flow through open channels including design of efficient channel sections. Also apply specific energy concepts in the
CO301005.4	Demonstrate Gradually Varied Flow & Rapidly Varied Flow analysis and its computation.
CO301005.5	Explain the different techniques of dimensional analysis in model testing.
CO301005.6	Demonstrate and apply basic concepts related to Turbines & Pumps in Water Resources planning.

Class	**TE (Civil)**
Semester	**V**
Course Name	**HWRE**
Course Code	**301001**
Course Outcomes	At the end of this course, the student will be able to:
CO301001.1	Apply the knowledge of hydrology in day to day life and utilize its basics for the measurement of precipitation
CO301001.2	Define and explain Infiltration, Evaporation and Transpiration and apply its knowledge to measure Infiltration and Interception

CO301001.3	Utilize the Technique of the Hydrograph to forecast Flood discharge at various duration.
CO301001.4	Apply the statistical technique to analyze the flood occurrence and frequency.
CO301001.5	Discuss Geo- Hydrology term in exploration of ground water potential and to assess it using various techniques.
CO301001.6	Explain the concept of ground water recharge and multipurpose project for water resources

Class	**TE (Civil)**
Semester	**V**
Course Name	**IECT**
Course Code	**301002**
Course Outcomes	At the end of this course, the student will be able to:
CO301002.1	Exhibit the knowledge of planning, design and the fundamental properties of highway materials in highway engineering.
CO301002.2	Acquire the knowledge of geometric design and draw appropriate conclusion.
CO301002.3	Understand and use the concept of different methods in design, construction, inspection and maintenance of the pavement
CO301002.4	Undertake various Traffic studies and apply the knowledge in planning and design of pavement and geometrics
CO301002.5	Understand and describe the terms related to tunnel.
CO301002.6	Understand the different sub-structures and super-structures of a docks and harbours and its construction, rating and maintenance

Class	**TE (Civil)**
Semester	**V**
Course Name	**Structural Analysis II**
Course Code	**301004**
Course Outcomes	At the end of this course, the student will be able to:
CO301004.1	Classify & discuss statically determinate & indeterminate structure
CO301004.2	Apply & Analyze the concept of influence lines for deciding the critical forces and sections while designing.

CO301004.3	Apply concept of strain energy and analyze redundant frames
CO301004.4	Explain the importance of horizontal thrust in maintaining parabola of two hinged parabolic arch for external loading and analyze the same
CO301004.5	Identify,analyze, & solve problems using slope deflection method.
CO301004.6	Apply the concept of force to solve indeterminate structure

Class	**TE (Civil)**
Semester	**V**
Course Name	**Structural Design I**
Course Code	**301003**
Course Outcomes	At the end of this course, the student will be able to:
CO301003.1	Uses of all loadings and limit state design method for steel structure.
CO301003.2	Analyze and design the Tension member
CO301003.3	Design of axial and eccentrically loaded column
CO301003.4	Design of laterally supported and unsupported beams
CO301003.5	Design of welded plate girder
CO301003.6	Explain the behavior of various connections and able to solve the problems various fasters (Bolted and welded) used in steel construction.

Class	**TE (Civil)**
Semester	**VI**
Course Name	**Environmental Engineering I**
Course Code	**301011**
Course Outcomes	At the end of this course, the student will be able to:
CO301011.1	Explain different aspects of air pollutants, its sources and effects on man and material etc.
CO301011.2	Examine composition of typical municipal wastes, their sources, and collection, treatment and disposal methods.
CO301011.3	Interpret the different characteristics of water &waste water and determine the necessity of treatment required.

CO301011.4	Compare the functions of water &waste water treatment and their different processes in water & waste water treatment plant
CO301011.5	Design different units of water treatment plant.
CO301011.6	Discuss about recent development in water & waste water treatment.

Class	**TE (Civil)**
Semester	**VI**
Course Name	**Foundation Engineering**
Course Code	**301009**
Course Outcomes	At the end of this course, the student will be able to:
CO301009.1	To learn about types and purposes of different foundation systems and structures.
CO301009.2	To provide students with exposure to the systematic methods for designing foundations.
CO301009.3	To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior.
CO301009.4	To build the necessary theoretical background for design and construction of foundation systems.
CO301009.5	Evaluate the importance of raft foundation and principles of design for buildings and tower structures.
CO301009.6	Examine and discuss various machine foundations.

Class	**TE (Civil)**
Semester	**VI**
Course Name	**Project Management and Engineering Economics**
Course Code	**301008**
Course Outcomes	At the end of this course, the student will be able to:
CO301008.1	Understand functions of management and Principles of management
CO301008.2	Find out solution of activities with CPM and PERT method
CO301008.3	Calculate critical paths of construction activity

CO301008.4	Be able to perform and evaluate payback period and capitalized cost on one or more economic alternatives.
CO301008.5	Project monitoring and control with different softwares
CO301008.6	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

Class	**TE (Civil)**
Semester	**VI**
Course Name	**Structural Design II**
Course Code	**301010**
Course Outcomes	At the end of this course, the student will be able to:
CO301010.1	Ability to analyze and design of columns
CO301010.2	Ability to analyze and design of beams
CO301010.3	Ability to analyze and design of Slabs
CO301010.4	Ability to analyze and design of footing
CO301010.5	An ability to design a system, component, or process to meet desired needs.
CO301010.6	An ability to identify, formulate, and solve engineering problems.

Class	**TE (Civil)**
Semester	**VI**
Course Name	**Advanced Surveying**
Course Code	**301007**
Course Outcomes	At the end of this course, the student will be able to:
CO301007.1	Evaluate horizontal and vertical distances in hilly terrain
CO301007.2	Apply survey technique to align highways curves
CO301007.3	Apply survey technique to align railway curves

CO301007.4	Explain the procedure of triangulation
CO301007.5	Explain the methods involve in photographic survey
CO301007.6	Choose advance surveying techniques over conventional method in the field of civil engineering

Class	**BE (Civil)**
Semester	**VII**
Course Name	**ENVIRONMENTAL ENGINEERING II**
Course Code	**401001**
Course Outcomes	At the end of this course, the student will be able to:
CO401001.1	Explain the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design.
CO401001.2	Classify and Compare the different components of sewer in construction, testing & maintenance of sewers.
CO401001.3	Distinguish the various characteristics of domestic waste water as well as industrial waste water and units of STP and CETP
CO401001.4	Design various units of conventional sewage treatment plant and the regulation of functional planning.
CO401001.5	Examine provisions for rural sanitation and perform functional design of septic tank.
CO401001.6	Design of screen chamber

Class	**BE (Civil)**
Semester	**VII**
Course Name	**STRUCTURAL DESIGN AND DRAWING III**
Course Code	**401003**
Course Outcomes	At the end of this course, the student will be able to:
CO401003.1	Identify various reinforced concrete structural members, its behavior and its purposes.
CO401003.2	Analyze the structural member and apply the knowledge in designing.
CO401003.3	Utilize of the knowledge of analysis and design and apply it in practical life

CO401003.4	Discuss the behavior and failure modes of different reinforced concrete members.
CO401003.5	Test the serviceability criteria of various reinforced concrete members.
CO401003.6	Utilize the relevant software in the analysis and design of reinforced concrete members.

Class	**BE (Civil)**
Semester	**VII**
Course Name	**TQM AND MIS IN CIVIL ENGINEERING**
Course Code	**401005**
Course Outcomes	At the end of this course, the student will be able to:
CO401005.1	Develop an understanding on quality management philosophies and frameworks
CO401005.2	Develop in-depth knowledge on various tools and techniques of quality management
CO401005.3	Learn the applications of quality tools and techniques in both manufacturing and service industry
CO401005.4	Understand difference between TQM , TQC, QC and QA
CO401005.5	Understand six sigma
CO401005.6	Develop analytical skills for investigating and analysing quality management issues in the industry.

Class	**BE (Civil)**
Semester	**VII**
Course Name	**TRANSPORTATION ENGINEERING**
Course Code	**401002**
Course Outcomes	At the end of this course, the student will be able to:
CO401002.1	Explain the function of various elements of railways
CO401002.2	Understand the relationship between the environment and transportation infrastructure and the importance the environment plays in project development of transportation projects.
CO401002.3	Explain the various principles of traffic control in railway

CO401002.4	Explain the function of various elements of tunnel and their maintenance
CO401002.5	Apply the various principles traffic control in airport
CO401002.6	Explain about layout, design and construction of permanent way, runway and taxiway

Class	**BE (Civil)**
Semester	**VII**
Course Name	**ADVANCED CONCRETE TECHNOLOGY**
Course Code	**401004**
Course Outcomes	At the end of this course, the student will be able to:
CO401004.1	Understand chemistry, properties, and classification of cement, fly ash, aggregates and admixtures, and hydration of cement in concrete
CO401004.2	Prepare and test the fresh concrete
CO401004.3	Test hardened concrete with destructive and nondestructive testing instruments
CO401004.4	Design concrete mix of desired grade
CO401004.5	Get acquainted to concrete handling equipments and different special concrete types.
CO401004.6	Predict deteriorations in concrete and repair it with appropriate methods and techniques.

Class	**BE (Civil)**
Semester	**VIII**
Course Name	**DAMS AND HYDRAULIC STRUCTURES**
Course Code	**401007**
Course Outcomes	At the end of this course, the student will be able to:
CO401007.1	Introduce dams, types of dams, safety and instrumentation of dams.

CO401007.2	Explain gravity dam, seismic analysis of dam, arch dams and other types of dams
CO401007.3	Introduce location of spillways and gates in detail
CO401007.4	Introduce earth dam,its limitations and classification. Diversion head work
CO401007.5	Give information abot canal and canal structures
CO401007.6	Introduce the necessity of cross drainage works and river training structures

Class	**BE (Civil)**
Semester	**VIII**
Course Name	**HYDROPOWER ENGINEERING**
Course Code	**401009**
Course Outcomes	At the end of this course, the student will be able to:
CO401009.1	Basic concepts of hydropower, water turbines, gradient, flow, force, power, energy and flow equations.
CO401009.2	Various types of turbines, suction tube, cavitation, hydraulic similarity, turbine characteristics
CO401009.3	Hydraulic solutions of impeller of Francis, Kaplan, Pelton and Bankiho turbines, impeller design, drawings and manufacturing technology.
CO401009.4	Determination of the basic parameters in the type and classification in power system.
CO401009.5	Basic equipment of water turbines structure, conduit and outflow facility with the necessary accessories.
CO401009.6	Specifics of small water power plants and pumped storage power plants.

Class	**BE (Civil)**
Semester	**VIII**
Course Name	**QSCT**
Course Code	**401008**
Course Outcomes	At the end of this course, the student will be able to:
CO401008.1	Explain the importance of preliminary estimate for administrative approval & technical sanction for a civil engineering project

CO401008.2	Utilize contracts and tenders in construction practices
CO401008.3	Analyze, & assess the quantity of materials required for civil engineering works as per specifications
CO401008.4	Evaluate & estimate the cost of expenditure and prepare a detailed rate analysis report
CO401008.5	Analyze and choose cost effective approach for civil engineering projects
CO401008.6	Construct detailed report on estimation and valuation process

Class	**BE (Civil)**
Semester	**VIII**
Course Name	**Construction Management**
Course Code	**401010**
Course Outcomes	At the end of this course, the student will be able to:
CO401010.1	Demonstrate the understanding of various types of projects, modern construction techniques and Exhibit the mastery in construction planning, scheduling and various
CO401010.2	Explain the knowledge of various type of equipments to be used in construction and Estimate its operational cost, understand manpower requirement, planning resources
CO401010.3	Assess the quality control aspects in planning and management, modern trends in project management
CO401010.4	Apply information system and safety provisions in construction project management
CO401010.5	Project economics, profit and loss account, balance sheet
CO401010.6	Explain various laws pertaining to civil engineering.

CO.3	Analyze and apply the knowledge of electrical and mechanical design of transmission lines.
CO.4	Calculation of line parameters
CO.5	Calculation of line parameters
CO.6	Identify and analyze the performance of transmission lines.

TE

	POWER ELECTRONICS-303143
CO.1	Develop characteristics of different power electronic switching devices
CO.2	Reproduce working principle of power electronic Choppers for different types of loads
CO.3	Reproduce working principle of power electronic converters for different types of loads
CO.4	Analyse the performance of power electronic converters
CO.5	Reproduce working principle of power electronic Inverters for different types of loads
CO.6	Analyse the performance of power electronic inverters
	POWER SYSTEM -II-303146
CO.1	Solve problems involving modelling, design and performance evaluation of power transmission lines.
CO.2	Solve problems involving modelling, design and performance evaluation of EHVAC lines.
CO.3	Evaluate power flow in power transmission networks and apply power flow results to solve simple planning problems.
CO.4	Calculate currents and voltages in a faulted power system under symmetrical fault and relate fault currents to circuit breaker ratings.
CO.5	Calculate currents and voltages in asymmetrical faults and relate fault currents to circuit breaker ratings.
CO.6	Solve problems involving modelling, design and performance evaluation of HVDC transmission line
	UEE-303148
CO.1	Get knowledge of principle of electric heating, welding and its applications.
CO.2	Understand collection of technical information and delivery of this technical information through presentations.

CO.3	Design simple resistance furnaces and residential illumination schemes.
CO.4	Calculate tractive effort, power, acceleration and velocity of traction.
CO.5	Get knowledge of electric braking methods, control of traction motors,
CO.6	Get knowledge of train lighting and signaling system.
	ITM-311121
CO.1	Differentiate between different types of business organization and discuss the fundamentals of economics and management.
CO.2	Explain the importance of technology management
CO.3	Explain the importance of quality management.
CO.4	Describe the characteristics of marketing and its types.
CO.5	Describe the human resource management
CO.6	Discuss the qualities of a good leader.
	Electrical Machines-II-303142
CO.1	Explain construction & working principle of three phase synchronous machines
CO.2	Estimate regulation of alternator by direct and indirect methods.
CO.3	Demonstrate operation of synchronous motor at constant load and variable excitation (v curves & ∧ curves) & constant excitation and variable load.
CO.4	Explain Speed control methods of three phase induction motor.
CO.5	Plot circle diagram of ac series motor
CO.6	Obtain equivalent circuit of single phase induction motor by performing no load & blocked rotor test.
	EIMT-303144
CO.1	Classify distribution systems, its types and substations
CO.2	Design of different earthing systems for residential and industrial premises
CO.3	Select methods of condition monitoring and testing of various Electrical Equipments
CO.4	Select methods of condition monitoring and testing of various Electrical Equipments

CO.5	Estimate and Costing of residential and industrial premises
CO.6	Different electrical safety technique.
	EAM-303150
CO.1	To get knowledge of BEE Energy policies, Electricity Acts.
CO.2	Use various energy measurement
CO.3	Use various audit instruments
CO.4	Carry out preliminary energy audit of various sectors
CO.5	Enlist energy conservation and demand side measures for electrical, thermal and utility Systems.
CO.6	Solve simple problems on cost benefit analysis.
	CS-I-303147
CO.1	Model physical system
CO.2	Determine time response of linear system
CO.3	Analyse stability of LTI system
CO.4	Analyze behavior of system in time
CO.5	Analyze behavior of system In frequency domain.
CO.6	Design PID controller for LTI system
	DEM-303149
CO.1	Determin types and specification Transformer
CO.2	Calculate main dimensions and Design of single phase and three phase transformer.
CO.3	Determine the parameters of transformer.
CO.4	Determin specifications and construction of Induction motor.
CO.5	Calculate main dimensions of three phase Induction motor.
CO.6	Determine parameters of three phase Induction motor.

	AMCA-303141
CO.1	Explain architecture of PIC18F458 microcontroller, its instructions and the addressing modes.
CO.2	Develop and debug program in assembly language or C language for specific applications
CO.3	Use of an IDE for simulating the functionalities of PIC microcontroller and its
CO.4	Use OF IDE for software and hardware development.
CO.5	Interface a microcontroller to various devices.
CO.6	Effectively utilize advance features of microcontroller peripherals.
BE	
	CS-II-403145
CO.1	Recognize the importance of digital control system.
CO.2	Familiarize with pulse transfer function.
CO.3	Analyze digital controllers.
CO.4	Present system in state space format.
CO.5	Solve state equation.
CO.6	Design observer for system.
	PLC AND SCADA -403142
CO.1	Develop and explain the working of PLC with the help of a block diagram.
CO.2	Develop architecture of SCADA
CO.3	Explain the importance of SCADA in critical infrastructure
CO.4	Execute and test the programs developed for digital and analog operations.
CO.5	Debug the programs developed for digital and analog operations.
CO.6	Reproduce block diagram representation on industrial applications using PLC and SCADA.
	EHVAC-403144

CO.1	Highlight need for EHV ac transmission.
CO.2	Calculate line parameters.
CO.3	Calculate ground parameters.
CO.4	Enlist problems encountered in EHV transmission.
CO.5	Enlist causes encountered in EHV transmission.
CO.6	Express issues related to UHV transmission discussed.
	PQ-403143
CO.1	Characterize power quality events.
CO.2	Reproduce causes of voltage sag.
CO.3	Estimate magnitude of voltage sag.
CO.4	Carry out harmonic analysis.
CO.5	Calculate total harmonic distortion.
CO.6	Calculate parameters for passive harmonic filter.
	PSOC-403141
CO.1	Identify and analyze the dynamics of power system and suggest means to improve stability of system
CO.2	Suggest the appropriate method of reactive power generation and control
CO.3	Analyze the generation-load balance in real time operation and its effect on frequency.
CO.4	Formulate objective functions for optimization tasks such as unit commitment.
CO.5	Develop automatic control strategies with mathematical relations.
CO.6	Economic load dispatch and get solution using computational techniques.
	SGP-403147
CO.1	Describe arc interruption methods in circuit breaker.
CO.2	Derive expression for restriking voltage and RRRV in circuit breaker

CO.3	Explain Construction, and working of different high voltage circuit breakers such as ABCB, SF6 CB, and VCB.
CO.4	Classify and Describe different type of relays such as over current relay, Reverse power relay, directional over current relay, Differential relay, Distance relay, Static
CO.5	Describe various protection schemes used for transformer, alternator and busbar
CO.6	Describe transmission line protection schemes.
	IE-403150
CO.1	Define various terms in illumination.
CO.2	Reproduce various terms in illumination.
CO.3	Identify various parameters for illumination system design.
CO.4	Design indoor lighting systems.
CO.5	Design outdoor lighting systems.
CO.6	Enlist state of the art illumination systems.
	PECD-403148
CO.1	Analyze the operation of the converte drive.
CO.2	Analyze the operation of the chopper fed dc drive.
CO.3	Analyze the operation of classical motor drives.
CO.4	Analyze the operation of modern induction motor drives.
CO.5	Design the current and speed controllers for a closed loop solid-state d.c motor drive
CO.6	Select the drives for any particular application
	HVE-403149
CO.1	Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid, liquid and gaseous materials.
CO.2	Study various causes of overvoltage and protection from them.
CO.3	List and reproduce various methods of generation and measurement of DC high voltage.

CO.4	List and reproduce various methods of generation and measurement of AC and impulse high voltage.
CO.5	Demonstrate an ability to carry various DC. AC and impulse testing on high voltage equipments and materials.
CO.6	Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory.