First Year Engineering Department

Course Outcomes (COs)

F.E. Electrical Engineering (2015 Course)

Course Code: 107001	
Name of Course: Engineering Mathematics - I	
CO 1	Understand the concepts of differential calculus, indeterminate forms, Taylors, Maclaurin's series.
CO 2	Apply the knowledge of Fourier series for the analysis of periodic continuous and discrete systems.
CO 3	Understand the concepts of Partial Differentiation and apply the knowledge of Partial Differentiation in evaluation of jacobians, maxima-minima, errors and approximations of functions.
CO 4	Understand the concepts of linear algebra and apply it to solve the system of linear equations.

Course Code: 107002	
Name of Course: Engineering Physics	
CO 1	Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.
CO 2	Learn basics of lasers and optical fibers and their use in some applications
CO 3	Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO 4	Understand theory of semiconductors and their applications in some semiconductor devices
CO 5	Summarize basics of magnetism and superconductivity. Explore few of their technological applications.
CO 6	Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application

Course Code: 107009	
Name of Course: Engineering Chemistry	
CO 1	Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity
CO 2	Select appropriate electro-technique and method of chemical analysis
CO 3	Understand structure, properties and applications of polymers and nano materials.
CO 4	Analyze fuel and suggest use of alternative fuels.
CO 5	Apply knowledge of spectroscopic techniques for analysis of structure of unknown chemical compounds.

Course Code: 102003	
Name of Course: System in Mechanical Engineering	
CO 1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO 2	Explain basic laws of thermodynamics, heat transfer and their applications
CO 3	List down the types of road vehicles and their specifications
CO 4	Illustrate various basic parts and transmission system of a road vehicle
CO 5	Discuss several manufacturing processes and identify the suitable process
CO 6	Explain various types of mechanism and its application

Course Code: 103004	
Name of Course: Basic Electrical Engineering	
CO 1	To learn basic electrical terminologies such as potential, potential difference, current, power, energy
CO 2	To be able to distinguish electric and magnetic circuits along with the derivations and coupling effect
CO 3	To understand the behavior of ac current when flowing through circuit parameters like

	resistance, inductor, and capacitor
CO 4	To apply and analyze network reduction techniques and its solution using star delta conversions, KCL, KVL, and network theorems
CO 5	To evaluate work, power, energy conversion from one system to others and battery applications for industrial and automobile applications.

Course Code: 104010	
Name of Course: Basic Electronics Engineering	
CO 1	Students should know the working of P-N junction diode and its circuits.
CO 2	Students should identify types of diodes and plot their characteristics and also they can compare BJT with MOSFET.
CO 3	After completion of unit 3 students should able to build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.
CO 4	To know the use different electronics measuring instruments to measure various electrical parameters.
CO 5	Students can select sensors for specific applications.
CO 6	To get the knowledge of basic principles of communication systems.

Course Code: 110005	
Name of Course: Programming and Problem Solving	
CO 1	Understand problem solving, problem solving aspects, programming and to know about various program design tools.
CO 2	Implement various decision control statements in python
CO 3	Understand and Implement Functions and Modules in python
CO 4	Implement various strings Operations in python
CO 5	Understand features of Object Oriented Programming and implement concept of class and object using Python
CO 6	Understand and develop programs for files handling concepts and dictionaries in Python.

Course Code: 101011	
Name of Course: Engineering Mechanics	
CO 1	Determine resultant of various force systems
CO 2	Determine centroid, moment of inertia and solve problems related to friction
CO 3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
CO 4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
CO 5	Calculate position, velocity and acceleration of particle using principles of kinematics.
CO 6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy

Course Code: 101011	
Name of Course: Engineering Mathematics - II	
CO 1	Understand various methods to solve first order first degree differential equations and apply the knowledge of differential equations to mathematical modeling and analysis of Electrical circuits,heat flow,orthogonal trajecories, cooling systems
CO 2	Apply the knowledge of Reduction Formulae, Beta and Gamma function, Differentiation Under Integral Sign to solve complex integrals.
CO 3	Understand the methods of Curve tracing and apply the knowledge of curve tracing in rectification of curves.
CO 4	Apply the knowledge of Solid Geometry to solve the complex engineering problems related to sphere, cone and cylinder.
CO 5	Apply the knowledge of multiple integrals to evaluate area, volume, mean and RMS values, centre of gravity and moment of inertia.
CO 6	Understand various methods to solve first order first degree differential equations and apply the knowledge of differential equations to mathematical modeling and analysis of Electrical circuits,heat flow,orthogonal trajecories, cooling systems.

Course Code: 102012	
Name of Course: Engineering Graphics	
CO 1	Define the fundamental engineering objects using basic rules and able to construct the simple geometries.
CO 2	Illustrate the fully-dimensioned 2D, 3D drawings using computer aided drafting tools.
CO 3	Construct the various engineering curves using the drawing instruments.
CO 4	Understand the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO 5	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO 6	Construct the development of lateral surfaces for cut section of geometrical solids.

Artificial Intelligence & Data Science Department

Course Outcomes (COs)

S.E. Artificial Intelligence & Data Science (2020 Course)

Course Code: 210241	
Name of Course: Discrete Mathematics	
CO1	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
CO2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
CO3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
CO4	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
CO5	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
CO6	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
CO7	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.

Course Code: 210242	
Name of Course: Fundamentals of Data Structures	
CO1	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
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	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.

CO4	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
CO5	Compare and contrast different implementations of data structures (dynamic and static).
CO6	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.

Course Code: 210243
Name of Course: Object Oriented Programming(OOP)

CO1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
CO2	Design object-oriented solutions for small systems involving multiple objects.
CO3	Use virtual and pure virtual function and complex programming situations.
CO4	Apply object-oriented software principles in problem solving.
CO5	Analyze the strengths of object-oriented programming.
CO6	Develop the application using object oriented programming language(C++).

Course Code: 210244
Name of Course: Computer Graphics

CO1	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
CO2	Apply mathematics to develop Computer programs for elementary graphic operations.
CO3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
CO4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
CO5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
CO6	Create effective programs using concepts of curves, fractals, animation and gaming.

Course Code: 217521	
Name of Course: Operating Systems	
CO1	Enlist functions of OS and types of system calls
CO2	Apply process scheduling algorithms to solve a given problem
CO3	Illustrate deadlock prevention, avoidance and recovery
CO4	Explain memory management technique
CO5	Illustrate I/O and file management policies
CO6	Describe Linux process management

Civil Engineering Department

Course Outcomes (COs)

S.E. Civil Engineering (2019 Course)

Course Code: 201001	
Name of Course: Building Technology and Architectural Planning	
CO 1	To classify types of building as per National Building Code and identify building components.
CO 2	To identify types of masonry, formwork, necessity of underpinning and scaffolding.
CO 3	To identify and apply different types of flooring and roofing materials.
CO 4	To classify various types of doors, windows, arches and lintel.
CO 5	To implement appropriate means of vertical circulation and select protective coatings for building.
CO 6	To explain different materials especially eco-friendly materials and safety measures to be adopted at any construction site.

Course Code: 201002	
Name of Course: Mechanics of structure	
CO 1	To compute different type of stresses in determinate, indeterminate, homogeneous and composite structures.
CO 2	To develop bending and shear stress diagram.
CO 3	To calculate the Torsional stresses and stresses due To strain energy for different loading conditions.
CO 4	To explain the concept of principal stresses due To combined loading and compare the values of analytical and graphical (Mohr's circle) method.
CO 5	To plot loading diagram, Shear Force Diagram (SFD) and Bending Moment Diagram (BMD).

CO 6	To analyze axially and eccentrically loaded column

Course Code: 201003	
Name of Course: Fluid Mechanics	
CO 1	To solve problems of fluid flow using fluid properties, dimensional analysis.
CO 2	To solve fluid statics problems.
CO 3	To measure fluid pressure.
CO 4	To calibrate ventrurimeter and orifice meter for discharge measurment.
CO 5	To distinguish fluid flows and find the fluid velocity using principles of Kinematics and Dynamics.
CO 6	To design pipes To carry particular amount of discharge.

Course Code: 207001	
Name of Course: Engineering Mathematics III	
CO 1	To solve higher order linear differential equations and apply to civil engineering problems such as bending of beams and whirling of shafts.
CO 2	To solve system of linear equations using direct and iterative numerical techniques and develop solutions to ordinary differential equations using single step and multistepmethods applied to structural systems.
CO 3	To apply statistical methods like correlation, regression analysis in analyzing and interpreting experimental data and probability theory applied to construction management.
CO 4	To perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
CO 5	To solve various partial differential equations such as wave equation, one and two dimensional flow equations.

Course Code: 207009	
Name of Course: Engineering Geology	

CO 1	To classify different rocks based on their inherent characteristics and their application in civil engineering.
CO 2	To describe plate tectonics and Mountain building activity
CO 3	To detect mass wasting processes and its effect on the civil engineering structures and remedial measures
CO 4	To carry out preliminary geological studies by geological explorations and Remote Sensing.
CO 5	To examine geohydrological characteristics of the rocks present at the foundations of the dams, percolation tanks and tunnels.
CO 6	To examine civil engineering constructions affected due to seismic activities and ground water and can select good building stone.

Course Code: 201008	
Name of Course: Geotechnical Engineering	
CO 1	To classify the soil types and their engineering properties.
CO 2	To determine the soil properties in laboraTory and develop a proficiency in handling experimental data.
CO 3	To explain the concept of effective stress and its influence on soil behavior.
CO 4	To describe the influence of water flow on the engineering behaviour of soils.
CO 5	To exmine soils, based on compaction, permeability and shear strength.
CO 6	To compute the lateral thrust due To backfill on the retaining walls, Classify soil slopes and identify their modes of failure.

Course Code: 201009	
Name of Course: Survey	
CO 1	To carry out plane table survey and compass travers in field.
CO 2	To plot contour map by simple levelling.
CO 3	To carry out topographic and radial survey using transit thodolite.

CO 4	To determine linear and angular measurements by tacheometer and total station.
CO 5	To design and set curves in road and railway works.
CO 6	To articulate advancements in surveying by space based positioning systems

Course Code: 201010	
Name of Course: Concrete Technology	
CO 1	To categorize cement, fly ash, aggregates and admixtures based on physical and chemical properties.
CO 2	To test the fresh concrete
CO 3	To test hardened concrete with destructive and nondestructive testing instruments
CO 4	To use concrete handling equipments and acquinted with special concrete.
CO 5	To design concrete mix of desired grade
CO 6	To predict deteriorations in concrete and repair it with appropriate methods and techniques.

Course Code: 201011	
Name of Course: Structural Analysis	
CO 1	To describe the basic concept of static and kinematic indeterminacy, slope and deflection of determinate and indeterminate beams for analysis of structures.
CO 2	To analyse indeterminate beams structures and frames.
CO 3	To analyse determinate and indeterminate trusses and its application in the field.
CO 4	To use influence line diagrams for the analysis of structures under moving load.
CO 5	To analyze two and three hinged arches and its application.
CO 6	To carry out plastic analysis for indeterminate steel structures by limits state method.

Course Code: 201012	
Name of Course: Project management	

CO 1	To be aware about project management
CO 2	To plan and schedule the projects.
CO 3	To plan project resources at construction site.
CO 4	To carry out project monitoring and inventory control
CO 5	To be aware about project economics
CO 6	To draft a detailed project report - DPR.

T.E. Civil Engineering (2015 Course)

Course Code: 301001	
Name of Course: Hydrology and Water Resources Engineering	
CO 1	To carry out abstraction of precipitation and streams gauging by Radar, Current meter, ADCP.
CO 2	To calculate water requirement of crops and assess canal revenue.
CO 3	To detect occurrences and distribution of ground water.
CO 4	To illustrate hydrograph and predict flood.
CO 5	To predict yield, storage and losses of reservoir &discuss reservoir economics.
CO 6	To practice water management.

Course Code: 301002	
Name of Course: Water Supply Engineering	
CO 1	To monitor and control Noise & Air Pollution and aware abou Municipal Solid Waste Management.
CO 2	To design water supply scheme and conduct potability tests.
CO 3	To carry prelimary and primary treatments on water.
CO 4	To design clarriflocculator and filtration units.

CO 5	To design chlorine dose, RO and UV treament, Ion exchange treatment.
CO 6	To design water distribution system.

Course Code: 301003	
Name of Course: Design of Steel Structures	
CO 1	To gain the knowledge about steel structure and design the tension member.
CO 2	To design a axialy loaded built up column along with lacing and battening connected with bolts and welds.
CO 3	To design an eccentrically loaded column, column bases for uniaxial and biaxial bending.
CO 4	To design laterally restrained, unrestrained beam with and without flange plate using rolled steel section.
CO 5	To design welded plate girder and beam - beam and beam - colum connection using bolt and weld.
CO 6	To design gantry girder for moving load and analyze the industrial truss for dead load, live load and wind load.

Course Code: 301004	
Name of Course: Engineering Economics and Financial Management	
CO 1	Understand basics of construction economics.
CO 2	Develop an understanding of financial management in civil engineering projects.
CO 3	Prepare and analyze the contract account.
CO 4	Decide on right source of fund for construction projects.
CO 5	Understand working capital and its estimation for civil engineering projects.
CO 6	Illustrate the importance of tax planning & understand role of financial regulatory bodies

Course Code: 301005 (c)	
Name of Course: Construction Management	
CO 1	To be aware about construction management.

CO 2	To schedule and measure activities in Civil Engineering projects
CO 3	To be aware about labour laws & financial aspects of construction projects.
CO 4	To distinguish elements of Risk Management & Value Engineering in constructional projects
CO 5	To recall and decide Material Management & Human Resource Management for construction projects
CO 6	To illustrate of Artificial Intelligence Techniques in Civil Engineering Projects

Course Code: 301012
Name of Course: Waste Water Engineering

CO 1	To quantify and test quality of sewage.
CO 2	To design sewage treatment plant.
CO 3	To design secondary treatment units for sewage treatment.
CO 4	To design low cost sewage treatment methods for rural areas.
CO 5	To design onsite sanitation treatment systems
CO 6	To understand about industrial waste water treatment, recycle & reuse of treated wastewater

Course Code: 301013
Name of Course: Design of RC Structures

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

CO 6	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.

Course Code: 301014
Name of Course: Remote Sensing and GIS

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

Course Code: 301015 (c)
Name of Course: Advanced Surveying

CO 1	To carry out geodetic survey and Spaced Based Positioning Survey
CO 2	To carry out hydrographic survey.
CO 3	To carry out topographic surveys by remote sensing and geographical information system.
CO 4	To practice adjustments in triangulation survey.
CO 5	To carry out aerial photogrammetry and compare with satelite imaging.
CO 6	To carry out trigonometric levelling and set out alignment of bridge and tunnel.

B.E. Civil Engineering (2015 Course)

Course Code: 401001
Name of Course: Environmental Engineering II

CO 1	To quantify and test quality of sewage.
CO 2	To design sewage treatment plant.

CO 3	To design secondary treatment units for sewage treatment.
CO 4	To design low cost sewage treatment methods for rural areas.
CO 5	To design onsite sanitation treatment systems
CO 6	To understand about industrial waste water treatment, recycle & reuse of treated wastewater

Course Code: 401002	
Name of Course: Transportation Engineering	
CO 1	To be aware about highway development & planning in India
CO 2	To carry geometric design of highways.
CO 3	To practice traffic engineering and its control.
CO 4	To test and select pavement materials used in highway construction
CO 5	To design the pavements.
CO 6	To be aware about new pavement construction methods, modern trends in highway materials, construction & maintenance.

Course Code: 401003	
Name of Course: Structural Design and Drawing III	
CO 1	To carry out analysis of prestressed concrete.
CO 2	To design prestressed concrete.
CO 3	To design flat slab.
CO 4	To design earth retaining structures.
CO 5	To design liquid retaining structures.
CO 6	To be aware about of vibration and earthquake analysis.

Course Code: 401004
Name of Course: Advanced Concrete Technology

CO 1	To be aware about cement and concrete.
CO 2	To classify the concrete and state its application in construction
CO 3	To design modern concrete.
CO 4	To be aware about fibre reinforced concrete
CO 5	To carry out test on fibre reinforced concrete
CO 6	To analyse and design precast elements by ferro cement

Course Code: 401005	
Name of Course: TQM & MIS in Civil Engineering	
CO 1	To be aware about concept of quality in construction by considering quality assurance, quality control & total quality management.
CO 2	To execute Six Sigma at construction projects
CO 3	To execute ISO & Quality Manual at constructional projects
CO 4	To categorize quality benchmark & certifications with implementation and awards
CO 5	To carry out modern techniques in TQM Implementation in Civil Engineering projects
CO 6	To explain MIS system for civil engineering projects

Course Code: 401006	
Name of Course: Project	
CO 1	To review the literature, identify problem and define objectives.
CO 2	To analyses the identified problem and define the appropriate methodology.
CO 3	To interpret the results and admit the conclusion of work.
CO 4	To draft and publish research work at national or international platforms.

Course Code: 401007	
Name of Course: Dams and Hydraulic Structures	
CO 1	To elaborate dams with their classification based on purpose, materials, size of projects,

	hydraulic action, structural action, and categorize instruments for dam safety
CO 2	To classify gravity dam, earth dam and other dams
CO 3	To classify spillway and spillway Gates
CO 4	To elaborate earth dams and diversion head works
CO 5	To design canal and canal structures
CO 6	To categorize cross drainage works and rivet training works.

Course Code: 401008	
Name of Course: Quantity Surveying, Contracts and tenders	
CO 1	To be aware about estimates and approximate estimate.
CO 2	To carry out detailed estimate.
CO 3	To be aware about material specifications and carry out rate analysis.
CO 4	To be aware about valuation and its methods.
CO 5	To carry out tendering and execution of works.
CO 6	To be aware about contracts and arbitration.

Course Code: 401009	
Name of Course: Air Pollution and control	
CO 1	To be aware about meterological parameters and its effect on pollutnat tansport.
CO 2	To collect and analyse ambient air sample
CO 3	To carry indoor air pollution monitoring and odour control
CO 4	To design air pollution control devices
CO 5	To apply and follow air pooution acts
CO 6	To carry environemntal Impact Analysis.

Course Code: 401010

Name of Course: Construction Management	
CO 1	To be aware about construction management.
CO 2	To schedule and measure activities in Civil Engineering projects
CO 3	To be aware about labour laws & financial aspects of construction projects.
CO 4	To distinguish elements of Risk Management & Value Engineering in constructional projects
CO 5	To recall and decide Material Management & Human Resource Management for construction projects
CO 6	To illustrate of Artificial Intelligence Techniques in Civil Engineering Projects

Course Outcomes (COs)

S.E. Computer Engineering (2019 Course)

Course Code: **C210241**	
Name of Course: **Discrete Mathematics**	
C201.1	**Design and analyze** real world engineering problems by applying set theory, propositional logic and mathematical induction
C201.2	**Develop** skill in expressing mathematical properties of relation and function
C201.3	**Identify** number of logical possibilities of events to design professional engineering Solutions
C201.4	**Model and solve** computing problem using graph and **Analyze** the properties of binary operations and evaluate the algebraic structure
C201.5	**Model and solve** computing problem using tree and **Analyze** the properties of binary operations and evaluate the algebraic structure
C201.6	**Apply** abstract algebra in combinatorics, coding theory and questions regarding geometric constructions

Course Code: **C210242**	
Name of Course: **Fundamentals of Data Structures**	
C202.1	**Design** algorithmic solution for programming problems and analyze time and space complexity of program..
C202.2	**Demonstrate** the use of sequential Data Structure.
C202.3	**Understand and Implement** various sorting and searching algorithms.
C202.4	**Discriminate** the use of Linked list for performing various operations such as insertion,deletion,searching, sorting.
C202.5	**Understand, Implement and Apply** principles of Stack to solve computational problem.
C202.6	**Understand, Implement and Apply** principles of Queue to solve computational problem.

Course Code: **C210243**

Name of Course: **Object Oriented Programming**	
C203.1	**Explain** Fundamentals of object-oriented programming like Namespaces, objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism etc.
C203.2	**Describe and implement** types of inheritance, pointers, Arrays of Pointers, Function pointers, Pointers to Pointers and Pointers to Derived classes.
C203.3	**Design and apply** types of polymorphism through Operator Overloading, Type casting, Function overloading and virtual function
C203.4	**Develop and compile** programs on files and streams.
C203.5	**Explain and implement** exception handling mechanism and templates.
C203.6	**Demonstrate and apply** standard template library, Containers and Iterators.

Course Code: **C210244**

Name of Course: **Computer Graphics**	
C204.1	**Identify** the basic terminologies of computer graphics and **apply** mathematics to develop computer programs for elementary graphics operation.
C204.2	**Illustrate** the concept of windowing and clipping and apply various algorithm to fill and clip polygons.
C204.3	**Understand and apply** the core concept of computer graphics, including transformation in two and three dimensions, viewing and projection.
C204.4	**Understand** the concept of color models lighting, shading models and hidden surface elimination.
C204.5	**Create** effective programs using concepts of curves and fractals.
C204.6	**Understand** the core concept of segment, animation and gaming.

Course Code: **C210245**	
Name of Course: **Digital Electronics and Logic Design**	
C205.1	**Simplify** Boolean expression using K Map
C205.2	**Design and Implement** combinational circuits
C205.3	**Design and Implement** combinational circuits
C205.4	**Develop** simple real world application using ASM and PLD
C205.5	**Differentiate and choose** appropriate logic families IC packages as per given design specification
C205.6	**Explain** organization and architecture of computer system

Course Code: **C210246**	
Name of Course: **Humanity and Social Science**	
C206.1	**Aware** about current affairs concerning humanity and society
C206.2	**Understand** various cultural diversity present in India
C206.3	**Write** an article on any social issue to explore their writing skills
C206.4	**Develop** communication and team orientation skills in students through group discussion activity.
C206.5	**Develop** of social etiquettes among students by making them understand responsibilities of every Indian citizen
C206.6	**Develop** a positive attitude & power of the minds in life.
C206.7	**Take** a debate on various domains of social science to improve knowledge and communication skills.

Course Code: **210247**	
Name of Course: **Data Structures Lab**	
C207.1	**Use** algorithms on various linear data structure using sequential organization to solve real life problems.
C207.2	**Analyze** problems to apply suitable searching and sorting algorithm to various applications
C207.3	**Analyze** problems to use variants of linked list and solve various real life problems
C207.4	**Design and implement** data structures and algorithms for solving different kinds of problems.

Course Code: **210248**	
Name of Course**: OOP and Computer Graphics Lab**	
C208.1	**Develop** program to draw a Circle using DDA and Bresenham's algorithm.
C208.2	**Design and Implement** program to draw 2-D object and perform basic operations like transformations, Scaling, Translation and Rotation.
C208.3	**Develop** OpenGL program to draw Sun Rise and Sunset.
C208.4	**Implement** a class Complex which represents the Complex Number data type.
C208.5	**Develop** a program to create a function template selection Sort.
C208.6	**Develop** C++ program using STL for sorting and searching with user defined records

Course Code: **C210249**	
Name of Course: **Digital Electronics Lab**	
C209.1	**Design and implement** Code Converters-Binary to Gray and BCD to Excess-3
C209.2	**Design & Implement** Parity Generator and checker using EX-OR.
C209.3	**Design** and Realization of Flip Flop conversion
C209.4	**Design and implement** Sequence detector using MS JK flip-flop
C209.5	**Study** of Shift Registers (SISO,SIPO, PISO, PIPO)
C209.6	**Design** of ASM chart using MUX controller Method

Course Code: **C210250**	
Name of Course**: Business Communication Skills Lab**	
C210.1	**Provide** an overview of Prerequisites to Business Communication skills like SWOT analysis at personal and organizational level
C210.2	**Learn** to Create a resume, a cover letter, profile on professional social media sites, professional Email writing
C210.3	**Discuss** different processes and considerations involved in discussion like Group discussion and debate for team spirit enhancement and person upliftment.
C210.4	**Learn** how to speak in public professionally, reading and writing
C210.5	**Prepare** for the personal interview through mock interviews.
C210.6	**Understand** career exploration process and match skills and interests with a chosen career path.

Course Code: **C210251**	
Name of Course: **Audit Course 3- Environmental Studies**	
C211.1	**Comprehend** the importance of ecosystem and biodiversity
C211.2	**Correlate** the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and prevention.
C211.3	**Identify** different types of environmental pollution and control measures.
C211.4	**Correlate** the exploitation and utilization of conventional and non-conventional resources.

Course Code: **210252**	
Name of Course: **Mathematics III**	
C212.1	**Solve** higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
C212.2	**Solve** problems related to Fourier transform, Z-Transform and applications to Signal and Image processing.
C212.3	**Apply** statistical methods like correlation and regression analysis for analysis of a given data as applied to machine intelligence
C212.4	**Apply** probability theory for analysis and prediction of a given data as applied to machine intelligence
C212.5	**Perform** vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals
C212.6	**Analyze** conformal mappings, transformations and perform contour integration of complex functions required in Image processing, Digital filters and Computer graphics.

Course Code: **C210253**	
Name of Course: **Data Structures and Algorithms**	
C213.1	**Identify and articulate** the complexity goals and benefits of a good hashing scheme for real world applications.
C213.2	**Apply** graph data structures or solving problems of various domain.
C213.3	**Design and specify** the operations of trees and implement them in a high-level programming language.
C213.4	**Design and specify** the operations of search trees and implement them in a high-level programming language
C213.5	**Design and specify** the operations of multiway trees and implement them in a high-level programming language
C213.6	**Use** efficient indexing methods and multiway search techniques to store and maintain data

Course Code: **210254**	
Name of Course: **Software Engineering**	
C214.1	**Apply** software engineering principles to develop software.
C214.2	**Analyze** software requirements and formulate design solution for a software
C214.3	**Explain** concepts of project estimation, planning and scheduling.
C214.4	**Elaborate** design concepts along with architectural design .
C214.5	**Explain** risk management and software configuration management.
C214.6	**Understand** various types of software testing.

Course Code: **210255**	
Name of Course: **Microprocessor**	
C215.1	**Classify** processor architectures and Exhibit skill of Assembly language programming through instruction set
C215.2	**Illustrate** advanced features of 80386 microprocessor
C215.3	**Describe and implement** memory management concepts of 80386 microprocessor
C215.4	**Compare** different processor modes
C215.5	**Describe** multitasking and virtual mode features of 80386 microprocessor
C215.6	**Use** interrupt mechanism in applications and Differentiate between microprocessor and microcontroller.

Course Code: **210256**	
Name of Course: **Principles of Programming Languages**	
C216.1	**Use** basic principles of programming languages
C216.2	**Develop** a program with Data representation and Computations
C216.3	**Develop** programs using Object Oriented Programming language : Java
C216.4	**Develop** application using inheritance, encapsulation, and polymorphism.
C216.5	**Demonstrate** Applet and Multithreading for robust application development.
C216.6	**Develop** a simple program using basic concepts of Functional and Logical programming paradigm.

Course Code: **210257**	
Name of Course: **Data Structures and Algorithms Lab**	
C217.1	**Implement** all the functions of a dictionary (ADT) using hashing and handle collisions using chaining with / without replacement.
C217.2	**Develop** an expression tree from the given prefix expression
C217.3	**Represent** a given graph using adjacency matrix/list to perform DFS and using adjacency list to perform BFS.
C217.4	**Build** the Binary search tree that has the least search cost given the access probability for each key.
C217.5	**Implement** operations like-Insertion and deletion of a record from a direct access file.
C217.6	**Develop** a mini project to implement a Smart text editor.

Course Code: **210258**	
Name of Course: **Microprocessor Lab**	
C218.1	**Write** an ALP to accept five 64 bit Hexadecimal numbers from user and store them in an array and display the accepted numbers.
C218.2	**Write** X86 program to sort the list of integers in ascending/descending order.
C218.3	**Write** X86/64 ALP to switch from real mode to protected mode and display the values of GDTR, LDTR, IDTR, TR and MSW Registers also identify CPU type using CPUID instruction
C218.4	**Write** 80387 ALP to find the roots of the quadratic equation. All the possible cases must be considered in calculating the roots..
C218.5	**Write** 80387 ALP to obtain: i) Mean ii) Variance iii) Standard Deviation. Define the input values in data segment.

Course Code: **210259**	
Name of Course: **Code of Conduct**	
C219.1	**Understand** the basic perception of profession, professional ethics, various moral & social issues, industrial standards, code of ethics and role of professional ethics in field.engineering
C219.2	**Aware** of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis
C219.3	**Understand** the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
C219.4	**Acquire** knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

Course Code: **210260**	
Name of Course: **Project Based Learning**	
C220.1	**Solve** real life problems by applying knowledge.
C220.2	**Analyze** alternative approaches, apply and use most appropriate one for feasible solution.
C220.3	**Understand** basics of IT Project management
C220.4	**Understand** challenges in the real world and mirroring what professionals do every day.
C220.5	**Classify** software applications and identify unique features of various domains
C220.6	**Promote** long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Course Code: **210261**	
Name of Course: **Audit Course 4 -Yoga and Meditation**	
C221.1	**Enhance** understanding of philosophy and religion as well as daily life issues and challenges..
C221.2	**Enhance** the immune system.
C221.3	**Develop** Intellectual and philosophical understanding of the theory of yoga and basic related Hindu scriptures.
C221.4	**Improve** powers of concentration, focus, and awareness.

T.E. Computer Engineering (2015 Course)

Course Code: C310241	
Name of Course: **Theory of Computation**	
C301.1	**Understand** formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite automata and its variants.
C301.1	**Construct** regular expressions to present regular language and understand pumping lemma for RE.
C301.1	**Design** context free grammar and learn to simplify grammar.
C301.1	**Devise** Turing Machine for the different requirements outlined by theoretical computer science.
C301.1	**Construct** pushdown Automaton model for the Context Free Language
C301.1	**Analyze** different classes of problems, and study concepts of NP completeness

Course Code: C310242	
Name of Course: **Database Management Systems (DBMS)**	
C302.1	**Design** E-R Model for given requirements and convert the same into database tables.
C302.2	**Use** database techniques such as SQL & PL/SQL.
C302.3	**Understand** Relational Database Design oncepts such as Relational Model, Relational Integrity, Database Design and Normalization.
C302.4	**Explain** transaction Management and query processing in relational database System.
C302.5	**Describe** different database architecture and analyses the use of appropriate architecture in real time environment.

C302.6	**Use** modern database techniques such as NOSQL.

Course Code: C310243	
Name of Course: **Software Engineering & Project Management**	
C303.1	**Decide** on a process model for a developing a software project ▢ .
C303.2	**Classify** software applications and Identify unique features of various domains
C303.3	**Design** test cases of a software system.
C303.4	**Understand** basics of IT Project management.
C303.5	**Plan, schedule and execute** a project considering the risk management.
C303.6	**Apply** quality attributes in software development life cycle.

Course Code: C310244	
Name of Course: **Information Systems & Engineering Economics**	
C304.1	**Understand** the need, usage and importance of an Information System to an organization.
C304.2	**Understand** the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.
C304.3	**Aware** about various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organizations.
C304.4	**Illustrate** the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry.
C304.5	**Perform and evaluate** present worth, future worth and annual worth analysis on one of more economic alternatives.
C304.6	**Evaluate** benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

Course Code: C310245	
Name of Course: **Computer Networks (CN)**	
C305.1	**Analyze** the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies.
C305.2	**Demonstrate** design issues, flow control and error control
C305.3	**Understand** Multiple Access Protocols, Pure and Slotted ALOHA, CSMA, WDMA, IEEE 802.3 Standards and Frame Formats and CSMA/CD.
C305.4	**Demonstrate** different routing and switching algorithms.
C305.5	**Demonstrate** different transport layer protocols
C305.6	**Understand** Application Layer protocols such as HTTP, SMTP, FTP, TELNET, DHCP and SNMP.

Course Code: C310246	
Name of Course: **Skills Development Lab**	
C306.1	**Evaluate** problems and **analyze** data using current technologies in a wide variety of business and organizational contexts.
C306.2	**Create** data-driven web applications
C306.3	**Incorporate** best practices for building applications
C306.4	**Employ** Integrated Development Environment(IDE) for i**mplementing** and testing of software solution
C306.5	**Construct** software solutions by evaluating alternate architectural patterns.

Course Code: C310247	
Name of Course: **DBMS Lab**	
C304.1	**Design and Develop** SQL queries for suitable database application
C304.2	**Design and Develop** MongoDB Queries for suitable database application
C304.3	**Develop** Mini Project on Database Project Life Cycle.

Course Code: C310248	
Name of Course: **CN Lab**	
C308.1	**Demonstrate** LAN and WAN protocol behavior using Modern Tools.
C308.2	**Analyze** data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
C308.3	**Demonstrate** basic configuration of switches and routers.
C308.4	**Develop** Client-Server architectures and prototypes by the means of correct standards and technology.

Course Code: C302049	
Name of Course:**Audit Course 3**	
C309.1	**Understand** the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
C309.2	**Understand** various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
C309.3	**Follow** Ethics as an engineering professional and adopt good standards & norms of engineering practice
C309.4	**Apply** ethical principles to resolve situations that arise in their professional lives

Course Code: C310250	
Name of Course: **Design & Analysis of Algorithms**	

C310.1	**Explain** Role of Algorithms in Computing.
C310.2	**Understand** Functional Model, Imperative Model Functions and Procedures, Functions and Procedures and Problem Solving using Greedy strategy
C310.3	**Analyze** the asymptotic performance of Abstract algorithms.
C310.4	**Understand** Complexity Theory and polynomial and non-polynomial problems.
C310.5	**Perform** Amortized Analysis through Binary, Binomial and Fibonacci heaps
C300.6	**Discuss** Multithreaded and Distributed Algorithms.

Course Code: C310251
Name of Course: **Systems Programming & Operating System (SP & OS)**

C311.1	**Analyze and synthesize** system software
C311.2	**Compare** different loading schemes and **analyze** the performance of linker and loader.
C311.3	**Use l**anguage Translator tools like LEX & YACC.
C311.4	**Implement** operating system functions.
C311.5	**Demonstrate** memory organization and memory management policies.
C311.6	**Demonstrate** I/O management and File Management.

Course Code: C310252
Name of Course: **Embedded Systems & Internet of Things (ES & IoT)**

C312.1	**Understand** fundamentals of IoT and embedded system including essence, basic design strategy and process modeling
C312.2	**Implement** an architectural design for IoT for specified requirement.
C312.3	**Study** Pillars of Embedded IoT and Physical Devices.
C312.4	**Understand** fundamentals of security in IoT.
C312.5	**Understand** Web of Things and Cloud of Things.
C312.6	**Learn** real world application scenarios of IoT along with its societal and economic impact using case studies

Course Code: C310253

Name of Course: **Software Modeling and Design**	
C313.1	**Design and analyze** an application using UML modeling as fundamental tool
C313.2	**Design and analyze** an application using static modelling.
C313.3	**Design and analyze** an application using dynamic modelling.
C313.4	**Decide and apply** appropriate modern tool for designing and modelling
C313.5	**Apply** design patterns to understand reusability in OO design
C313.6	**Decide and apply** appropriate modern testing tool for testing web-based/desktop application

Course Code: C310254	
Name of Course: **Web Technology**	
C314.1	**Implement and analyze** behavior of web pages using HTML and CSS.
C314.2	**Apply** the client side technologies for web development.
C314.3	**Analyze** the concepts of Servlet and JSP for server side development.
C314.4	**Apply** the server side technologies for web development.
C314.5	**Analyze** the Web services and frameworks for client and server sides.
C314.6	**Create** the effective web applications for business functionalities using latest web development platforms.

Course Code: C310255	
Name of Course: **Seminar and Technical Communication**	
C315.1	**Analyze** a latest topic of professional interest
C315.2	**Enhance** technical writing skills.
C315.3	**Identify** an engineering problem, **analyze** it and **propose** a work plan to solve it..
C315.4	**Communicate** with professional technical presentation skills.

Course Code: C310256	
Name of Course: **Web Technology Lab**	
C316.1	**Design and develop** any suitable web application using HTML, CSS and XML
C316.2	**Design and develop** any suitable web application and perform validation of all fields by

	using Java script/JQuery.
C316.3	**Design and develop** any suitable web application using Servlet and JSP
C316.4	**Design** dynamic web application using PHP, MySQL database connectivity and AJAX controls.
C316.5	**Design, develop and deploy** assignment no. 3 of unit –III using Strut
C316.6	**Design, Develop and Deploy** separate web application using EJB/CMS/JSF/Spring/Bootstrap.

Course Code: C310257	
Name of Course: **System Programming & Operating System Lab**	
C317.1	**Design** suitable data structures and implement pass-I and pass-II of a two-pass assembler for pseudo-machine and macro-processor in Java using object oriented feature.
C317.2	**Develop** a program using Lex/YACC specifications to implement lexical analysis phase of compiler to generate tokens of subset of 'Java' program, count no. of words, lines and characters of given input file, validate type and syntax of variable declaration in Java and recognize simple and compound sentences given in input file.
C317.3	**Design** a Java program (using OOP features) to implement scheduling algorithms, Banker's Algorithm
C317.4	**Develop** a Java Program (using OOP features) to implement paging simulation using Least Recently Used (LRU) and Optimal algorithm.

Course Code: C310258	
Name of Course: **Embedded Systems & Internet of Things Lab**	
C318.1	**Study** Raspberry-Pi, Beagle board, Arduino and other micro controller,also its operating systems and Connectivity and configuration
C318.2	**Understand** the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor/camera/ Zigbee module and develop application for the same.
C318.3	**Write** an application using Raspberry-Pi /Beagle board to control the operation of stepper motor, a hardware simulated traffic signal and a hardware simulated lift elevator.
C318.4	**Design** a client and server/dashboard/web interface application to be deployed on

	Raspberry-Pi /Beagle board and cloud.
C318.5	**Develop** a Real time application like smart home.

Course Code: C310259	
Name of Course: **Audit Course 4-Foreign Language(Japanese Module 4)**	
C319.1	Develop ability of basic communication.
C319.2	Develop the knowledge of Japanese script
C319.3	Understood reading, writing and listening skills for Japanese language.
C319.4	Develop interest to pursue professional Japanese Language course

B.E. Computer Engineering (2015 Course)

Course Code: **410241**	
Name of Course: **High Performance Computing**	
C401.1	**Describe** different parallel architectures, inter-connect networks, programming models.
C401.2	**Design & develop** an efficient parallel algorithm to solve given problem
C401.3	**Discuss** communication for parallel programming models .
C401.4	**Apply** the suitable algorithms to solve Complex problems using parallel models.
C401.5	**Analyze and measure** performance of modern parallel computing systems.
C401.6	**Design & develop** OpenMP and CUDA programs.

Course Code:**410242**	
Name of Course: **Artificial Intelligence and Robotics**	
C402.1	**Apply** different informed search /uninformed search or heuristic approaches to solve Artificial intelligence Problems.
C402.2	**Solve** problems using problem decomposition and planning methods.
C402.3	**Identify** knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.

C402.4	**Use** natural language processing and Artificial neural network techniques in AI systems.
C402.5	**Explain** fundamentals of mobile robotics and robot system control.
C402.6	**Describe** robot pose maintenance and localization and robotics in practice.

Course Code:**410243**	
Name of Course: **Data Analytics**	
C403.1	**Understand** the statistical concepts and inferences to analyze different types of data, and characterize it to make more intelligent predictions
C403.2	**Describe and use** statistical methods for evaluation and clustering,
C403.3	**Understand** the concepts behind the association rule, regression and types of regression.
C403.4	**Evaluate** decision trees and Naïve Bayes.
C403.5	**Understand** data visualization,types of data visualization and tools used in data visualization.
C403.6	**Apply** analytics technology and tools for unstructured data.

Course Code: **410244D**	
Name of Course: Elective-I **(Data Mining and Warehousing)**	
C404.1	**Describe** and **implement** data preprocessing techniques.
C404.2	**Illustrate** basics of data warehouse, operations and models of data warehouse.
C404.3	**Use** data similarities and dissimilarities in data mining applications
C404.4	**Describe and implement** association rule mining.

C404.5	**Describe and implement** various classifications methods for predictive analysis.
C404.6	**Describe** the advanced classification methods and classifier performance measures.

Course Code:**410245B**	
Name of Course: Elective-II **(Software Testing and Quality Assurance)**	
C405.1	**Point out** Current scenario in the Indian auto/ancillary industries and **demonstrate** Chassis, Frames and transmission systems
C405.2	**Explain** the importance and features of axles, wheels, tyres and steering system
C405.3	**Demonstrate** the suspension and brake systems.
C405.4	**Describe** vehicle performance and safety measures used in Automotive Vehicles.
C405.5	**Explain** electrical system, accessories, batteries and vehicle maintenance.
C405.6	**Develop** a strong base for understanding EVs and HEVs.

Course Code:**410246**	
Name of Course: **Laboratory Practice I**	
C406.1	**Implement** Parallel Reduction using Min, Max, Sum and Average operations, Parallel Sorting Algorithms for Vector and Matrix Operations, parallel algorithm utilizing all available resources, Parallel Search Algorithm utilizing all available resources.
C406.2	**Develop** mini project on Compression Module (Image /Video)/Generic

	Compression/Encoding/Database Query Optimization .
C406.3	**Implement** Tic-Tac-Toe/ 3 missionaries and 3 cannibals problem/ 8-puzzle problem using A* algorithm,
C406.4	**Develop** elementary chatbot for suggesting investment as per the customers need
C406.5	**Use** Heuristic Search Techniques to Implement Hill-Climbing Algorithm, Best first search (Best-Solution but not always optimal) and A* algorithm (Always gives optimal solution).
C406.6	**Download and study** the Iris flower dataset or any other dataset into a DataFrame.
C406.7	**Download** and study Pima Indians Diabetes dataset. **Use** Naive Bayes" Algorithm for classification

Course Code:**410247**	
Name of Course: **Laboratory Practice II**	
C407.1	**Design** star / snow flake schemas for analyzing processes.
C407.2	**Apply** different clustering techniques and Visualize the clusters using suitable tool.
C407.3	**Apply** a-priori algorithm to find frequently occurring items from given data and generate strong association rules using support and confidence thresholds.
C407.4	**Develop** mini project on classification
C407.5	**Develop** mini project on Software Architecture
C407.6	**Develop** mini project on use of Design Patterns.

Course Code:**410248**	
Name of Course: **Project Work Stage I**	
C408.1	**Show** evidence of independent investigation.
C408.2	**Develop** technical skills by hands on experience.
C408.3	**Apply** different software testing techniques on software.
C408.4	**Analyze** the results and their interpretation.
C408.5	**Prepare** project reports for future references.

C408.6	**Develop** different qualities like team work,leadership etc.

Course Code:**410249**
Name of Course: **Audit Course 5 -MOOC-Learn New Skill**

C409.1	**Develop** community interactions among students, professors, and experts.
C409.2	**Acquire** additional knowledge and skill.
C409.3	**Learn** professional skills anytime and anywhere.
C409.4	**Enhance** online teaching and learning.

Course Code:**410250**
Name of Course: **Machine Learning**

C410.1	**Distinguish** different learning based applications.
C410.2	**Apply** different preprocessing methods to prepare training data set for machine learning.
C410.3	**Discuss** linear and logistic regression.
C410.4	**Demonstrate** Naïve Bayes and Support Vector Machines
C410.5	**Learn** decision trees, clustering and Meta classifiers.
C410.6	**Learn** clustering and fundamentals of deep networks..

Course Code:**410251**
Name of Course: **Information and Cyber Security**

C411.1	**Learn** basic of security, system attacks, security policy and defenses against security issues.
C411.2	**Know** various data encryption techniques along with standards..
C411.3	**Acquire** knowledge of public key cryptography and **implement** digital signature

	concepts.
C411.4	**Learn** IP security and Email security basics.
C411.5	**Enhance** awareness about firewall, types and intrusion detection.
C411.6	**Enhance** awareness about Personally Identifiable Information (PII) and cyber forensics.

Course Code:**410252**	
Name of Course:**Embedded and Real Time Operating System**	
C412.1	**Study** basics of embedded system, processors and devices in embedded system.
C412.2	**Learn** embedded system on chip(SOC), advanced processors for embedded systems and network enabled systems.
C412.3	**Discuss** types of IO communication, types of serial communication, serial and parallel protocols.
C412.4	**Explain** basics of real time operating systems and its types..
C412.5	**Discuss** inter process communication through semaphores, message queues, mailboxes and pipes.
C412.6	**Explain** multiprocessor scheduling and synchronization in Real-time Operating system.

Course Code:**410253**	
Name of Course: **Cloud Computing**	
C413.1	**Learn** basics of cloud computing, PaaS, IaaS and IDaaS.
C413.2	**Discuss** cloud file system, cloud storage and security in cloud.

C413.3	**Stud**y implementation levels of virtualization, virtualization of CPU, memory and IO devices and virtualization for data.
C413.4	**Study** and **create** various amazon web services.
C413.5	**Explore** ubiquitous Clouds and the Internet of Things.
C413.6	**Explore** future trends of cloud computing.

Course Code:**410254**	
Name of Course: **Laboratory Practice III**	
C414.1	**Solve** assignment on linear regression.
C414.2	**Solve** assignment on Decision Tree Classifier
C414.3	**Solve** assignment on k-NN Classification
C414.4	**Solve** assignment on K-Means Clustering
C414.5	**Develop** mini project on Genetic Algorithm or on SVM or on PCA.
C414.6	**Implement** S-DES, S-AES, Diffie-Hellman key exchange, RSA, ECC algorithm.
C414.7	**Develop** mini project for detecting SQL Injection attacks and Cross -Site Scripting attacks.
C414.8	**Develop** mini project for a web site and demonstrate how the contents of the site can be changed by the attackers.

Course Code:**410255**
Name of Course: **Laboratory Practice IV**

C415.1	**Solve** given assignment on Embedded and Real Time Operating System .
C415.2	**Implement** Simulation/ Design, planning and modeling of a Real-Time / Embedded System for any application (mini project)
C415.3	**Solve** given assignment on Cloud Computing .
C415.4	**Develop** mini project to Setup your own cloud for Software as a Service (SaaS) over the existing LAN without HDFS.
C415.5	**Develop** mini project to Setup your own cloud for Software as a Service (SaaS) over the existing LAN with HDFS.

Course Code:**410256**	
Name of Course: **Project Work Stage II**	
C416.1	**Show** evidence of independent investigation..
C416.2	**Develop** technical skills by hands on experience.
C416.3	**Apply** different software testing techniques on software.
C416.4	**Analyze** the results and their interpretation.
C416.5	**Prepare** project reports for future references.
C416.5	**Develop** different qualities like team work,leadership etc.

Course Code:**410257**	
Name of Course: **Audit Course 6- MOOC**	
C417.1	**Develop** community interactions among students, professors, and experts.
C417.2	**Acquire** additional knowledge and skill.
C417.3	**Learn** professional skills anytime and anywhere.
C417.4	**Enhance** online teaching and learning.

Electrical Engineering Department

Course Outcomes (COs)

S.E. Electrical Engineering (2015 Course)

Course Code: 203141	
Name of Course: Power Generation Technologies	
CO 1	To learn conventional energy conversion system with steam, hydro based and nuclear based power plant.
CO 2	To understand non-conventional energy conversion system with solar, wind, fuel cell, tidal ocean, geothermal, biomass etc.
CO 3	To understand interconnection of energy source to gird, stand alone and hybrid system
CO 4	Apply knowledge of power plants to obtain energy produced by each plant.

Course Code: 203142	
Name of Course: Material Science	
CO 1	To learn types of conducting, Dielectric, Insulating and magnetic materials used in Electrical Engineering applications.
CO 2	To understand properties of conducting, Dielectric, Insulating and magnetic materials.
CO 3	Apply knowledge of conducting, Dielectric, Insulating, magnetic and Nano materials used in field of Electrical Engineering.
CO 4	To execute tests on dielectric, insulating, magnetic, conducting, resistive materials as per IS to decide the quality of the materials.

Course Code: 203143	
Name of Course: Analog and Digital Electronics	
CO 1	Illustrate and analyze logical, sequential and combinational digital circuit using K-Map.
CO 2	Demonstrate different digital memories and programmable logic families.
CO 3	Apply and analyze applications of OPAMP in open and closed loop condition.
CO 4	Analyze uncontrolled rectifier with given specifications.

Course Code: 203144	
Name of Course: Electrical Measurements and Instrumentation	
CO 1	Define various characteristic and classify measuring instruments along with range extension techniques.
CO 2	Apply measurement techniques for measurement of resistance, inductance and capacitance.
CO 3	Demonstrate construction, working principle and use of dynamometer type wattmeter for measurement of power under balance and unbalance condition.
CO 4	Demonstrate Construction, working principle of induction type energy meter, static energy meter and calibration procedures.
CO 5	Make use of CRO for measurement of voltage, current and frequency
	Classify transducer and apply it for measurement of physical parameters in real time.

Course Code: 203151	
Name of Course: Soft Skill	
CO 1	Effectively communicate through verbal/oral communication and improve the listening skills.
CO 2	To develop thinking ability and polish his/ her expression in group discussions.
CO 3	To train about Corporate / Business Etiquette, Leadership skills.
CO 4	Be prepared for the personal interview through mock interviews while being aware of the various kinds of interviews.

Course Code: 203145	
Name of Course: Power System-I	
CO 1	Recognize different patterns of load curve and calculate associated different factors with it and tariff.
CO 2	Draft specifications of electrical equipment in power station.
CO 3	Design electrical and mechanical aspects in overhead transmission and underground cables.
CO 4	Evaluate the inductance and capacitance of different transmission line configurations.

Course Code: 203146

Name of Course: Electrical Machines-I	
CO 1	To learn types of conducting, Dielectric, Insulating and magnetic materials used in Electrical Engineering applications.
CO 2	To understand properties of conducting, Dielectric, Insulating and magnetic materials.
CO 3	Apply knowledge of conducting, Dielectric, Insulating, magnetic and Nano materials used in field of Electrical Engineering.
CO 4	To execute tests on dielectric, insulating, magnetic, conducting, resistive materials as per IS to decide the quality of the materials.
CO 5	Test and Evaluate performance of transformer and three phase induction motor as per IS standard.

Course Code: 203147	
Name of Course: Network Analysis	
CO 1	Calculate current/voltage in electrical circuits using simplification techniques, Mesh, Nodal, Analysis and network theorems
CO 2	Analyze the response of RLC circuit with electrical supply in transient and stead state.
CO 3	Apply Laplace transform to analyze behavior of an electrical circuit.
CO 4	Derive formula and solve numerical of two port network and Design of filters.
CO 5	Apply knowledge of network theory to find transfer function, poles and zeroes location to perform stability analysis and parallel resonance

Course Code: 203148	
Name of Course: Numerical Methods and Computer Programming	
CO 1	To study the basics of mathematics, polynomials, simultaneous equations, ordinary differential equations, derivatives and integration.
CO 2	To calculate numerical computation errors, roots of polynomials and Transcendental equation, solution of ordinary differential equation, solution of linear simultaneous equation.
CO 3	To apply curve fitting and interpolation techniques for finding unknown values of y from known values of x from tabulated data.
CO 4	To analyze Newton Raphson method, Gauss Elimination, Gauss Jordan, Gauss Seidal and Gauss Jacobi methods in Power System load flow analysis.

Course Code: 203149	
Name of Course: Fundamental of Microcontroller and Applications	
CO 1	List the architecture and features of various types of the microcontroller.
CO 2	Illustrate addressing modes and execute programs in assembly language for the microcontroller.
CO 3	Develop programs in MPLAB for microcontroller 8051.
CO 4	Model input output devices and measure electrical parameters with 8051 in real time.

T.E. Electrical Engineering (2015 Course)

Course Code: 311121

Name of Course: Industrial and Technology Management	
CO 1	Distinguish between different types of business organizations.
CO 2	Elaborate the importance of IPR and role of Human Resource Management, technology management, quality management and its significance
CO 3	Develop marketing Strategies and financial Management model.
CO 4	Adapt the qualities of a good leader and Entrepreneurship.

Course Code: 303141	
Name of Course: Advanced Microcontroller and Embedded System	
CO 1	Explain architecture of PIC 18F458 microcontroller, its instructions, addressing modes and various serial communication protocols
CO 2	Make use of Ports and timers for peripheral interfacing and delay generation
CO 3	Elaborate CCP and module interrupt structure in internal and External interrupt mode
CO 4	Apply concept of ADC for parameter measurement and also understand LCD interfacing.

Course Code: 303142	
Name of Course: Electrical Machines II	
CO 1	To learn construction, working principle of Three phase Synchronous machines, three phase Induction Motor, A.C. series motor, single phase motors and Special Purpose motors.
CO 2	To understand characteristics of Three phase Synchronous machines, three phase Induction Motor, A.C. series motor, single phase motors and Special Purpose motors.
CO 3	Utilization of above machines in power system, engineering industry, household appliances, military engineering and automobile industries.
CO 4	Testing of machines performance through experimentation.

Course Code: 303143	
Name of Course: Power Electronics	
CO 1	Develop characteristics of different power electronic switching devices.
CO 2	Reproduce working principle of power electronic converters for different types of loads.
CO 3	Choose the appropriate converter for different applications.

Course Code: 303144

Name of Course: Electrical Installation Maintenance and Testing	
CO 1	Classify different types of distribution supply system and determine economics of distribution system. compare and classify various substations, bus-bars and Earthing systems.
CO 2	Analyze and test different condition monitoring methods.
CO 3	Estimate costing of internal wiring for residential and commercial installations.
CO 4	Apply electrical safety procedures.

Course Code: 303146	
Name of Course: Power System-II	
CO 1	Model power system components based on per unit system.
CO 2	Analyze of transmission lines, load flow analysis and fault analysis for electrical power system.
CO 3	Examine power system behavior at fault condition.
CO 4	Solve short circuit and load flow calculations.

Course Code: 303147	
Name of Course: Control System -I	
CO 1	To explain concepts of the classical control theory.
CO 2	To develop model of physical systems mathematically.
CO 3	To analyze behavior of system in time and frequency domain.
CO 4	To design controller to meet desired specifications.

Course Code: 303148	
Name of Course: Utilization of Electrical Energy	
CO 1	Get knowledge of principle of electric heating, welding and its applications.
CO 2	Design simple resistance furnaces and residential illumination schemes.
CO 3	Calculate tractive effort, power, acceleration and velocity of traction.
CO 4	Get knowledge of electric braking methods, control of traction motors, train lighting and signaling system.
CO 5	Understand collection of technical information and delivery of this technical information through presentations.

Course Code: 303149	
Name of Course: Design of Electrical Machines	
CO 1	To learn types of conducting, Insulating and magnetic materials used in Electrical Engineering applications.
CO 2	To determine design parameters of transformer and induction motor.
CO 3	To understand details and layout of AC winding with design report.
CO 4	Use of Finite Element Analysis (FEA) software for analysis of electrical machine.
CO 5	Design and testing of transformer and induction motor as per IS standard.

Course Code: 303150	
Name of Course: Energy Audit and Management	
CO 1	To get knowledge of BEE Energy policies, Electricity Acts.
CO 2	Use various energy measurement and audit instruments.
CO 3	Carry out preliminary energy audit of various sectors
CO 4	Enlist energy conservation and demand side measures for electrical, thermal and utility Systems.
CO 5	Solve simple problems on cost benefit analysis

B.E. Electrical Engineering (2015 Course)

Course Code: 403141	
Name of Course: Power System Operation and Control	
CO 1	To learn terminologies such as types of power system stability, critical clearing time and angle, reactive power management, FACTS devices, capacity and spinning reserve, unit

	commitment and reliability indices.
CO 2	To understand concepts of automatic generation and control, economic dispatch, unit commitment and energy banking.
CO 3	To calculate critical clearing time and angle, power system gain and time constant, economics of load dispatch.
CO 4	To analyze the generation-load balance in real time operation and its effect on frequency and develop automatic control strategies with mathematical relations.
CO 5	To simulate swing curve, equal area criteria for stability analysis, load frequency control, economic load dispatch.

Course Code: 403142	
Name of Course: PLC and SCADA Applications	
CO 1	To study the generic architecture, constituent components of a Programmable Logic Controller and classify the input and output interfacing devices.
CO 2	To execute, debug and test the programs, developed for digital and analog operations.
CO 3	To illustrate advance functions of PLC for industrial applications.
CO 4	To describe various SCADA protocols along with their architecture and explain the importance of SCADA in critical infrastructure.

Course Code: 403143	
Name of Course: Power Quality	
CO 1	Understand different types of power quality problems with their source of generation.
CO 2	To estimate the impact of various power quality problems on appliances.
CO 3	Acquire knowledge about the harmonics, harmonic introducing devices and effect of harmonics on system equipment and loads.
CO 4	Suggest the methodology to improve the power quality for sensitive loads by various mitigating custom power devices

Course Code: 403144	
Name of Course: Electric and Hybrid Vehicles	
CO 1	To learn the history, Social and environmental importance of Hybrid and Electric vehicles along with its classification details.

CO 2	To figure out the performance of Hybrid and Electric vehicles and select energy storage systems required for it.
CO 3	Demonstrate the different Instrumentation and Control used for electric vehicles along with battery management and charging system.
CO 4	Distinguish between the performance and architecture of various drive trains.

Course Code: 403145	
Name of Course: Control System II	
CO 1	Explain Digital Control Scheme and Process of Sampling and reconstruction.
CO 2	Derive Z Transform and pulse transfer function.
CO 3	Analyze the Stability of digital controllers.
CO 4	Build state space model for system and Solve state equation.
CO 5	Design observer for system.

Course Code: 403147	
Name of Course: Switchgear and Protection	
CO 1	To learn terminologies of relays, TSM, PSM, reach of relay, VA burden, primary and backup protection.
CO 2	To understand construction and working principle ABCB, SF6 CB, VCB and electromechanical, static and numerical relays.
CO 3	To classify different type of relays such as over current relay, Reverse power relay, directional over current relay, Differential relay, Distance relay, Static relay and numerical relay.
CO 4	Testing of relays like overload relay, IDMT type induction overcurrent relay, MCB, MCCB, contactors and Air Circuit Breaker.
CO 5	Protection of transformer, large induction motor, alternator and transmission line by applying protective measures.

Course Code: 403148	
Name of Course: Power Electronic Controlled Drives	
CO 1	Understand motor load dynamics and multi quadrant operation of drives.
CO 2	Analyze operation of converter fed and chopper fed DC drives.

CO 3	Understand braking methods of D.C. and induction motor drive.
CO 4	Understand vector control for induction motor drives.
CO 5	Understand synchronous motor drive.

Course Code: 403149	
Name of Course: High Voltage Engineering	
CO 1	Explain the breakdown phenomenon of solid, liquid, gaseous materials and causes of overvoltage.
CO 2	List and reproduce various methods of generation and measurement of DC, AC and impulse high voltage.
CO 3	Demonstrate and ability to carry various DC, AC and impulse testing on high voltage equipment's and materials.
CO 4	Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory.

Course Code: 403150	
Name of Course: Smart Grid	
CO 1	Distinguish Conventional Grid and Smart Grid.
CO 2	Elaborate the importance of Smart Grid, Micro Grid, Smart metering, Smart storage, Hybrid Vehicles, Home Automation, and Smart Communication.
CO 3	Recommend smart meters for Smart Grid depending upon the different Communication protocols
CO 4	Analysis the threats of Power Quality issues to Smart Grid

E & TC Department

Course Outcomes (COs)

S.E. E & TC Engineering (2019 Course)

Course Code: 207005	
Name of Course: Engineering Mathematics III	
CO 1	Solve higher order linear differential equation using appropriate techniques for modeling, analyzing of electrical circuits and control systems.
CO 2	Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO 3	Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
CO 4	Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO 5	Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

Course Code: 204181	
Name of Course : Electronic Circuits	
CO 1	Assimilate the physics, characteristics and parameters of MOSFET towards its application as an amplifier.
CO 2	Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO 3	Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies
CO 4	Explain internal schematic of Op-Amp and define its performance parameters.
CO 5	Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO 6	Understand and compare the principles of various data conversion techniques and PLL with their application.

Course Code: 204182	
Name of Course : Digital Circuits	
CO 1	Identify and prevent various hazards and timing problems in a digital design.
CO 2	Use the basic logic gates and various reduction techniques of digital logic circuit.
CO 3	Analyze, design and implement combinational logic circuits.
CO 4	Analyze, design and implement sequential circuits.
CO 5	Differentiate between Mealy and Moore machines.
CO 6	Analyze digital system design using PLD.
Course Code: 204183	
Name of Course : Electrical Circuits	
CO 1	Analyze the steady state operation of networks fed by DC and AC sources using circuit simplification techniques.
CO 2	Formulate and analyze source driven and source free RL and RC circuits.
CO 3	Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO 4	Characterize and select DC machines, induction motor, brushless DC motor and stepper motor for given application.
Course Code: 204184	
Name of Course : Data Structures	
CO 1	Solve mathematical problems using C programming language.
CO 2	Implement sorting and searching algorithms and calculate their complexity
CO 3	Develop applications of stack and queue using array.
CO 4	Demonstrate applicability of Linked List.
CO 5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO 6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm
Course Code: 204191	
Name of Course : Signals and Systems	
CO 1	Identify, classify continuous time and discrete time signals and perform operations

	on signals.
CO 2	Identify, classify the continuous time and discrete time systems based on their properties in terms of input output relation and in terms of impulse response
CO 3	Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO 4	Analyze the continuous time linear time invariant systems using Laplace Transform.
CO 5	Compute the probability, CDF, PDF and mean, mean square, variance and standard deviation for given random variables using PDF of a random event.
CO 6	Identify, classify continuous time and discrete time signals and perform operations on signals.

Course Code: 204192

Name of Course : Control Systems

CO 1	Determine the mathematical model of Electrical and Mechanical systems in the form of differential equation, transfer function and state space representation; and compute the overall transfer function of systems using block diagram algebra and mason's gain formula.
CO 2	Analyze the first and second order linear time invariant systems from its transient, steady state and frequency domain performance specifications.
CO 3	Investigate the closed loop stability of a system in s-plane from its pole location, Routh stability criterion and root locus.
CO 4	Investigate stability of continuous time linear time invariant systems using graphical tools in frequency domain viz. Bode plot and Nyquist plot.
CO 5	Compare, select and tune controller modes of PID controller.

Course Code: 204193

Name of Course : Principles of Communication Systems

CO 1	Determine the fundamental aspects of the communication system.
CO 2	Identify basic mathematical tools for time domain and frequency domain analysis of communication signal and systems.
CO 3	Analysis and design of various modulation and demodulation techniques.
CO 4	Demonstrates an appreciative effect of sampling in continuous-time signals and comparison of Pulse Modulation technique (PAM, PWM, and PPM).
CO 5	Acquaint waveform coding, multiplexing and synchronization techniques in baseband digital transmission. Compare digital representation techniques (PCM, DPCM, DM and ADM).

Course Code: 20194	
Name of Course : Object Oriented Programming	
CO 1	Describe the principles of object oriented programming.
CO 2	Apply the concepts of data encapsulation, inheritance in C++.
CO 3	Understand Operator overloading and friend functions in C++.
CO 4	Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
CO 5	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
CO 6	Describe and use of File handling in C++.

T.E. E & TC Engineering (2019 Course)

Course Code: 304181	
Name of Course: Digital Communication	
CO 1	Apply the statistical theory for describing various signals in a communication system.
CO 2	To acquire the basic knowledge of Digital communication including source coding, channel coding, modulation and equalization techniques as per the channel capacity requirements over various channels
CO 3	Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO 4	Understand the working of a spread spectrum communication system and analyze its performance.
CO 5	Analyze a communication system using information theoretic approach.
CO 6	Use error control coding techniques to improve performance of a digital communication system

Course Code: 304182	
Name of Course: Electromagnetic Field Theory	
CO 1	Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO 2	Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO 3	State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO 4	Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.

CO 5	Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
CO 6	Carry out a detailed study, interpret the relevance and applications of Electromagnetics.

Course Code: 304183

Name of Course: Database Management

CO 1	To understand fundamental concepts of a database from its design to its implementation.
CO 2	To analyze database requirements and determine the entities involved in the system and with one another.
CO 3	To manipulate database using SQL Query to create, update and manage Database
CO 4	Be familiar with the basic issues of transaction processing and concurrency control.
CO 5	To learn and understand Parallel Databases and its Architectures.
CO 6	To learn and understand Distributed Databases and its applications.

Course Code: 304184

Name of Course: Microcontroller

CO 1	Understand the fundamentals of microcontroller, selection of microcontrollers with Applications and write c programming
CO 2	Interface the I/O device as per the need of the application, draw interfacing diagram and write a suitable C program, design a DAS for real time industrial applications
CO 3	Analyze the features of PIC 18F XXXX.
CO 4	Describe the programming details in peripheral support, Selection of the interrupts and ADC channels.
CO 5	Develop interfacing models according to applications.
CO 6	Evaluate the serial communication details and interfaces, select the bus protocol for interfacing devices, and interface input/output devices using buses.

Course Code: 304185 (A)

Name of Course: Digital Signal Processing

CO 1	Select sampling frequency for discretizing the given continuous time signals.
CO 2	Compute discrete Fourier transform using its equation and fast Fourier transform

	algorithms and analyze discrete time signals in frequency domain using discrete Fourier transform.
CO 3	Analyze discrete time systems using z transform.
CO 4	Design digital Butterworth IIR filter for the given specifications using bilinear transformation and impulse invariance techniques.
CO 5	Design FIR filters for the given specifications using windowing technique and frequency sampling method.

Course Code: 304185 (D)	
Name of Course: Computer Network	
CO 1	Design LAN using appropriate networking architecture, topologies, transmission media, and Networking devices.
CO 2	Understand the working of controlling techniques for flawless data communication using data link layer protocols.
CO 3	Learn the functions of network layer, various switching techniques and internet protocol addressing.
CO 4	Explore various interior and exterior, unicasting and multicasting protocols.
CO 5	Analyze data flow using TCP/UDP Protocols, congestion control techniques for QoS.
CO 6	Illustrate the use of protocols at application layer.

Course Code: 304192	
Name of Course: Cellular Networks	
CO 1	Understand fundamentals of wireless communications.
CO 2	Discuss and study OFDM and MIMO concepts.
CO 3	Elaborate fundamentals mobile communication.
CO 4	Describes aspects of wireless system planning.
CO 5	Understand of modern and futuristic wireless networks architecture.
CO 6	Summarize different issues in performance analysis.

Course Code: 304193	
Name of Course: Project Management	
CO 1	Apply the fundamental knowledge of project management for effectively handling the projects.
CO 2	Identify and select the appropriate project based on feasibility study and undertake its

	effective planning.
CO 3	Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.
CO 4	Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.
CO 5	Identify and assess the project risks and manage finances in line with Project Financial Management Process.
CO 6	Develop new products assessing their commercial viability and develop skillsetsfor becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

Course Code: 304194
Name of Course: Power Devices & Circuits

CO 1	To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.
CO 2	To design triggering / driver circuits for various power devices.
CO 3	To evaluate and analyze various performance parameters of the different converters and its topologies.
CO 4	To understand significance and design of various protections circuits for power devices.
CO 5	To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.
CO 6	To understand case studies of power electronics in applications like electric vehicles, solar systems etc.

Course Code: 304195 (D)
Name of Course: Embedded Processors(Elective -II)

CO 1	Understand basics of Embedded C Programming and usage of Embedded C and study different software tools for programming microcontrollers.
CO 2	Get acquainted with various Embedded Processor architectures related to industrial application.

CO 3	Know about the programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.
CO 4	Understand the architectures of ARM Cortex M4 Microcontrollers and its advantages over ARM 7 Microcontrollers.
CO 5	Implement the real world programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.
CO 6	Recognize the interfacing of real world sensors and standard buses. Will also able to design different case studies.

B.E. E & TC Engineering (2015 Course)

Course Code: 404181	
Name of Course: VLSI Design and Technology	
CO 1	Write effective HDL coding for digital design.
CO 2	Apply knowledge of real time issues in digital design.
CO 3	Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO 4	Design CMOS circuits for specified applications.
CO 5	Analyze various issues and constraints in design of an ASIC
CO 6	Apply knowledge of testability in design and build self-test circuit.
Course Code: 404182	
Name of Course: Computer Networks & Security	
CO 1	Understand fundamental underlying principles of computer networking
CO 2	Describe and analyze the hardware, software, components of a network and their interrelations.
CO 3	Analyze the requirements for a given organizational structure and select the most Appropriate networking architecture and technologies
CO 4	Have a basic knowledge of installing and configuring networking applications.
CO 5	Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
CO 6	Have a basic knowledge of the use of cryptography and network security.
Course Code: 404183	
Name of Course: Radiation and Microwave Techniques	

CO 1	Formulate Friss Transmission equation and describe different antenna parameters Distinguish between linear, circular, and elliptical polarization.
CO 2	Analyze and Evaluate various linear wire antennas and uniform arrays based on the current distribution and measure antenna parameters.
CO 3	Formulate and solve the wave equation for coaxial wire and Analyze of rectangular wave guide, cavity resonator.
CO 4	Compute and Analyze the microwave components by using scattering matrix parameters.
CO 5	Describe the working principle and operation of various microwave tubes and solid state devices with their applications.
CO 6	Choose suitable microwave measurement instruments and conduct the required measurements.
CO 7	Carry out experiment as an individual and in a team, understand and write a laboratory record and draw conclusions at a technical level.

Course Code: 404184	
Name of Course: Internet Of Things	
CO 1	Understand the various concepts, terminologies and architecture of IoT systems.
CO 2	Use sensors and actuators for design of IoT.
CO 3	Understand and apply various protocols for design of IoT systems
CO 4	Use various techniques of data storage and analytics in IoT
CO 5	Understand various applications of IoT

Course Code: 404185	
Name of Course: Electronics Product Design	
CO 1	Understand various stages of hardware, software and PCB design.
CO 2	Selection & evolution of Electronics products with respect to Hardware.
CO 3	Understand, perform & analyze of analog, digital and mixed circuit design.
CO 4	Determine product test & test specifications for reliable Electronics product.
CO 5	Design and important considerations of documentation for Electronics Product.
Course Code: 404189	
Name of Course: Mobile Communication	

CO 1	The concepts of switching technique and traffic engineering to design multistage networks.
CO 2	Learn the concept of how a voice call and data is processed with different functions of switching technologies.
CO 3	To apply knowledge of call traffic management to handle queued calls in the network and accordingly customer signaling.
CO 4	Explore cellular communication concepts for evolved communication strategies.
CO 5	Learn the evolution of mobile generations with worldwide communication networks.
CO 6	Explore GSM and 5G network architecture and future scope with 5G
Course Code:404190	
Name of Course: Broadband Communication Systems	
CO 1	To select various components such as optical source, detector and Fiber for Optical Communication system.
CO 2	Perform Link power budget and Rise Time Budget by proper selection of Components and check its viability.
CO 3	Recognize state of art of active and passive WDM components
CO 4	Calculate Orbital parameters of Satellite Orbits
CO 5	Realize various sub systems in Satellite Communication
CO 6	Design Uplink and Downlink Satellite System
Course Code: 404191	
Name of Course: Audio Video Engineering	
CO 1	To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes.
CO 2	To study the various Color Television systems with a greater emphasis on television standards.
CO 3	To study the advanced topics in Digital Television and High Definition Television.
CO 4	To study audio recording systems such CD/DVD recording, Audio Standards, and Acoustics principles.
Course Code: 404192	
Name of Course: Wireless Sensor Networks (Elective-IV)	
CO 1	Explain various concepts and terminologies used in WSN
CO 2	Describe importance and use of radio communication and link management in WSN
CO 3	Explain various wireless standards and protocols associated with WSN

CO 4	Recognize importance of localization and routing techniques used in WSN
CO 5	Understand techniques of data aggregation and importance of security in WSN
CO 6	Examine the issues involved in design and deployment of WSN

Information Technology Department

Course Outcomes (COs)

S.E. Information Technology (2019 Course)

Course Code:214441	
Name of Course: Discrete Mathematics	
CO 1	Formulate and apply formal proof techniques and solve the problems with logical reasoning.
CO 2	Analyze and evaluate the combinatorial problems by using probability theory.
CO 3	Apply the concepts of graph theory to devise mathematical models.
CO 4	Identify techniques of number theory and its application.
CO 5	Identify fundamental algebraic structures.
CO 6	Analyze types of relations and functions to provide solution to computational problems.

Course Code: 214442	
Name of Course: Logic Design and Computer Organization	
CO 1	Perform basic binary arithmetic & simplify logic expressions
CO 2	Grasp the operations of logic ICs and Implement combinational logic functions using ICs.
CO 3	Comprehend the operations of basic memory cell types and Implement sequential logic functions using ICs.
CO 4	Elucidate the functions & organization of various blocks of CPU.
CO 5	Understand CPU instruction characteristics, enhancement features of CPU.
CO 6	Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.

Course Code: 214443	
Name of Course: Data Structures and Algorithms	
CO 1	Perform basic analysis of algorithms with respect to time and space complexity. CO6: Design different hashing functions and use files organizations.
CO 2	Select appropriate searching and/or sorting techniques in the application development.

CO 3	Implement abstract data type (ADT) and data structures for given application.
CO 4	Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.
CO 5	Apply implement learned algorithm design techniques and data structures to solve problems.
CO 6	Design different hashing functions and use files organizations.

Course Code: 214444	
Name of Course: Object Oriented Programming	
CO 1	Differentiate various programming paradigms. CO5: Use of files for persistent data storage for real world application. CO6: Apply appropriate design patterns to provide object-oriented solutions.
CO 2	Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems.
CO 3	Identify relationship among objects using inheritance and polymorphism principles.
CO 4	Handle different types of exceptions and perform generic programming.
CO 5	Use of files for persistent data storage for real world application.
CO 6	Apply appropriate design patterns to provide object-oriented solutions.

Course Code: 214445	
Name of Course: Basics of Computer Network	
CO 1	Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model.
CO 2	Analyze data link layer services, error detection and correction, linear block codes, cyclic Codes, framing and flow control protocols.
CO 3	Compare different access techniques, channelization and IEEE standards.
CO 4	Apply the skills of subnetting, supernetting and routing mechanisms.
CO 5	Differentiate IPv4 and IPv6.
CO 6	Illustrate services and protocols used at transport layer.

Course Code: 207003	
Name of Course: Engineering Mathematics- III	
CO 1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
CO 2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
CO 3	Apply Statistical methods like correlation& regression analysis and probability theory for data analysis and predictions in machine learning.
CO 4	Solve Algebraic &Transcendental equations and System of linear equations using numerical techniques.
CO 4	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

Course Code: 214451	
Name of Course: Processor Architecture	
CO 1	Apprehend architecture and memory organization of PIC 18 microcontroller.
CO 2	CO2: Implement embedded C programming for PIC 18.
CO 3	CO3: Use concepts of timers and interrupts of PIC 18.
CO 4	CO4: Demonstrate real life applications using PIC 18.
CO 5	CO5: Analyze architectural details of ARM processor.

Course Code: 214452	
Name of Course: Database Management System	
CO 1	Apply fundamental elements of database management systems.
CO 2	Design ER-models to represent simple database application scenarios.
CO 3	Formulate SQL queries on data for relational databases.
CO 4	Improve the database design by normalization & to incorporate query processing.
CO 5	Apply ACID properties for transaction management and concurrency control.
CO 6	Analyze various database architectures and technologies.

Course Code: 214453	
Name of Course: Computer Graphics	
CO 1	Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving.
CO 2	CO2: Employ techniques of geometrical transforms to produce, position and manipulate Objects in 2 dimensional and 3-dimensional space respectively.
CO 3	CO3: Describe mapping from a world coordinates to device coordinates, clipping, and projections in order to produce 3D images on 2D output device.
CO 4	CO4: Apply concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications.
CO 5	CO5: Perceive the concepts of virtual reality.

Course Code: 214454	
Name of Course: Software Engineering	
CO 1	Classify various software application domains.
CO 2	Analyze software requirements by using various modeling techniques.
CO 3	Translate the requirement models into design models.
CO 4	Apply planning and estimation to any project.
CO 5	Use quality attributes and testing principles in software development life cycle.
CO 6	Discuss recent trends in Software engineering by using CASE and agile tools.

Information Technology Department

Course Outcomes (COs)

T.E. Information Technology (2019 Course)

Course Code:314441	
Name of Course: Theory of Computation	
CO 1	Construct finite automata and its variants to solve computing problems.
CO 2	Write regular expressionsfor the regular languages and finite automata.
CO 3	Identify types of grammar, design and simplify Context Free Grammar.
CO 4	Construct Pushdown Automata machine for the Context Free Language.
CO 5	Design and analyze Turing machines for formal languages.
CO 6	Understand decidable and undecidable problems, analyze complexity classes.

Course Code: 314442	
Name of Course: Operating Systems	
CO 1	Explain the role of Modern Operating Systems.
CO 2	Apply the concepts of process and thread scheduling.
CO 3	Illustrate the concept of process synchronization, mutual exclusion and the deadlock.
CO 4	Implement the concepts of various memory management techniques.
CO 5	Make use of concept of I/O management and File system.
CO 6	Understand Importance of System software. COURSE CONTEN

Course Code: 314443	
Name of Course: Machine Learning	
CO 1	Apply basic concepts of machine learning and different types of machine learning algorithms.
CO 2	CO2: Differentiate various regression techniques and evaluate their performance.
CO 3	CO3: Compare different types of classification models and their relevant application.
CO 4	CO4: Illustrate the tree-based and probabilistic machine learning algorithms.

CO 5	CO5: Identify different unsupervised learning algorithms for the related real-worldproblems.
CO 6	CO6: Apply fundamental concepts of ANN.

Course Code: 314444
Name of Course: Human Computer Interaction

CO 1	Explain importance of HCIstudy and principles of user-centered design (UCD) approach.
CO 2	Develop understanding of human factors in HCI design.
CO 3	Develop understanding of models, paradigms, and context of interactions.
CO 4	Design effective user-interfacesfollowing a structured and organized UCD process.
CO 5	Evaluate usability of a user-interface design.
CO 6	Apply cognitive modelsfor predicting human-computer-interactions

Course Code: 314445
Name of Course: Elective-I

CO 1	Calculate computational complexity using asymptotic notations for various algorithms
CO 2	Apply Divide & Conquer as well as Greedy approach to design algorithms.
CO 3	Understand and analyze optimization problems using dynamic programming.
CO 4	Illustrate different problems using Backtracking.
CO 5	Compare different methods of Branch and Bound strategy.
CO 5	Classify P, NP, NP-complete, NP-Hard problems.

Course Code: 314451
Name of Course: Computer Networks& Security

CO 1	Explain Responsibilities,services offered and protocol used at application layer of network
CO 2	Apply concepts of wireless network and different wirelessstandards.
CO 3	Recognize the Adhoc Network's MAC layer, routing protocol and Sensor network architecture.
CO 4	Implement the principal concepts of network security and Understand network security threats, security services, and countermeasures
CO 5	Apply basic cryptographic techniques in application development.
CO 6	Gain a good comprehension of the landscape of cyber security Vulnerabilities & describe

	typical threats to modern digitalsystem

Course Code: 314452	
Name of Course: Data Science and Big Data Analytics	
CO 1	Understand Big Data primitives.
CO 2	CO2: Learn and apply different mathematical models for Big Data.
CO 3	CO3: Demonstrate Big Data learning skills by developing industry or research applications.
CO 4	CO4: Analyze and apply each learning model comes from a different algorithmic approach and it will perform differently under different datasets.
CO 5	CO5: Understand, apply and analyze needs, challenges and techniques for big data visualization.
CO 6	CO6: Learn different programming platformsfor big data analytics.

Course Code: 314453	
Name of Course: Web Application Development	
CO 1	Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap.
CO 2	Demonstrate the use of web scripting languages.
CO 3	Develop web application with Front End & Back End Technologies.
CO 4	Develop mobile website using JQuery Mobile.
CO 5	Deploy web application on cloud using AWS.

Course Code: 314454	
Name of Course: Elective-II	
CO 1	Apply the fundamental concepts of Artificial Intelligence
CO 2	Choose appropriate search strategies for any AI problem
CO 3	Illustrate knowledge reasoning and knowledge representation methods (for solving real world problems)
CO 4	Analyze the suitable techniques of NLP to develop AI applications
CO 5	Correlate the appropriate methods of Game Theory to design AI applications
CO 6	Understand the concept of deep learning and AI applications

Course Code: 314455	
Name of Course: Internship	
CO 1	Develop professional competence through industry internship.
CO 2	Apply academic knowledge in a personal and professional environment
CO 3	Build the professional network and expose students to future employees.
CO 4	Apply professional and societal ethics in their day-to-day life.
CO 5	Become a responsible professional having social, economic and administrative considerations.
CO 6	Make own career goals and personal aspirations.

Information Technology Department

Course Outcomes (COs)

B.E. Information Technology (2015 Course)

Course Code: 414453	
Name of Course: Information and Cyber Security	
CO 1	Use basic cryptographic techniques in application development.
CO 2	Apply methods for authentication, access control, intrusion detection and prevention.
CO 3	To apply the scientific method to digital forensics and perform forensic investigations.
CO 4	To develop computer forensics awareness.
CO 5	Ability to use computer forensics tools.

Course Code: 414454	
Name of Course: Machine Learning and Applications	
CO 1	Model the learning primitives.
CO 2	Build the learning model.
CO 3	Tackle real world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

Course Code: 414455	
Name of Course: Software Design and Modeling	
CO 1	To teach the student the fundamental aspects of different object oriented methodologies and unified approach along with Unified Modeling Language (UML), in terms of "how to use" it for the purpose of specifying and developing software.
CO 2	Explore and analyze use case modeling, domain/ class modeling.
CO 3	To teach the student Interaction and behaviour modeling.
CO 4	Aware students with design process in software development.
CO 5	Orient students with the software design principles and patterns.

CO 6	Enable students to learn the architectural design guidelines in various type of application development.

Course Code: 414456E	
Name of Course: Elective-I (Business Analytics and Intelligence)	
CO 1	Comprehend the Information Systems and development approaches of Intelligent.
CO 2	Evaluate and rethink business processes using information systems.
CO 3	Propose the Framework for business intelligence
CO 4	Get acquainted with the Theories, techniques, and considerations for capturing organizational intelligence.
CO 5	Align business intelligence with business strategy.
CO 6	Apply the techniques for implementing business intelligence systems.

Course Code: 414457C	
Name of Course: Elective-II (Software Testing and Quality Assurance)	
CO 1	Test the software by applying testing techniques to deliver a product free from bugs
CO 2	Investigate the scenario and to select the proper testing technique.
CO 3	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.
CO 4	Understand how to detect, classify, prevent and remove defects.
CO 5	Choose appropriate quality assurance models and develop quality.
CO 5	Ability to conduct formal inspections, record and evaluate results of inspections.

Course Code: 414462	
Name of Course: Distributed Computing System	
CO 1	Understand the principles and desired properties of distributed systems based on different application areas.
CO 2	Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
CO 3	Recognize the inherent difficulties that arise due to distributed-ness of computing resources.
CO 4	Identify the challenges in developing distributed applications

Course Code: 414463	
Name of Course: Ubiquitous Computing	
CO 1	Demonstrate the knowledge of design of Ubicomp and its applications.
CO 2	Explain smart devices and services used Ubicomp.
CO 3	Describe the significance of actuators and controllers in real time application design.
CO 4	Use the concept of HCI to understand the design of automation applications.
CO 5	Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy.
CO 6	Get the knowledge of ubiquitous and service oriented networks along with Ubicomp management.

Course Code: 414464B	
Name of Course: : Elective III (Information Storage and Retrieval)	
CO 1	Understand the concept of Information retrieval.
CO 2	Deal with storage and retrieval process of text and multimedia data.
CO 3	Evaluate performance of any information retrieval system.
CO 4	Design user interfaces.
CO 5	Understand importance of recommender system.
CO 6	Understand concept of multimedia and distributed information retrieval.

Course Code: 414464D	
Name of Course: Elective IV (Social Media Analytics)	
CO 1	Understand the basics of Social Media Analytics.
CO 2	Explain the significance of Data mining in Social media.
CO 3	Demonstrate the algorithms used for text mining.
CO 4	Apply network measures for social media data.
CO 5	Explain Behavior Analytics techniques used for social media data.
CO 6	Apply social media analytics for Face book and Twitter kind of applications.

Mechanical Engineering Department

Course Outcomes (COs)

S.E. Mechanical Engineering (2019 Course)

Course Code: **C202041**	
Name of Course: **Solid Mechanics**	
C201.1	**Explain** types of loads, Stress-strain diagram for ductile and brittle materials and **Determine** stresses and strains
C201.2	**Draw** Shear force and bending moment diagram for transverse loadings and supports.
C201.3	**Compute** the bending stresses, shear stresses and slope & deflection on a beam.
C201.4	**Explain** Torsion on circular shafts, Thin-Walled Tubes and **Calculate** torsional shear stress in shaft and buckling of columns
C201.5	**Apply** the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
C201.6	**Apply** the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.

Course Code: **C202042**	
Name of Course: **Solid Modeling and Drafting**	
C202.1	Illustrate Fundamentals of 3D Modeling, CAD system, Model viewing in Product Lifecycle management
C202.2	Apply the knowledge of Curves & Surfaces to create complex solid geometry and create reverse Engineering of surface/solid modeling using Point Cloud Data
C202.3	Create & analyze solid models and assemblies using modeling technique by applying design principles
C202.4	APPLY geometric transformations to simple 2D objects
C202.5	Apply CAD model data for CAD based engineering applications viz. production

	drawings, 3D printing, FEA, CFD, MBD, CAE, CAM
C202.6	Apply PMI & MBD approach for communication

Course Code: **C202043**	
Name of Course: Engineering Thermodynamics	
C203.1	**DESCRIBE** the Fundamentals of Thermodynamics and **Apply** first law of thermodynamics to flow and non-flow process.
C203.2	**APPLY** the gas laws for thermodynamic processes and **Evaluate** the system performance by Second Law of Thermodynamics
C203.3	**APPLY** entropy, available and non available energy for an Open and Closed System
C203.4	**DETERMINE t**he properties of steam and their effect on performance of vapour power cycle.
C203.5	**ANALYSE** the fuel combustion process and products of combustion.
C203.6	**EVALUATE** the performance parameters of Steam generators and **ANALYZE** the Boiler Draught parmeters

Course Code: **C202044**	
Name of Course: **Engineering Materials and Metallurgy**	
C204.1	**Compare** crystal structures, **Estimate** lattice parameters & Material Properties and **Describe** the Deformation of Materials
C204.2	**Analyze** mechanical properties using destructive and non-destructive testing of materials and **Examine** surface morphology using Microscopic and Macroscopy Techniques
C204.3	**Examine** Solid solutions, **Estimate** Solidification parameters and **Describe** Phase Diagrams and Iron-Carbon Diagram
C204.4	**Describe** Austenite transformation in steel and A**pply** heat treatment processes and Surface Hardening methods to different materials
C204.5	**Describe** Ferrous Materials and **Establish** it's Microstructure and property relationship
C204.6	**Describe** and **select** appropriate Non-Ferrous Materials & recent material for industrial applications, **Establish** it's microstructure and property relationship

Course Code: **C202056**	
Name of Course: **Electrical and Electronics Engineering**	
C2056.1	**APPLY** programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
C2056.2	**DEVELOP** interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
C2056.3	**UNDERSTAND** the operation of DC motor, its speed control methods and braking
C2056.4	**DISTINGUISH** between types of three phase induction motor and its characteristic features
C2056.5	**EXPLAIN** about emerging technology of Electric Vehicle (EV) and its modular subsystems
C2056.6	**CHOOSE** energy storage devices and electrical drives for EVs

Course Code: **C202045**	
Name of Course: **Geometric Dimensioning and Tolerancing Lab**	
C205.1	**SELECT** appropriate IS and ASME standards for drawing
C205.2	**CREATE,** read and analyze the industrial drawings of the parts and assembly with appropriate tolerances, fits, Surface finish and Welding symbols
C205.3	**SELECT** an appropriate manufacturing process using DFM, DFA, etc.

Course Code: **207002**	
Name of Course: **Engineering Mathematics - III**	
207002.1	**Apply** the knowledge of higher order linear differential equations to model and **analyze** the mass spring systems.
207002.2	**Understand** the concepts of Laplace transform and Fourier transform and **apply** it to solve the models of vibration theory, heat transfer.
207002.3	**Interpret** and **analyze** the data using statistical tools and techniques.
207002.4	**Interpret** and **analyze** the data using probability techniques.
207002.5	**Understand** and **Apply** Vector Integral Calculus to Analyze Fluid Mechanics problems
207002.6	**Understand** the solutions of Partial differential equations and **analyze** the problems related to vibration of string and heat flow.

Course Code: **202047**	
Name of Course**: Kinematics of Machinery**	
C207.1	**Apply** kinematic analysis to simple mechanisms
C207.2	**Analyze** velocity and acceleration in mechanisms by Analytical method
C207.3	**Analyze** velocity and acceleration in mechanisms by graphical method
C207.4	**Synthesize** a four bar mechanism with analytical and graphical methods
C207.5	**Classify** and illustrate gears and gear train
C207.6	**Construct** cam profile for given follower motion and explain transfer Mechanisms in Automation Systems

Course Code: **C202048**	
Name of Course: **Theory of Machines – I**	
C208.1	**DETERMINE** COP of refrigeration system and **ANALYZE** psychometric processes.
C208.2	**Describe the** basics of engine terminology, air standard, fuel air and actual cycles.
C208.3	**Describe** the factors affecting the combustion performance of SI and CI engines and **discuss** the factors affecting knocking and detonation.
C208.4	**Analyze** the performance parameters for Engine and **Describe** the effect of engine emissions on environment and various emission control methods.
C208.5	**Describe** the Engine systems and alternative fuels
C208.6	**Explain** the construction and working reciprocating and rotary air compressors and **Evaluate** the performance of reciprocating compressors.

Course Code: **C202049**	
Name of Course**: Fluid Mechanics**	
C209.1	**Illustrate** the fluid properties
C209.2	**APPLY** the laws of fluid statics for the surfaces immersed in the fluid and **understand** the concept of buoyancy
C209.3	**Categorize** types of fluid flow and **Evaluate** terms associated in fluid kinematics
C209.4	**APPLY** principles of fluid dynamics for flow measurment
C209.5	**ESTIMATE** major and minor losses in internal flows and **DETERMINE** boundary layer formation over an external surface
C209.6	**CONSTRUCT** mathematical correlation considering dimensionless parameters and **Estimate** the performance of prototype using model laws

Course Code: **C202050**	
Name of Course: **Manufacturing Processes**	
C2050.1	**Design** and **Analyze** casting processes and describe its defect
C2050.2	**Explain** metal forming Processes and E**valuate** load required for rolling
C2050.3	**Demonstrate** press working operations and **Apply** the basic principles to **Design** dies and tools for forming and shearing operations
C2050.4	**Explain** different welding processes and **Evaluate** welding parameters
C2050.5	**Compare** thermoplastics and thermosetting and **Explain** polymer processing techniques
C2050.6	**Categorize** composites and D**escribe** the Composite Manufacturing Processes

Course Code: **202051**	
Name of Course: **Machine Shop**	
C2051.1	**PERFORM** welding using TIG/ MIG/ Resistance/Gas welding technique
C2051.2	**MAKE** Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
C2051.3	**PERFORM** cylindrical/surface grinding operation and CALCULATE its machining time
C2051.4	**DETERMINE** number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
C2051.5	**PREPARE** industry visit report
C2051.6	**UNDERSTAND** procedure of plastic processing

Course Code: **C203152**	
Name of Course: **Project Based Learning - II**	
C2052.1	**IDENTIFY** the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
C2052.2	**ANALYZE** the results and arrive at valid conclusions
C2052.3	**PROPOSE** a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge
C2052.4	**CONTRIBUTE** to society through proposed solutions by strictly following professional ethics and safety measures.
C2052.5	**USE** of technology in proposed work and demonstrate learning in oral and written form
C2052.6	**DEVELOP** ability to work as an individual and as a team member

T.E. Mechanical Engineering (2015 Course)

Course Code: C302041	
Name of Course: **Design of Machine Elements-I**	
C303.1	**DESIGN&ANALYZE** the cotter and knuckle Joints, levers and components subjected to eccentric loading.
C303.2	**DESIGN** shafts, keys and couplings under static loading conditions.
C303.3	**Design** machine components under fluctuating loads.
C303.4	**ANALYZE** different stresses in power screws and **design** screw jack.
C303.5	**EVALUATE&INTERPRET** the stress developed on the different type of welded and threaded joints.
C303.6	**APPLY** the design and development procedure for different types of springs.

Course Code: C302042	
Name of Course: **Heat Transfer (HT)**	
C302.1	**Formulate** heat conduction equations for one dimensional steady state thermal system without heat generation
C302.2	**Formulate** heat conduction equations for one dimensional steady state thermal system with heat generation and **Apply** principles of heat transfer to extended surfaces
C302.3	**Explain** Thermal insulation aspects and **Analyze** transient heat conduction
C302.4	**Evaluate** the heat transfer rate in natural and forced convection
C302.5	**Analyze** heat transfer by radiation.
C302.6	**Explain** condensation and boiling and **analyze** the performance of heat transfer equipments

Course Code: C302043	
Name of Course: **Theory of Machines II**	
C303.1	**Explain** the fundamentals of spur gear and **Analyze** forces in spur gear.
C303.2	**Explain** the fundamentals of Helical, Bevel, Worm and Worm Wheel gear and **Analyze** forces in it.
C303.3	**Explain** gear trains and **Analyze** speed and torque in gear trains.
C303.4	**Design** Cam profiles for given follower motions.
C303.5	**Discuss** steps in synthesis process and **synthesize** a four-bar mechanism
C303.6	**Discuss** step less regulation and **Analyze** the gyroscopic couple of ship, aero plane and four wheeler vehicles.

Course Code: C302044	
Name of Course: **Turbo Machines**	
C304.1	**Apply** the fundamentals of Turbomachines, and Impulse-Momentum Principle to **Evaluate** the performance of the vanes
C304.2	**Design** impulse water turbine and **analyze** its performance
C304.3	**Evaluate** the performance parameters of hydraulic reaction turbine
C304.4	**Analyze** the performance of the steam nozzles and **Evaluate** the performance parameters of Steam Turbines.
C304.5	**Design** centrifugal pump and **analyze** its performance
C304.6	**Illustrate** compressor types and **analyze** the performance parameters of Centrifugal and Axial flow Compressor

Course Code: C302045	
Name of Course: **Metrology & Quality Control (MQC)**	
C305.1	**Explain** the fundamentals of Metrology, Measurement System and **Design** gauges
C305.2	**Explain** comparators, gear metrology and **Measure** linear and Angular dimensions for different geometries
C305.3	**Explain** Advance Metrological Instruments and their applications in industries
C305.4	**Select** and **apply** the quality tools in design and manufacturing Engineering
C305.5	**Construct** control charts with the help of statistical quality control technique and **illustrate** Acceptance sampling
C305.6	**Understand** and **apply** quality management techniques and systems for engineering applications

Course Code: C302046	
Name of Course: **Skill Development**	
C306.1	**Interpret and demonstrate** the assembly and disassembly of the machines.
C306.2	**Apply** the knowledge of design of machinery and mechanisms.
C306.3	**Draw** the detailed design of the parts and assemblies.
C306.4	**Apply** the knowledge of geometric dimensioning and tolerances.

Course Code: C302054	
Name of Course: **AUDIT COURSE**	
C304.1	**Understand** and **analyze** technology and practices in smart manufacturing
C304.2	**Explain** challenges and advancement in industry

Course Code: C302047	
Name of Course: **Numerical Method & Optimization (NMO)**	
C307.1	**Understand** and **Apply** Error Approximations to SOLVE system of equations using numerical methods
C307.2	**Solve** system of equations using iterative numerical methods.
C307.3	**Understand**and Apply optimization techniques to solve engineering problems.
C307.4	**Estimate** solutions for differential equations using numerical techniques.
C307.5	**Design** and develop a model using a curve fitting and regression analysis.
C307.6	**Develop** solution for engineering applications with numerical integration.

Course Code: C302048	
Name of Course: **Design of Machine Elements-II**	
C308.1	**Describe** Gears and apply principles of gear design to spur gears and industrial spur gear boxes.
C308.2	**Design** and **analyze** Helical and Bevel Gear
C308.3	**Select & Design** Rolling Contact Bearings
C308.4	**Design** Worm & Worm gear for industrial applications
C308.5	**Explain** belt, rope and chain drives and design belt drives
C308.6	**Discuss** lubricating oils, Hydrodynamic lubrication and Design sliding contact bearing

Course Code: C302049	
Name of Course: **Refrigeration and Air Conditioning**	
C409.1	**Illustrate** the applications of refrigeration and air-conditioning and **Explain** refrigerant classes, properties and environmental issues.
C409.2	**Analyze** the performance of simple vapour compression and vapour absorption refrigeration systems
C409.3	**Evaluate** the performance parameters of multiple-pressure vapour compression systems and **Explain** Linde Hampson cycle.
C409.4	**Describe** psychometric processes and **Estimate** air conditioning load for human comfort.

C409.5	**Illustrate** air conditioning systems and components of refrigeration and air conditioning system
C409.6	**Design** simple duct system and **describe** air handling units

Course Code: **C302050**	
Name of Course: **Mechatronics (MTRX)**	
C300.1	**Understand** characteristic of instruments, sensors and actuators and **apply** for the measurement of appropriate parameters
C300.2	**Determine** the transfer function by using block diagram reduction technique.
C300.3	**Explain** the concept of signal processing and **apply** interfacing systems for data acquisition
C300.4	**Explain** Programmable logic control and **develop** the ladder programming for industrial and real time application.
C300.5	**Evaluate** Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.
C300.6	**Apply** the concept of different controller modes to an industrial application.

Course Code: C302051	
Name of Course: **Manufacturing -Process-II**	
C301.1	**Explain** Single point cutting tool parameters and **Analyze** merchants' circle and machinability
C301.2	**Describe** drilling, milling and broaching processes and state its applications
C301.3	**Illustrate** grinding and super finishing processes
C301.4	**Illustrate** advance machining processes and **state** its applications
C301.5	**Explain** CNC technology and **Apply** CNC programming to machining operations
C301.6	**Understand** the fundamentals of Jigs and Fixtures and **Design** jig and fixtures for machining operations

Course Code: C302052	
Name of Course: **Machine Shop-II**	
C203.1	**Create** marketable assembly using machining processes
C203.2	**Develop** and **apply** CNC programming to manufacture turning job
C203.3	**Design** and **draft** jig and fixture for machine components
C203.4	**Prepare** process planning sheet to manufacture machine components
C203.5	**Illustrate** machining processes in manufacturing plant
C203.1	**Create** marketable assembly using machining processes

Course Code: C302053	
Name of Course: **Seminar**	
C313.1	**Develop** a thought process to select and analyze technical topic
C313.2	**Understand, categorize, analyze and summarize** literature on selected topic
C313.3	**Develop** technical report/ research paper writing and presentation skills

B.E. Mechanical Engineering (2015 Course)

Course Code: **402041**	
Name of Course: **Hydraulics and Pneumatics**	
C401.1	**Apply** the basics of Fluid Power and evaluate the performance of hydraulic pumps
C401.2	**Demonstrate** the role of Actuators, Power Unit and accessories in Fluid Power System
C401.3	**Select** appropriate Control Valves for Hydraulic and Pneumatic systems
C401.4	**Analyze** Hydraulic circuits with their circuit diagram and **illustrate** the appropriate Contamination removal system.
C401.5	**Design** a Pneumatic system with suitable components, Control valves and related units.
C401.6	**Design and analyze** the Fluid power system according to the requirements.

Course Code:**402042**	
Name of Course: **CAD CAM Automation**	
C403.1	**Discuss** 2D, 3D transformation & projections and **C**reate 2D CAD basic entities for geometric transformations
C403.2	**Apply** analytical and synthetic curves and surfaces in part modeling.
C403.3	**Discuss** Finite Element Analysis (FEA) and **Analyze** performance of simple mechanical components and trusses
C403.4	**Create** CNC program for Turning / Milling and generate tool path using CAM software.
C403.5	**Explain** Product Life Cycle and **Develop** competency in designing and developing products using rapid manufacturing technology
C403.6	**Explain** Automation, Group Technology, Robotic systems and its application

Course Code:**402043**	
Name of Course: **Dynamics of Machinery**	
C403.1	**Estimate** natural frequency for single degree of freedom un-damped and damped free vibratory systems.
C403.2	**Determine** response of forced vibration due to harmonic excitation, base excitation and excitation due to unbalanced forces.
C403.3	**Estimate** natural frequencies and mode shapes for two degree of freedom un-damped free longitudinal and torsional vibratory systems.
C403.4	**Calculate** the magnitude and position of balancing mass for static and dynamic balancing of rotating and reciprocating machines.
C403.5	**Select** vibration measuring instruments and vibration control methods for industrial/real-life applications.
C403.6	**Illustrate** noise measuring instruments and noise reduction techniques for industries /real-life applications.

Course Code: **402044C**	
Name of Course: Elective-I **(Heating Ventilation and Air Conditioning)**	
C203.1	**Evaluate** the performance parameters of trans-critical & ejector refrigeration systems
C203.2	**Estimate** the thermal performance of compressor, evaporator, condenser and cooling tower.
C203.3	**Describe** refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
C203.4	**Explain** importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
C203.5	**Estimate** heat transmission through building walls using CLTD and decrement factor &time lag methods with energy-efficient and cost-effective measures for building envelope.
C203.6	**Explain** working of types of desiccants, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.

Course Code:**402045C**	
Name of Course: Elective-II (**Automobile Engineering**)	
C405A.1	**Point out** Current scenario in the Indian auto/ancillary industries and **demonstrate** Chassis, Frames and transmission systems
C405A.2	**Explain** the importance and features of axles, wheels, tyres and steering system
C405A.3	**Demonstrate** the suspension and brake systems.
C405A.4	**Describe** vehicle performance and safety measures used in Automotive Vehicles.
C405A.5	**Explain** electrical system, accessories, batteries and vehicle maintenance.
C405A.6	**Develop** a strong base for understanding EVs and HEVs.

Course Code:**402045C**	
Name of Course: Elective-II (**Energy Audit and Management**)	
C405C.1	**Compare** current energy scenario and energy policy of India and World
C405C.2	**Analyze** and Carry out the Energy Audit in Residence / Institute/ Organization
C405C.3	**Evaluate** the cost of utilization and **apply** financial techniques in energy conservation
C405C.4	**Identify and evaluate** energy conservation opportunities in Thermal Utilities
C405C.5	**Identify and evaluate** energy conservation opportunities in Electrical Utilities.
C405C.6	**Identify** the feasibility of Cogeneration and **apply** waste heat recovery techniques

Course Code:**402047**	
Name of Course: **Energy Engineering**	
C407.1	**Analyze** the power generation scenario in country and **Evalute** the performance of thermal power plant.
C407.2	**Analyze** the steam condensers and **identify** the environmental impact of thermal power plant and method to control the same
C407.3	**Identify** the layout, component details and environmental impacts of hydroelectric and nuclear power plant
C407.4	**Evaluate** the performance of Diesel and Gas Turbine power plant and **identify** its environmental impacts
C407.5	**Explain** the fundaments of non-conventional power plants
C407.6	**Explain** the different power plant electrical instruments and basic principles of economics of power generation

Course Code:**402048**	
Name of Course: **Mechanical System Design**	
C408.1	**Design** multi speed machine tool gear box
C408.2	**Estimate** reliability of mechanical elements using statistical considerations in design
C408.3	**Design** material handling systems
C408.4	**Design** cylinders and pressure vessels
C408.5	**Design** internal combustion engine components
C408.6	**Determine** optimum dimensions of mechanical components

Course Code:**402049 B**	
Name of Course: Elective-III **(Industrial Engineering)**	
C409B.1	**Explain** Industrial Engineering concepts and **Apply** Productivity improvement techniques
C409B.2	**Understand, analyze** and **implement** different concepts involved in method study
C409B.3	**Understand, design** and **Develop** different aspects of work systems and time systems
C409B.4	**Describe** Supply Chain Management and **Apply** production planning, capacity planning and Forecasting Techniques to the given product /process
C409B.5	**Explain** facility design concepts and **Analyze** plant layout modeling- simulation and material handling system - modeling simulation
C409B.6	**Understand** and **Apply** Industrial safety standards, financial management practices and Human Resource Development policies.

Course Code:**402050 BA**	
Name of Course: Elective-IV (**Advanced Manufacturing Processes)**	
C400A.1	**Classify** and A**nalyze** special forming processes
C400A.2	**Analyze** and **identify** applicability of advanced joining processes
C400A.3	**Understand** and **Analyze** the basic mechanisms of hybrid non-conventional machining techniques
C400A.4	**Explain** Micro Machining and Nano Fabrication Techniques, challenges and its applications
C400A.5	**Describe** and **Apply** various additive manufacturing technology for product development
C400A.6	**Understand** And **Illustrate** Material Characterization Techniques

Course Code:**402050 B**	
Name of Course: Elective-IV (**Solar & Wind Energy)**	
C4050B.1	**Explain** solar energy scenario and **evaluate** solar radiation parameters
C4050B.2	**Explain** concentrating and non-concentrating solar collectors
C4050B.3	**Discuss** and **apply** the Solar Photovoltaic systems
C4050B.4	**Design** and **Analyze**solar food drier, parabolic dish solar cooker and solar photovoltaic system
C4050B.5	**Analyze** and **estimate** performance of wind mill
C4050B.6	**Design** and **analyze** the domestic purpose wind turbine systems

Course Code:**402050 C**	
Name of Course: Elective-IV (**Product design and development**)	
C400.1	**Explain** the essential factors for Product Design and Development
C400.2	**Analyze** and **design** the product as per customer needs and satisfaction
C400.3	**Design** and **Evaluate** product from concept to function
C400.4	**Describe** methods and processes of Forward and Reverse engineering
C400.5	**Select** and **evaluate** design processes (DFA, DFMEA, Design for Reliability and Safety)
C400.6	**Interpret** the concepts of Product Lifecycle Management and Product Data Management.

Course Code:**402051**	
Name of Course: **PROJECT**	
C4051.1	**Implement** suitable methodology to solve the societal Problems pertaining to the mechanical engineering by utilizing the knowledge gained during the curriculum
C4051.2	**Create** the sustainable, economic and environmental friendly solution to the considered problem and analyze the same by effective utilization of relevant tools and techniques.
C4051.3	**Develop** managerial skills and work as a team for obtaining the solution of mechanical or interdisciplinary engineering related problems within stipulated time, following morality and ethics.

Robotics & Automation Engineering Department

Course Outcomes (COs)

S.E. Robotics & Automation   Engineering (2019 Course)

Course Code:207007	
Name of Course: Engineering Mathematics-III	
CO 1	Solve higher order linear differential equations and apply to modeling and analyzing mass spring systems.
CO 2	Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
CO 3	Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data and probability theory in testing and quality control.
CO 4	Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
CO 5	Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.

Course Code:211501	
Name of Course: Industrial Electronics and Electrical Technology	
CO 1	Develop the capability to identify and select suitable DC motor / induction motor
CO 2	Identify special purpose motor and its speed control method for given industrial application.
CO 3	Program Arduino IDE using conditional statements
CO 4	Interfacing sensors with Arduino IDE
CO 5	Analyze Microcontrollers and embedded systems terminologies and sensors

Course Code:211082	
Name of Course: Strength of Material	
CO 1	Explain stress and strain at a point as well as the stress-strain relationship for homogeneous, isotropic materials.
CO 2	Construct shear force and bending moment diagram
CO 3	Detect Shear stress and bending stress in a various cross sections of beams.

CO 4	Design the shaft subjected to torsion.
CO 5	Design and analyze the thick and thin cylinders used for industrial applications.
CO 6	Detect the slope and deflection of beam.
CO 7	Explain and detect the buckling of columns.

Course Code:211502	
Name of Course: Manufacturing Technology	
CO 1	Describe and classify metal casting processes
CO 2	Classify and analyze various forming processes
CO 3	Understand special casting and forming processes
CO 4	Classify and describe different types of welding and joining processes
CO 5	Understand various non-conventional machining process.
CO 6	Understand various applications of robots in manufacturing

Course Code:211503	
Name of Course: Material Science and Engineering Metallurgy	
CO 1	Define the mechanical properties of materials and conduct destructive and non-destructive tests to evaluate and test the properties of materials.
CO 2	Draw and explain equilibrium diagrams for various alloy systems.
CO 3	Work with Iron-Iron carbide equilibrium diagram and apply this knowledge for classification of steels from microstructure observations.
CO 4	Select proper Heat Treatment, Surface Hardening technique & Isothermal Treatments for the steels considering properties and service requirements.
CO 5	Distinguish different Alloy Steels and Cast Irons based on chemical compositions and microstructures.
CO 6	Familiarize with different types of non-ferrous alloys and Composites with their need scope and applications.

Course Code:211508	
Name of Course: Industrial Engineering and Management	
CO 1	Describe Principles and Types of Management
CO 2	Interpret Theories of Motivations and leadership
CO 3	Develop Entrepreneurship skills
CO 4	Apply various Tools and techniques of Industrial Engineering for Productivity improvement
CO 5	Apply Method study and examine the recorded facts and propose new method
CO 6	Apply Work Measurement techniques to determine standard time

Course Code:211509	
Name of Course: Control System Engineering	
CO 1	Model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer functions.
CO 2	Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behavior.
CO 3	Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability.
CO 4	Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis.
CO 5	Determine the frequency response of a control system and use it to evaluate or adjust the relative stability
CO 6	Design a P, PD, PI, or PID controller based on the transient and steady state response criteria.

Course Code: 211510	
Name of Course: Design of Machine Elements	
CO 1	Understand the basic principles and process of machine design
CO 2	Understand the theories of failures and Factor of safety to design mechanical component.
CO 3	Analyze the stress and strain on mechanical components such as shaft, power screws, mechanical springs, gears, and bearings.
CO 4	Understand, identify and quantify failure modes for mechanical parts such as shaft, power screws, mechanical springs, gears, and bearings.

CO 5	Demonstrate knowledge on basic machine elements used in design of machine elements to withstand the loads and deformations for a given practical application.

Course Code: 211511	
Name of Course: Metrology and Quality Assurance	
CO 1	Describe and work with various linear and angular measuring devices.
CO 2	Design limit gauges and work with special measuring devices for gear,screw thread and surface finish measurements.
CO 3	Distinguish various comparators and use profile projector.
CO 4	Use various control charts and various quality assurance tools.
CO 5	Get knowledge of various quality standards and their implementations in industries.
CO 6	Implement TQM and TPM concepts in practice

Course Code: 211512	
Name of Course: Computer Graphics for Robotics	
CO 1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics
CO 2	Use of geometric transformations on graphics objects and their application in robot kinematics analysis.
CO 3	Demonstrate the application of Bezier curves and interpolation in robot path planning.
CO 4	Apply concept of analytic geometry and geometric algebra for modeling in robotic physics