Engineering Mathematics I [107001]
CO1: Mean value theorems and its generalizations leading to Taylors and Maclaurin's Series useful in the analysis of engineering problems.
CO2: the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
CO3: to deal with derivative of functions of several variables that are essential in variousbranches of Engineering.
CO4: to apply the concept of Jacobian to find partial derivative of implicit function andfunctional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.
CO5: the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigenvalues and Eigen vectors applicable to engineering problems
CO6: Learn the basic definition and properties of Jacobian, error function and problems related to maxima and minima.

Engineering Mathematics II[107008]
CO1: Acquire knowledge of differential equation of first order first degree and its solution
CO2: learn how to apply first order first degree differential equation in engineering field.
CO3: Learn the basic results about the properties of Fourier series.
CO4: Differentiation under the integral sing and Error functions, Method to trace a curvedepends upon the representation of its equation in cartesian, polar or parametric form.
CO5: Solid Geometry, Cartesian, Spherical Polar and Cylindrical Co-ordinate System, Sphere, cone and cylinder.
CO6: Prepare to evaluate multiple integrals in rectangular, polar, spherical and cylindrical coordinates. Triple integrals in applications.

Engineering Physics [107002]
CO1: Develop understanding of interference, diffraction and polarization; connect it to few engineering applications
CO2: Learn basics of lasers and optical fibers and their use in some applications.
CO3: Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO4: Understand theory of semiconductors and their applications in some semiconductor devices.
CO5: Summarize basics of magnetism and superconductivity. Explore few of their technological applications.
CO6: Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterial and their application.

Engineering Chemistry [107009]
CO1. To understand technology involved in analysis and improving quality of water as commodity.

CO2. To acquire the knowledge of electro-analytical techniques that facilitates rapid and precise understanding of materials
CO3. To understand structure, properties and applications of specialty polymers and nanomaterial.
CO4. To study conventional and alternative fuels with respect to their properties and applications
CO5. To study spectroscopic techniques for chemical analysis.
CO6. To understand corrosion mechanisms and preventive methods for corrosion control

Engineering Mechanics [101011]

CO1: The student will be able to analyze statically determinate structures including trusses using equations of equilibrium.
CO2: The student will be able to find space-time relationship (kinematics) of particle.
CO3: The student will be able to solve dynamic problems of particle using Newton's law,energy method and impulse-momentum approach.
CO4: The student will be able to solve elementary problems in friction.
CO4: Develop skills for team work and technical communication and discussions.
CO5: Apply theoretical principles of modern physics to analysis and measurements performed in the laboratory.

Systems In Mechanical Engineering [102003]

CO1: To identify the sources of energy and their conversions.
CO2: To explain the basic concept of engineering thermodynamics and its applications.
CO3: To understanding the specifications of vehicles
CO4: To get acquainted with vehicle systems
CO5: To introduce manufacturing processes applying proper method to produce components
CO6: To be able to select and compare domestic appliances

Engineering Graphics-I [102012]

CO1: Students' ability in legible writing letters and numbers will be improved
CO2: Students' ability to perform basic sketching techniques and instrumental drawing will be improved.
CO3: Students will be able to draw orthographic projections of different objectsirrespective of number of dimensions and to develop pictorial views.
CO4: Students' ability to present the scale drawings of the visualized objects will be increased.
CO5: Students' ability to produce engineered drawing of any newly designed object will be improved.
CO6: Students will become familiar with practice and standards in technical drawing.
CO7: Students will develop good communication skills and team work.

Fundamentals of Computer Programming [110003]

CO1: To learn the basics of different types of programming.
CO2: To understand the syntax and building blocks of the C- program.
CO3: To learn to solve a problem using the C Program.
CO4: To compile and debug a C- Program.
CO5: To generate an executable file from program.

Programming and problem solving skills [110005]

CO1: 1. To understand problem solving, problem solving aspects, programming and to know about various program design tools.

CO2: To learn problem solving with computers.
CO3: To learn basics, features and future of Python programming.
CO4: To acquaint with data types, input output statements, decision making, looping and functions in Python
CO5: To learn features of Object Oriented Programming using Python.
CO6: To acquaint with the use and benefits of files handling in Python

Problem Based Learning [117013]
CO1: Project based learning will increase their capacity and learning through shared cognition.
CO2: Students able to draw on lessons from several disciplines and apply them in practical way.
CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Basic Mechanical Engineering [102013]
CO1: Understand mechanism of power transfer through belt, rope, chain and gear drives
CO2: Understand design process and Identify engineering materials, their properties,
CO3: Manufacturing methods encountered in engineering practice
CO4: Understand functions and operations of machine tools including milling, shaping, grinding and lathe machines
CO5: Understand basics of heat transfer, refrigeration and internal combustion engines.
CO6: Understand basics of thermodynamics and components of a thermal power plant.
Basic Electrical Engineering [103004**]**
CO 1. To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems.
CO 2. To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency along with different types of fields
CO 3. To provide knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits.
CO 4. To provide knowledge of the concepts of transformer, different energy conversions Techniques.
Workshop Practice [111006]
CO1: Familiar with safety norms to prevent any mishap in workshop.
CO2: Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO3: Able to understand the construction, working and functions of machine tools and their parts.
CO4: Able to know simple operations (Turning and Facing) on a center lathe.
Environmental Studies-I [101007**]**
CO1:Demonstrate an integrative approach to environmental issues with a focus on sustainability
CO2: Explain and identify the role of the organism in energy transfers in different Ecosystems.
CO3: Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources
CO4: Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.

Basic Electronics Engineering [104010]

CO1: Acquire basic knowledge on the working of various diode circuits.

CO2: Develop analysis capability in BJT and MOSFET Amplifier Circuits.

CO3: Develop competence in Opamp another linear integrated circuits

CO4: Acquire knowledge on basic digital electronic gates.

CO5: Develop knowledge of electronics used in industry.

CO6: Develop knowledge on electronics communication components and systems.

Environmental Studies-II [101014]

CO1: Have an understanding of environmental pollution and the science behind those problems and potential solutions.

CO2: Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.

CO3: Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.

CO4: Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve Environmental problems and/or issues.

Program Outcomes		
PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural Sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

A graduate of the Computer Engineering Program will demonstrate-

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

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

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

Course Outcomes (COs)	
Second Year (2019 Course)	
C301	**Discrete Mathematics**
C301.1	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
C301.2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
C301.3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
C301.4	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems
C301.5	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatory.
C301.6	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
C301.7	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures
C302	**Fundamentals of Data Structures**
C302.1	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
C302.2	Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.
C302.3	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
C302.4	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
C302.5	Compare and contrast different implementations of data structures (dynamic and static).
C302.6	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.

C303	**Object Oriented Programming**
C303.1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
C303.2	Design object-oriented solutions for small systems involving multiple objects.
C303.3	Use virtual and pure virtual function and complex programming situations.
C303.4	Apply object-oriented software principles in problem solving.
C303.5	Analyze the strengths of object-oriented programming.
C303.6	Develop the application using object oriented programming language (C++).
C304	**Computer Graphics**
C304.1	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
C304.2	Apply mathematics to develop Computer programs for elementary graphic operations.
C304.3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
C304.4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
C304.5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
C304.6	Create effective programs using concepts of curves, fractals, animation and gaming.
C305	**Digital Electronics and Logic Design**
C305.1	Simplify Boolean Expressions using K Map.
C305.2	Design and implement combinational circuits.
C305.3	Design and implement sequential circuits.
C305.4	Develop simple real-world application using ASM and PLD.
C305.5	Differentiate and Choose appropriate logic families IC packages as per the given design specifications.
C305.6	Explain organization and architecture of computer system
C306	**Data Structures Laboratory**
C306.1	Use algorithms on various linear data structure using sequential organization to solve real life problems.
C306.2	Analyze problems to apply suitable searching and sorting algorithm to various applications.
C306.3	Analyze problems to use variants of linked list and solve various real life problems.
C306.4	Designing and implement data structures and algorithms for solving different kinds of problems.
C307	**OOP and Computer Graphics Laboratory**
C307.1	Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.
C307.2	Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.
C307.3	Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion and filling with the help of object oriented programming concepts.
C307.4	Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.

C307.5	Apply logic to implement, curves, fractals, animation and gaming programs.
C308	**Digital Electronics Laboratory**
C308.1	Understand the working of digital electronic circuits.
C308.2	Apply the knowledge to appropriate IC as per the design specifications.
C308.3	Design and implement Sequential and Combinational digital circuits as per the specifications.
C309	**Business Communication Skills**
C309.1	Express effectively through verbal/oral communication and improve listening skills
C309.2	Write precise briefs or reports and technical documents.
C309.3	Prepare for group discussion / meetings / interviews and presentations.
C309.4	Explore goal/target setting, self-motivation and practicing creative thinking.
C309.5	Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities
C310	**Humanity and Social Science**
C310.1	Aware of the various issues concerning humans and society.
C310.2	Aware about their responsibilities towards society.
C310.3	Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.
C310.4	Able to understand the nature of the individual and the relationship between self and the community.
C310.5	Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
C311	**Smart Cities**
C311.1	Understand the dynamic behavior of the urban system by going beyond the physical appearance and by focusing on representations, properties and impact factors
C311.2	Explore the city as the most complex human-made organism with a metabolism that can be modelled in terms of stocks and flows.
C311.3	Knowledge about data-informed approaches for the development of the future city, based on crowd sourcing and sensing.
C311.4	Knowledge about the latest research results in for the development and management of future cities
C311.5	Understand how citizens can benefit from data-informed design to develop smart and responsive cities
C401	**Engineering Mathematics III**
C401.1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
C401.2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
C401.3	Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
C401.4	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
C401.5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
C402	**Data Structures and Algorithms**

C402.1	Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications.
C402.2	Apply non-linear data structures for solving problems of various domains.
C402.3	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
C402.4	Analyze the algorithmic solutions for resource requirements and optimization
C402.5	Use efficient indexing methods and multiway search techniques to store and maintain data.
C402.6	Use appropriate modern tools to understand and analyse the functionalities confined to the secondary storage.
C403	**Software Engineering**
C403.1	Analyze software requirements and formulate design solution for software.
C403.2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
C403.3	Apply new software models, techniques and technologies to bring out innovative and Novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
C403.4	Model and design User interface and component-level.
C403.5	Identify and handle risk management and software configuration management.
C403.6	Utilize knowledge of software testing approaches, approaches to verification and validation.
C403.7	Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.
C404	**Microprocessor**
C404.1	Exhibit skill of assembly language programming for the application.
C404.2	Classify Processor architectures
C404.3	Illustrate advanced features of 80386 Microprocessor.
C404.4	Compare and contrast different processor modes.
C404.5	Use interrupts mechanism in applications
C404.6	Differentiate between Microprocessors and Microcontrollers.
C404.7	Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.
C403	**Software Engineering**
C403.1	Analyze software requirements and formulate design solution for software.
C403.2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
C403.3	Apply new software models, techniques and technologies to bring out innovative and Novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
C403.4	Model and design User interface and component-level.
C403.5	Identify and handle risk management and software configuration management.
C403.6	Utilize knowledge of software testing approaches, approaches to verification and validation.

C403.7	Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.	
C405	**Principles of Programming Languages**	
C405.1	Make use of basic principles of programming languages.	
C405.2	Develop a program with Data representation and Computations.	
C405.3	Develop programs using Object Oriented Programming language: Java.	
C405.4	Develop application using inheritance, encapsulation, and polymorphism.	
C405.5	Demonstrate Multithreading for robust application development.	
C405.6	Develop a simple program using basic concepts of Functional and Logical programming paradigm.	
C406	**Data Structures and Algorithms Laboratory**	
C406.1	Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem.	
C406.2	Choose most appropriate data structures and apply algorithms for graphical solutions of the problems.	
C406.3	Apply and analyze nonlinear data structures to solve real world complex problems.	
C406.4	Apply and analyze algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression.	
C406.5	Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations.	
C407	**Microprocessor Laboratory**	
C407.1	Understand and apply various addressing modes and instruction set to implement assembly language programs	
C407.2	Apply logic to implement code conversion.	
C407.3	Analyze and apply logic to demonstrate processor mode of operation.	
C408	**Project Based Learning II**	
C408.1	Identify the real life problem from societal need point of view	
C408.2	Choose and compare alternative approaches to select most feasible one	
C408.3	Analyze and synthesize the identified problem from technological perspective.	
C408.4	Design the reliable and scalable solution to meet challenges.	
C408.5	Evaluate the solution based on the criteria specified.	
C408.6	Inculcate long life learning attitude towards the societal problems.	
C409	**Code of Conduct**	
C409.1	Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field.	
C409.2	Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.	
C409.3	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	

C409.4	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.

Third Year (2015 Course)	
C501	**Theory of Computation**
C501.1	Able to design deterministic Turing machine for allinputs and all outputs
C501.2	Able to subdivide problem space based on inputsubdivision using constraints
C501.3	Able to apply linguistic theory
C502	**Database Management Systems**
C502.1	Design E-R Model for given requirements andconvert the same into database tables.
C502.2	Use database techniques such as SQL & PL/SQL.
C502.3	Use modern database techniques such as NOSQL.
C502.4	Explain transaction Management in relational database System.
C502.5	Describe different database architecture and analyses the use of appropriate architecture in real time environment.
C502.6	Students will be able to use advanced database Programming concepts Big Data – HADOOP
C503	**Software Engineering & Project Management**
C503.1	Decide on a process model for a developing asoftware project
C503.2	Classify software applications and Identify uniquefeatures of various domains
C503.3	Design test cases of a software system.
C503.4	Understand basics of IT Project management.
C503.5	Plan, schedule and execute a project considering therisk management.
C503.6	Apply quality attributes in software developmentlife cycle.
C504	**InformationSystems & Engineering Economics**
C504.1	Understand the need, usage and importance of an Information System to an organization.
C504.2	Understand the activities that are undertaken while managing, designing, planning, implementation, anddeployment of computerized information system in an organization.
C504.3	Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successfulimplementation of these technology solutions in anyorganizations
C504.4	Outline the past history, present position andexpected performance of a company engaged in engineering practice or in the computer industry.Perform and evaluate present worth, future worth and annual worth analyses on one of more economicalternatives.
C504.5	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
C505	**Computer Networks**
C505.1	Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies
C505.2	Demonstrate design issues, flow control and error control.
C505.3	Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.

C505.4	Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
C505.5	Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.
C505.6	Demonstrate different routing and switching algorithms
C506	**Skill Development Lab**
C506.1	Evaluate problems and analyze data using current technologies in a wide variety of business and organizational contexts.
C506.2	Create data-driven web applications.
C506.3	Incorporate best practices for building applications.
C506.4	Employ Integrated Development Environment (IDE) for implementing and testing of software solution.
C506.5	Construct software solutions by evaluating alternate architectural patterns.
C507	**Database Management System Lab**
C507.1	Develop the ability to handle databases of varying complexities.
C507.2	Use advanced database Programming concepts.
C508	**Computer Networks Lab**
C508.1	Demonstrate LAN and WAN protocol behavior using Modern Tools.
C508.2	Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
C508.3	Demonstrate basic configuration of switches and routers.
C508.4	Develop Client-Server architectures and prototypes by the means of correct standards and technology
C601	**Design andAnalysis ofAlgorithms**
C601.1	Formulate the problem
C601.2	Analyze the asymptotic performance of algorithms
C601.3	Decide and apply algorithmic strategies to solvegiven problem
C601.4	Find optimal solution by applying various methods
C602	**Systems Programming andOperating System**
C602.1	Analyze and synthesize system software
C602.2	Use tools like LEX & YACC.
C602.3	Implement operating system functions
C603	**Embedded Systems and Internet of Things**
C603.1	Implement an architectural design for IOT for specified requirement.
C603.2	Solve the given societal challenge using IOT.
C603.3	Choose between available technologies and devicesfor stated IOT challenge.
C604	**Software Modeling andDesign**
C604.1	Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
C604.2	Design and analyze an application using UML modeling as fundamental tool
C604.3	Apply design patterns to understand reusability inOO design

C604.4	Decide and apply appropriate modern tool fordesigning and modeling.
C604.5	Decide and apply appropriate modern testing toolfor testing web-based/desktop application
C605	**Web Technology**
C605.1	Analyze given assignment to select sustainable web development design methodology.
C605.2	Develop web based application using suitable client side and server side web technologies
C605.3	Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management
C606	**Seminar and Technical Communication**
C606.1	Be able to be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
C606.2	Be able to improve skills to read, understand, and interpret material on technology.
C606.3	Improve communication and writing skills
C607	**Web Technology Lab**
C607.1	Develop web based application using suitable client side and server side web technologies
C607.2	Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management
C608	**System Programming & Operating System Lab**
C608.1	Understand the internals of language translators
C608.2	Handle tools like LEX & YACC.
C608.3	Understand the Operating System internals and functionalities with implementation point of view
C609	Embedded Systems & Internet of Things Lab
C609.1	Design the minimum system for sensor based application
C609.2	Solve the problems related to the primitive needs using IoT
C609.3	Develop full-fledged IoT application for distributed environment

Fourth Year (2015 Course)	
C701	**High Performance Computing**
C701.1	Describe different parallel architectures, inter-connect networks, programming models
C701.2	Develop an efficient parallel algorithm to solve given problem
C701.3	Analyze and measure performance of modern parallel computing systems
C701.4	Build the logic to parallelize the programming task
C702	**Artificial Intelligence and Robotics**
C702.1	Identify and apply suitable Intelligent agents for various AI applications
C702.2	Design smart system using different informed search / uninformed search or heuristic approaches.
C702.3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
C702.4	Apply the suitable algorithms to solve AI problems
C703	**Data Analytics**

C703.1	Write case studies in Business Analytic and Intelligence using mathematical models
C703.2	Present a survey on applications for Business Analytic and Intelligence
C703.3	Provide problem solutions for multi-core or distributed, concurrent/Parallel environments
C704(D)	**Elective I** **Data Mining and Warehousing**
C704.1	Apply basic, intermediate and advanced techniques to mine the data.
C704.2	Analyze the output generated by the process of data mining.
C704.3	Explore the hidden patterns in the data.
C704.4	Optimize the mining process by choosing best data mining technique.
C705 (B)	**Elective II** **Software Testing and Quality Assurance**
C705.1	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
C705.2	Design and develop project test plan, design test cases, test data, and conduct test operations
C705.3	Apply recent automation tool for various software testing for testing software
C705.4	Apply different approaches of quality management, assurance, and quality standard to software system
C705.5	Apply and analyze effectiveness Software Quality Tools
C705 (D)	**Mobile Communication**
C705.1	Justify the Mobile Network performance parameters and design decisions.
C705.2	Choose the modulation technique for setting up mobile network.
C705.3	Formulate GSM/CDMA mobile network layout considering futuristic requirements which conforms to the technology.
C705.4	Use the 3G/4G technology based network with bandwidth capacity planning.
C705.5	Percept to the requirements of next generation mobile network and mobile applications.
C801	**Machine Learning**
C801.1	Distinguish different learning based applications
C801.2	Apply different pre-processing methods to prepare training data set for machine learning.
C801.3	Design and implement supervised and unsupervised machine learning algorithm.
C801.4	Implement different learning models
C801.5	Learn Meta classifiers and deep learning concepts
C802	**Information and Cyber Security**
C802.1	Gauge the security protections and limitations provided by today's technology.
C802.2	Identify information security and cyber security threats.

C802.3	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
C802.4	Build appropriate security solutions against cyber-attacks.
C803 (D)	**Elective III** **Soft Computing and Optimization Algorithms**
C803.1	Apply soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzy logic, fuzzy inference systems and genetic algorithms
C803.2	Design and development of certain scientific and commercial application using computational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified applications.
C804 (B)	**Elective IV** **Human Computer Interface**
C804.1	Evaluate the basics of human and computational abilities and limitations
C804.2	Inculcate basic theory, tools and techniques in HCI.
C804.3	Apply the fundamental aspects of designing and evaluating interfaces.
C804.4	Apply appropriate HCI techniques to design systems that are usable by people
C804 (C)	**Elective IV** **Cloud Computing**
C804.1	To install cloud computing environments.
C804.2	To develop any one type of cloud
C804.3	To explore future trends of cloud computing

Program Outcomes		
PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural Sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in Multidisciplinary Environments.
PO12	**Life-long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest Context of technological change.

Program Specific Outcomes:

Sr. No.	Program Specific Outcomes	Bloom's Level
PSO 1	An ability to apply the theoretical concepts and practical knowledge of Information Technology in analysis, design, development and management of information processing systems and applications in the interdisciplinary domain.	L3: **Apply**
PSO2	An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large-scale computing systems	L2: **Analyze**
PSO3	An understanding of professional, business and business processes, ethical, legal, security and social issues and responsibilities.	L1:**Understand**
PSO4	Practice communication and decision-making skills through the use of appropriate technology and be ready for professional responsibilities	L3:**Apply**

Course Outcomes (COs)	
Second Year Engineering	
C301	**Discrete Mathematics**
C301.1	Formulate and apply formal proof techniques and solve the problems with logical reasoning.
C301.2	Analyze and evaluate the combinatorial problems by using probability theory.
C301.3	Apply the concepts of graph theory to devise mathematical models.
C301.4	Analyze types of relations and functions to provide solution to computational problems.
C301.5	Identify techniques of number theory and its application.
C301.6	Identify fundamental algebraic structures
C302	**Logic Design & Computer Organization**
C302.1	Perform basic binary arithmetic & simplify logic expressions.
C302.2	Grasp the operations of logic ICs and Implement combinational logic functions using ICs.
C302.3	Comprehend the operations of basic memory cell types and Implement sequential logic functions using ICs
C302.4	Elucidate the functions & organization of various blocks of CPU.
C302.5	Understand CPU instruction characteristics, enhancement features of CPU.
C302.6	Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.
C303	**Data Structure & Algorithms**
C303.1	To study data structures and their implementations and applications.
C303.2	To learn different searching and sorting techniques.
C303.3	To study some advanced data structures such as trees, graphs and tables.
C303.4	To learn different file organizations.
C303.5	To learn algorithm development and analysis of algorithms.
C304	**Object-Oriented Programming**
C304.1	Differentiate various programming paradigms.
C304.2	Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems.
C304.3	Identify relationship among objects using inheritance and polymorphism principles.
C304.4	Handle different types of exceptions and perform generic programming.
C304.5	Use of files for persistent data storage for real world application.
C304.6	Apply appropriate design patterns to provide object-oriented solutions
C305	**Data Structures**
C305.1	Solve mathematical problems using C programming language.
C305.2	Implement sorting and searching algorithms and calculate their complexity.
C305.3	Develop applications of stack and queue using array.
C305.4	Demonstrate applicability of Linked List.
C305.5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
C305.6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.
C306	**Basics of Computer Network**
C306.1	Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model.
C306.2	Analyze data link layer services, error detection and correction, linear block codes, cyclic Codes, framing and flow control protocols.
C306.3	Compare different access techniques, channelization and IEEE standards.
C306.4	Apply the skills of submitting, super netting and routing mechanisms.
C306.5	Differentiate IPv4 and IPv6.

C306.6	Illustrate services and protocols used at transport layer
C307	**Logic Design &Computer Organization Lab**
C307.1	Use logic function representation for simplification with K-Maps and design Combinational logic circuits using SSI & MSI chips.
C307.2	Design Sequential Logic circuits: MOD counters using synchronous counters. CO3: Understand the basics of simulator tool & to simulate basic blocks such as ALU & memory.
C307.3	Understand the basics of simulator tool & to simulate basic blocks such as ALU & memory.
C308	**Data Structure & Algorithms Lab**
C308.1	Analyze algorithms and to determine algorithm correctness and time efficiency class.
C308.2	Implement abstract data type (ADT) and data structures for given application.
C308.3	Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.).
C308.4	Solve problems using algorithmic design techniques and data structures. CO5: Analyze of algorithms with respect to time and space complexity.
C308.5	Analyze of algorithms with respect to time and space complexity.
C309	**Object Oriented Programming Lab**
C309.1	Differentiate various programming paradigms.
C309.2	Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems.
C309.3	Identify relationship among objects using inheritance and polymorphism.
C309.4	Handle different types of exceptions and perform generic programming.
C309.5	Use file handling for real world application.
C309.6	Apply appropriate design patterns to provide object-oriented solutions.
C310	**Soft Skill Lab**
C310.1	Introspect about individual's goals, aspirations by evaluating one's SWOC and think creatively.
C310.2	Develop effective communication skills including Listening, Reading, Writing and Speaking.
C310.3	Constructively participate in group discussion, meetings and prepare and deliver Presentations.
C310.4	Write precise briefs or reports and technical documents.
C310.5	Practice professional etiquette, present oneself confidently and successfully handle personal interviews.
C310.6	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.
C401	**Engineering Mathematics -III**
C401.1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
C401.2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
C401.3	Apply Statistical methods like correlation& regression analysis and probability theory for data analysis and predictions in machine learning.
C401.4	Solve Algebraic &Transcendental equations and System of linear equations using numerical techniques.
C401.5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing
C402	**Processor Architecture**
C402.1	Apprehend architecture and memory organization of PIC 18 microcontroller.
C402.2	Implement embedded C programming for PIC 18.
C402.3	Use concepts of timers and interrupts of PIC 18.
C402.4	Demonstrate real life applications using PIC 18.
C402.5	Analyze architectural details of ARM processor.
C403	**Database Management System**
C403.1	Apply fundamental elements of database management systems.
C403.2	Design ER-models to represent simple database application scenarios.
C403.3	Formulate SQL queries on data for relational databases. CO4: Improve the database design by normalization & to incorporate query processing.
C403.4	Improve the database design by normalization & to incorporate query processing.

C403.5	Apply ACID properties for transaction management and concurrency control.
C403.6	Analyze various database architectures and technologies
C404	**Computer Graphics**
C404.1	Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving.
C404.2	Employ techniques of geometrical transforms to produce, position and manipulate Objects in 2 dimensional and 3-dimensional space respectively.
C404.3	Describe mapping from a world coordinates to device coordinates, clipping, and projections in order to produce 3D images on 2D output device. CO4: Apply concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications.
C404.4	Apply concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications.
C404.5	Perceive the concepts of virtual reality
C405	**Software Engineering**
C405.1	Classify various software application domains.
C405.2	Analyze software requirements by using various modeling techniques.
C405.3	Translate the requirement models into design models.
C405.4	Apply planning and estimation to any project.
C405.5	Use quality attributes and testing principles in software development life cycle.
C405.6	Discuss recent trends in Software engineering by using CASE and agile tools.
C406	**Programming Skill Development Lab**
C406.1	Apply concepts related to embedded C programming.
C406.2	Develop and Execute embedded C program to perform array addition, block transfer, sorting operations
C406.3	Perform interfacing of real-world input and output devices to PIC18FXXX microcontroller.
C406.4	Use source prototype platform like Raspberry-Pi/Beagle board/Arduino.
C407	**Database Management System Lab**
C407.1	Install and configure database systems.
C407.2	Analyze database models & entity relationship models.
C407.3	Design and implement a database schema for a given problem-domain
C407.4	Implement relational database systems.
C407.5	Populate and query a database using SQL DDL / DML / DCL commands.
C407.6	Design a backend database of any one organization: CASE STUDY
C408	**Computer Graphics Lab**
C408.1	Apply line& circle drawing algorithms to draw the objects.
C408.2	Apply polygon filling methods for the object.
C408.3	Apply polygon clipping algorithms for the object.
C408.4	Apply the 2D transformations on the object.
C408.5	Implement the curve generation algorithms.
C408.6	Demonstrate the animation of any object using animation principles.
C409	**Project Based Learning**
C410.1	Design solution to real life problems and analyze its concerns through shared cognition.
C410.2	Apply learning by doing approach in PBL to promote lifelong learning.
C410.3	Tackle technical challenges for solving real world problems with team efforts.
C410.4	Collaborate and engage in multi-disciplinary learning environments.

	Course Outcomes (COs)
Third Year Engineering	
C501	**Theory Of Computation**
C501.1	To construct finite state machines to solve problems in computing.
C501.2	To write mathematical expressions for the formal languages

C501.3	To apply well defined rules for syntax verification.	
C501.4	To construct and analyze Push Down, Post and Turing Machine for formal languages.	
C501.5	To express the understanding of the decidability and decidability problems.	
C501.6	To express the understanding of computational complexity.	
C502	**Database Management Systems**	
C502.1	To define basic functions of DBMS & RDBMS.	
C502.2	To analyze database models & entity relationship models.	
C502.3	To design and implement a database schema for a given problem-domain.	
C502.4	To populate and query a database using SQL DML/DDL commands.	
C502.5	Do Programming in PL/SQL including stored procedures, stored functions, cursors and packages.	
C502.6	To appreciate the impact of analytics and big data on the information industry and the external	
C503	**Software Engineering And Project Management**	
C503.1	To identify unique features of various software application domains and classify software applications.	
C503.2	To choose and apply appropriate lifecycle model of software development.	
C503.3	To describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.	
C503.4	To analyze software requirements by applying various modeling techniques.	
C503.5	To list and classify CASE tools and discuss recent trends and research in software engineering.	
C503.6	To understand IT project management through life cycle of the project and future trends in IT Project Management.	
C504	**Operating System**	
C504.1	Fundamental understanding of the role of Operating Systems.	
C504.2	To understand the concept of a process and thread.	
C504.3	To apply the cons of process/thread scheduling.	
C504.4	To apply the concept of process synchronization, mutual exclusion and the deadlock.	
C504.5	To realize the concept of I/O management and File system.	
C504.6	To understand the various memory management techniques.	
C505	**Human-Computer Interaction**	
C505.1	To explain importance of HCI study and principles of user-centred design (UCD) approach.	
C505.2	To develop understanding of human factors in HCI design.	
C505.3	To develop understanding of models, paradigms and context of interactions.	
C505.4	To design effective user-interfaces following a structured and organized UCD process.	
C505.5	To evaluate usability of a user-interface design.	
C505.6	To apply cognitive models for predicting human-computer-interactions.	
C506	**Software Laboratory - I**	
C506.1	To install and configure database systems.	
C506.2	To analyze database models & entity relationship models.	
C506.3	To design and implement a database schema for a given problem-domain	
C506.4	To understand the relational and document type database systems.	
C506.5	To populate and query a database using SQL DML/DDL commands.	
C506.6	To populate and query a database using MongoDB commands.	
C507	**Software Laboratory – II**	
C507.1	To understand the basics of Linux commands and program the shell of Linux.	
C507.2	To develop various system programs for the functioning of operating system.	
C507.3	To implement basic building blocks like processes, threads under the Linux.	
C507.4	To develop various system programs for the functioning of OS concepts in user space like concurrency control and file handling in Linux.	
C507.5	To design and implement Linux Kernel Source Code.	

C507.6	To develop the system program for the functioning of OS concepts in kernel space like embedding the system call in any Linux kernel.
C508	**Software Laboratory – III**
C508.1	To identify the needs of users through requirement gathering.
C508.2	To apply the concepts of Software Engineering process models for project development.
C508.3	To apply the concepts of HCI for user-friendly project development.
C508.4	To deploy website on live webserver and access through URL.
C508.5	To understand, explore and apply various web technologies.
C508.6	To develop team building for efficient project development.
C509	**Audit Course 3**
C509.1	Develop a far deeper understanding of the changing digital landscape.
C509.2	Identify some of the latest digital marketing trends and skill sets needed for today's marketer.
C509.3	Successful planning, prediction, and management of digital marketing campaigns.
C509.4	Implement smart management of different digital assets for marketing needs. Assess digital marketing as a long term career opportunity.
C601	**Computer Network Technology**
C601.1	To know Responsibilities, services offered and protocol used at each layer of network.
C601.2	To understand different addressing techniques used in network.
C601.3	To know the difference between different types of network.
C601.4	To know the different wireless technologies and IEEE standards.
C601.5	To use and apply the standards and protocols learned, for application development.
C601.6	To understand and explore recent trends in network domain.
C602	**Systems Programming**
C602.1	To learn independently modern software development tools and creates novel solutions for language processing applications.
C602.2	To design and implement assemblers and macro processors.
C602.3	To use tool LEX for generation of Lexical Analyzer.
C602.4	To use YACC tool for generation of syntax analyzer.
C602.5	To generate output for all the phases of compiler.
C602.6	To apply code optimization in the compilation process.
C603	**Design And Analysis Of Algorithms**
C603.1	To calculate computational complexity using asymptotic notations for various algorithms.
C603.2	To apply Divide & Conquer as well as Greedy approach to design algorithms.
C603.3	To practice principle of optimality.
C603.4	To illustrate different problems using Backtracking.
C603.5	To compare different methods of Branch and Bound strategy.
C603.6	To explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms.
C604	**Cloud Computing**
C604.1	To understand the need of Cloud based solutions.
C604.2	To understand Security Mechanisms and issues in various Cloud Applications
C604.3	To explore effective techniques to program Cloud Systems.
C604.4	To understand current challenges and trade-offs in Cloud Computing.
C604.5	To find challenges in cloud computing and delve into it to effective solutions.
C604.6	To understand emerging trends in cloud computing.
C605	**Data Science And Big Data Analytics**
C605.1	To understand Big Data primitives.
C605.2	To learn and apply different mathematical models for Big Data.
C605.3	To demonstrate their Big Data learning skills by developing industry or research applications.
C605.4	To analyze each learning model come from a different algorithmic approach and it will perform differently under different datasets.
C605.5	To understand needs, challenges and techniques for big data visualization.
C605.6	To learn different programming platforms for big data analytics.

C606	Software Laboratory – IV
C606.1	To implement small size network and its use of various networking commands.
C606.2	To understand and use various networking and simulations tools.
C606.3	To configure various client/server environments to use application layer protocols
C606.4	To understand the protocol design at various layers.
C606.5	To explore use of protocols in various wired and wireless applications.
C606.6	To develop applications on emerging trends.
C607	**Software Laboratory - V**
C607.1	To design and implement two pass assembler for hypothetical machine instructions.
C607.2	To design and implement different phases of compiler (Lexical Analyzer, Parser, Intermediate code generation)
C607.3	To use the compile generation tools such as "Lex" and "YACC".
C607.4	To apply algorithmic strategies for solving various problems.
C607.5	To compare various algorithmic strategies.
C607.6	To analyze the solution using recurrence relation.
C608	**Software Laboratory - Vi**
C608.1	To apply Big data primitives and fundamentals for application development.
C608.2	To explore different Big data processing techniques with use cases.
C608.3	To apply the Analytical concept of Big data using R/Python.
C608.4	To visualize the Big Data using Tableau.
C608.5	To design algorithms and techniques for Big data analytics.
C608.6	To design Big data analytic application for emerging trends.
C609	**Project Based Seminar**
C609.1	To Gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
C609.2	To write a technical report summarizing state-of-the-art on an identified topic.
C609.3	Present the study using graphics and multimedia presentations.
C609.4	Define intended future work based on the technical review.
C609.5	To explore and enhance the use of various presentation tools and techniques.
C609.6	To understand scientific approach for literature survey and paper writing.
C610	**Audit Course 4**
C610.1	Identify the health- and skill-related fitness components.
C610.2	Understand the benefits of physical fitness, and the underlying principles, physiology, and practices for fitness development.
C610.3	Apply of fitness management skills and strategies for the development of physical activity habits and personal fitness by the students.
C610.4	Aware about healthy diet for physical and mental fitness of an individual.
C610.5	Understand importance of mental fitness along with physical fitness by practicing yoga, meditation and relaxation techniques.
Course Outcomes (COs)	
Fourth Year Engineering	
701	**Information and Cyber Security**
701.1	Be able to use basic cryptographic techniques in software and system design.
701.2	Apply methods for authentication, access control, intrusion detection and prevention.
701.3	Able to apply the scientific method to digital forensics and perform forensic investigations.
701.4	To develop computer forensics awareness.
701.5	Ability to use computer forensics tools.
702	**Machine Learning and Applications**
702.1	Model the learning primitives.
702.2	Build the learning model.
702.3	Tackle real world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer vision, Linguistics and Bioinformatics.
703	**Software Design and Modelling**

703.1	Understand object oriented methodologies, basics of Unified modelling Language (UML).
703.2	Understand analysis process, use case modeling, domain/class modeling
703.3	Understand interaction and behavior modeling.
703.4	Understand design process and business, access and view layer class design
703.5	Get started on study of GRASP principles and GoF design patterns.
703.6	Get started on study of architectural design principles and guidelines in the various type of application development.
704(A)	**Elective-I : Wireless Communications**
704.1(A)	Understand the basics of propagation of radio signals
704.2(A)	Understand the basic concepts of basic Cellular System and the design requirements
704.3(A)	Have an understanding of the basic principles behind radio resource management techniques such as power control, channel allocation and handoffs.
704.4(A)	Gain insights into various mobile radio propagation models and how the diversity can be exploited to improve performance
704.5(A)	Gain knowledge and awareness of the technologies for how to effectively share spectrum through multiple access techniques i.e. TDMA, CDMA, FDMA etc.
704.6(A)	Have in-depth understanding of the design consideration and architecture for different Wireless Systems like GSM, CDMA, GPRS etc
704.7(A)	Understanding of the emerging trends in Wireless communication like WiFi, WiMAX, Software Defined Radio (SDR) and related issues and challenges.
704(B)	**Elective-I: Natural Language Processing**
704.1(B)	Understand automatic processing of human languages using computers.
704.2(B)	Understand various applications of natural language processing
704(C)	**Elective-I: Usability Engineering**
704.1(C)	Justify the theory and practice of usability evaluation approaches, methods and techniques.
704.2(C)	Compare and evaluate strengths and weaknesses of various approaches, methods and techniques for evaluating usability.
704.3(C)	Design and implement a usability test plan, based on modelling or requirements specification.
704.4(C)	Choose appropriate approaches, methods and techniques to evaluate the usability of a specified interactive system.
704(D)	**Elective-I: Multicore and Concurrent Systems**
704.1(D)	Know types of parallel machine and to know multicore and concurrent systems in detail.
704.2(D)	Know the ways to measure the performance of multicore systems.
704.3(D)	Understand need of multicore and concurrent system programming.
704.4(D)	Know the different approaches for multicore and concurrent programming.
704.5(D)	Use and apply the approaches learned, for application development.
704.6(D)	Understand and explore recent trends in multicore and concurrent system programming.
704(E)	**Elective-I: Business Analytics and Intelligence**
704.1(E)	Comprehend the Information Systems and development approaches of Intelligent Systems
704.2(E)	Evaluate and rethink business processes using information systems
704.3(E)	Propose the Framework for business intelligence
704.4(E)	Get acquainted with the Theories, techniques, and considerations for capturing organizational intelligence
704.5(E)	Align business intelligence with business strategy
704.6(E)	Apply the techniques for implementing business intelligence systems
705(A)	**Elective-II: Software Defined Networks**
705.1(A)	Acquire fundamental knowledge of SDN exploring the need, characteristics, and architecture of SDN.
705.2(A)	Recognize OpenFlow protocols and its forwarding, pipeline model.
705.3(A)	Understand different methodologies for sustainable SDN.
705.4(A)	Comprehend IT Infrastructure for SDN.
705.5(A)	Acquiring knowledge of OpenFlow protocols, visualization.
705(B)	**Elective-II: Soft Computing**
705.1(B)	Tackle problems of interdisciplinary nature.

705.2(B)	Find an alternate solution , which may offer more adaptability, resilience and optimization
705.3(B)	Gain knowledge of soft computing domain which opens up a whole new career option
705.4(B)	Tackle real world research problems
705(C)	**Elective-II: Software Testing and Quality Assurance**
705.1(C)	Test the software by applying testing techniques to deliver a product free from bugs.
705.2(C)	Investigate the scenario and to select the proper testing technique.
705.3(C)	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.
705.4(C)	Understand how to detect, classify, prevent and remove defects.
705.5(C)	Choose appropriate quality assurance models and develop quality.
705.6(C)	Ability to conduct formal inspections, record and evaluate results of inspections.
705(D)	**Elective-II: Compiler Construction**
705.1(D)	Understand the structure of compilers
705.2(D)	Understand the basic and advanced techniques used in compiler construction
705.3(D)	Understand the basic data structures used in compiler construction such as abstract syntax
705.4(D)	trees, symbol tables, three-address code, and stack machines
705.5(D)	Cognitive skills (thinking and analysis)- Design and implement a compiler using a software engineering approach
705.6(D)	Communication skills (personal and academic).
705.7(D)	Practical and subject specific skills (Transferable Skills) - Use generators (e.g. Lex and Yacc).
705(E)	**Elective-II: Gamification**
705.1(E)	Write programs to solve problems using gamification and open source tools.
705.2(E)	To apply gamifications for Mobile and Web Applications
705.3(E)	Solve problems for multi-core or distributed, concurrent/Parallel environments
706	**Computer Laboratory VII**
706.1	The students will be able to implement and port controlled and secured access to software systems and networks.
706.2	The students will be able to build learning software in various domains.
707	**Computer Laboratory VIII**
707.1	Draw, discuss different UML 2.0 diagrams, their concepts, notation, advanced notation, forward and reverse engineering aspects.
707.2	Identify different software artifacts used to develop analysis and design model from requirements.
707.3	Develop use case model
707.4	Develop, implement analysis model and design model
707.5	Develop, implement Interaction and behaviour Model
707.6	Implement an appropriate design pattern to solve a design problem.
708	**Project Phase-I**
708.1	To show preparedness to study independently in chosen domain of Information Technology and programming languages and apply their acquired knowledge to variety of real time problem scenarios.
708.2	To function effectively as a team to accomplish a desired goal.
708.3	An understanding of professional, ethical, legal, security and social issues and responsibilities related to Information Technology Project.
709(A)	**Audit Course-V: Emotional Intelligence**
709.1(A)	Expand your knowledge of emotional patterns in yourself and others.
709.2(A)	Discover how you can manage your emotions, and positively influence yourself and others.
709.3(A)	Build more effective relationships with people at work and at home.
709.4(A)	Positively influence and motivate colleagues, team members, and managers.
709.5(A)	Increase your leadership effectiveness by creating an atmosphere that engages others.
709.6(A)	Apply EI behaviours and supports high performance.
709(B)	**Audit Course-V: Green Computing**
709.1(B)	Understand the concept of green IT and relate it to sustainable development.
709.2(B)	Apply the green computing practices to save energy.

709.3(B)	Discuss how the choice of hardware and software can facilitate a more sustainable operation,
709.4(B)	Use methods and tools to measure energy consumption
709(C)	**Audit Course-V: Critical Thinking**
709.1(C)	If students whole-heartedly participate in the course, they can expect to be smarter, stronger and more confident thinkers.
709.2(C)	They can embark on a life-long journey of "self-directed learning".
709(D)	**Audit Course-V: Statistical Learning Model using R**
709.1(D)	Students will be familiar with concepts related to "data science", "analytics", "machine learning", etc. These are important topics, and will enable students to embark on highly rewarding careers.
709.2(D)	Students will capable of learning "big data" concepts on their own
801	**Distributed Computing System**
801.1	Understand the principles and desired properties of distributed systems based on different application areas.
801.2	Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
801.3	Recognize the inherent difficulties that arise due to distributed-ness of computing resources.
801.4	Identify the challenges in developing distributed applications
802	**Ubiquitous Computing**
802.1	Demonstrate the knowledge of design of Ubicomp and its applications.
802.2	Explain smart devices and services used Ubicomp.
802.3	Describe the significance of actuators and controllers in real time application design.
802.4	Use the concept of HCI to understand the design of automation applications.
802.5	Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy.
802.6	Get the knowledge of ubiquitous and service oriented networks along with Ubicomp management.
803(A)	**Elective III :Internet of Things (IoT)**
803.1(A)	Explain what is internet of things.
803.2(A)	Explain architecture and design of IoT
803.3(A)	Describe the objects connected in IoT
803.4(A)	Understand the underlying Technologies.
803.5(A)	Understand the platforms in IoT
803.6(A)	Understand cloud interface to IoT
803(B)	**Elective III: Internet of Things Laboratory**
803.1(B)	To understand IoT platforms such as Raspberry-Pi/Beagle board/Arduino.
803.2(B)	To understand operating systems for platforms such as Raspberry-Pi/Beagle board/Arduino.
803.3(B)	To communicate with objects using IoT platforms such as Raspberry-Pi/Beagle board/Arduino.
803.4(B)	To interface cloud environment for IoT application.
803.5(B)	To implement IoT related protocols such as MQTT / CoAP etc.
803.6(B)	To implement the web interface for IoT
803(C)	**Elective III: Information Storage and Retrieval**
803.1(C)	Student should be able to understand the concept of Information retrieval.
803.2(C)	Student should be able to deal with storage and retrieval process of text and multimedia data.
803.3(C)	Student should be able to evaluate performance of any information retrieval system.
803.4(C)	Students should be able to design user interfaces
803.5(C)	Student should be able to understand importance of recommender system.
803.6(C)	Student should be able to understand concept of multimedia and distributed information retrieval.
803(D)	**Information Storage and Retrieval Laboratory**
803.1(D)	Student should be able to understand the concept, data structure and preprocessing algorithms of Information retrieval.
803.2(D)	Student should be able to deal with storage and retrieval process of text and multimedia data.

803.3(D)	Student should be able to evaluate performance of any information retrieval system.
803.4(D)	Students should be able to design user interfaces
803.5(D)	Student should be able to understand importance of recommender system. (take decision on design parameters of recommender system.)
803.6(D)	Student should be able to understand concept of multimedia and distributed information retrieval.
803.7(D)	Students must be able to map the concepts of the subject on recent developments in the Information retrieval field
803(E)	**Elective III: Multimedia Techniques**
803.1(E)	To create own file formats for specific application
803.2(E)	To do some projects based on current trends in multimedia
803.3(E)	To use open sources for authoring tool for animation and presentations
803.4(E)	Understand some research areas of current multimedia techniques
803(F)	**Multimedia Techniques Laboratory**
803.1(F)	To create own file formats for specific application
803.2(F)	To do some projects based on current trends in multimedia
803.3(F)	To use open sources for authoring tool for animation and presentations.
803(G)	**Elective III : Internet and Web Programming**
803.1(G)	Demonstrate static website using basic tools.
803.2(G)	Develop client side programming skills.
803.3(G)	Develop server side programming skills.
803.4(G)	Understand web services and handle content management tools.
803.5(G)	Develop mobile website using mobile web development tools.
803.6(G)	Understand aspects of web security and cyber ethics.
803(H)	**Internet and Web Programming Laboratory**
803.1(H)	Use fundamental skills to develop and maintain website and web application.
803.2(H)	Apply scripting skills for Server side and Client-side Programming
803.3(H)	Develop web services to transfer data and add interactive components to website.
803.4(H)	Combine multiple web technologies to create advanced web components
803(I)	**Elective III: Computational Optimization**
803.1(I)	Learn and implement various optimization techniques
803.2(I)	Learn model real-world problems in optimization framework
803.3(I)	Apply various optimization models to solve optimization problems in computer-science & IT Engineering.
803(J)	**Computational Optimization Laboratory**
803.1(J)	understand Transportation problem
803.2(J)	learn different measures in shortest path algorithms
803.3(J)	understand and learn Queuing Model
803(A)	**Elective IV: Rural Technologies and Community Development**
803.1(A)	understand rural development model
803.2(A)	learn different measures in rural development and its impact on overall economy
803.3(A)	understand and learn importance of technologies in rural and community development
803.4(A)	understand challenges and opportunities in rural development
803(B)	**Elective IV:Parallel Computing**
803.1(B)	understand fundamentals in parallel computing
803.2(B)	understand and learn importance of technologies including different hardware structures used in parallel computing
803.3(B)	understand challenges and opportunities in parallel computing
803(C)	**Elective IV: Computer Vision**
803.1(C)	To implement fundamental image processing techniques required for computer vision
803.2(C)	To implement boundary tracking techniques

803.3(C)	To apply Hough Transform for line, circle, and ellipse detections
803.4(C)	To implement motion related techniques
803.5(C)	to develop skills to develop applications using computer vision techniques
803(D)	**Elective IV: Social Media Analytics**
803.1(D)	Understand the basics of Social Media Analytics
803.2(D)	Explain the significance of Data mining in Social media
803.3(D)	Demonstrate the algorithms used for text mining
803.4(D)	Apply network measures for social media data
803.5(D)	Explain Behavior Analytics techniques used for social media data
803.6(D)	Apply social media analytics for Face book and Twitter kind of applications
804(A)	**Elective IV: Open Elective: COMPUTER LABORATORY-IX**
804.1(A)	Demonstrate knowledge of the core concepts and techniques in distributed systems.
804.2(A)	Learn how to apply principles of state-of-the-Art Distributed systems in practical application.
804.3(A)	Design, build and test application programs on distributed systems.
805	**COMPUTER LABORATORY-X**
805.1	set up the Android environment and explain the Evolution of cellular networks (BT-2)
805.2	create applications for performing CURD SQLite database operations using Android(BT-6)
805.3	create the smart android applications using the data captured through sensors (BT-6)
805.4	implement the authentication protocols between two mobile devices for providing security (BT-3)
805.5	analyze the data collected through android sensors using any machine learning algorithm (BT-4)
805.6	develop the User Interfaces using pre-built Android UI components (BT -6)
806	**Project Work**
806.1	learn teamwork.
806.2	be well aware about Implementation phase.
806.3	get exposure of various types of testing methods and tools.
806.4	understand the importance of documentation.
807(A)	**Audit Course-VI: IoT Applications in Engineering field**
807.1(A)	Expand your knowledge of Internet of Things.
807.2(A)	Discover how can you use IoT in your Engineering applications
807.3(A)	Build more effective hands on with IoT elements.
807.4(A)	Expand the practical knowledge of using IoT components like sensors, processors.
807.5(A)	Expand the understanding of using different protocols.
807(B)	**Audit Course-VI: Entrepreneurship**
807.1(B)	Expand your knowledge of Entrepreneurship & Startups.
807.2(B)	Discover how you can use Entrepreneur Qualities.
807.3(B)	Expand the practical knowledge of Finance, Legal-Patents, Intellectual Property, and Business Associations.
807.4(B)	Expand the understanding of Deliverables & Achieving Target.
807(C)	**Audit Course-VI: Cognitive computing**
807.1(C)	Understand and discuss what cognitive computing is, and how it differs from traditional approaches.
807.2(C)	Plan and use the primary tools associated with cognitive computing.
807.3(C)	Plan and execute a project that leverages cognitive computing.
807.4(C)	Understand and discuss the business implications of cognitive computing.
807(D)	**Audit Course-VI: AI and Robotics**
807.1(D)	The goal of this course is to familiarize the students with the basic concepts of robotics, artificial intelligence and intelligent machines.
807.2(D)	It will help students to understand and apply principles, methodology and techniques of intelligent systems to robotics

Programme Outcomes (POs)	
	Students are expected to know and be able –
PO1	**Engineering Knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals, and Mechanical Engineering to the solution of complex engineering prblms
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex Engineering activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one''s own work, as a member and leader in a team, to manage projects and in multi- disciplinary environments.
PO12	**Life -long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological changes

	Programme Specific Outcomes (PSOs)
PSO1	Graduates will be able to provide multi-disciplinary and cost effective solutions to problems in the allied areas of mechanical engineering.
PSO2	Graduates will be able to apply engineering knowledge and skills to have Employability, entrepreneurship and higher studies.
	Course Outcomes (COs)
C301	**Engineering Mathematics – III**
C301.1	Solve higher order linear differential equations and apply to modeling and analyzing mass spring systems
C301.2	Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
C301.3	Apply statistical methods like correlation, regression analysis in analyzing, Interpreting experimental data and probability theory in testing and quality control.
C301.4	Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
C301.5	Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.
C302	**Manufacturing Process-I**
C302.1	Understand and analyze foundry practices like pattern making, mold making, Core making and Inspection of defects.
C302.2	Understand and analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
C302.3	Understand different plastic molding processes, Extrusion of Plastic and Thermoforming
C302.4	Understand different Welding and joining processes and its defects
C302.5	Understand, Design and Analyze different sheet metal working processes
C302.6	Understand the constructional details and Working of Centre Lathe
C303	**Computer Aided Machine Drawing**
C303.1	Understand the importance of CAD in the light of allied technologies such as CAM,CAE, FEA, CFD, PLM.
C303.2	Understand the significance of parametric technology and its application in 2D Sketching.
C303.3	Understand the significance of parametric feature-based modeling and its application in 3D machine components modeling
C303.4	Ability to create 3D assemblies that represent static or dynamic Mechanical Systems.
C303.5	Ability to ensure manufacturability and proper assembly of components and assemblies.
C303.6	Ability to communicate between Design and Manufacturing using 2D drawings.
C304	**Thermodynamics**

C304.1	Apply various laws of thermodynamics to various processes and real systems.
C304.2	Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes.
C304.3	Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
C304.4	Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle
C304.5	Estimate Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
C304.6	Use Psychometric charts and estimate various essential properties related to Psychometric and processes
C305	**Material Science**
C305.1	Understand the basic concepts and properties of Material.
C305.2	Understand about material fundamental and processing.
C305.3	Select proper metal, alloys, non-metal and powder metallurgical component for specific requirement
C305.4	Detect the defects in crystal and its effect on crystal properties.
C305.5	Evaluate the different properties of material by studying different test
C305.6	Recognize how metals can be strengthened by cold-working and hot working
C306	**Strength of Materials**
C306.1	Apply knowledge of mathematics, science for engineering applications
C306.2	Design and conduct experiments, as well as to analyze and interpret data
C306.3	Design a component to meet desired needs within realistic constraints of health and safety
C306.4	Identify, formulate, and solve engineering problems
C306.5	Practice professional and ethical responsibility
C306.6	Use the techniques, skills, and modern engineering tools necessary for engineering practice
C307	**Audit Course I**
C307.1	On completion of the course, learner will be able to– Understood human values, their significance and role in life.
C307.2	Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others.
C307.3	Practice respect for human rights and democratic principles.
C307.4	Familiarized with various living and non-living organisms and their interaction with environment.
C307.5	Calculate the basics regarding the leadership and to become a conscious professional.
C401	**Fluid Mechanics**

C401.1	Student will be able to use of various properties in solving the problems in fluids
C401.2	Student will be able to use of Bernoulli's equation for solutions in fluids
C401.3	Student will be identify types of fluid flow measurement devices like venturimeter and orifice meter.
C401.4	Understand the physics of Laminar and Turbulent flow
C401.5	Student will be estimate the friction and measure the frictional losses in fluid flow
C401.6	Determination of forces drag and lift on immersed bodies
C402	**Soft Skills**
C402.1	To understand role and contents of soft skills through instructions, knowledge acquisitions, demonstration and practice
C402.2	To Improved communication, interaction and presentation of ideas.
C402.3	To developed right-attitudinal and behavioural change
C402.4	To improved writing and documentation skills
C402.5	To developed confidence and problem solving through group discussion
C402.6	To perform any social task through team activity
C404	**Engineering Metallurgy**
C404.1	Describe how metals and alloys formed and how the properties change due to microstructure
C404.2	Apply core concepts in Engineering Metallurgy to solve engineering problems.
C404.3	Conduct experiments, as well as to analyze and interpret data
C404.4	Select materials for design and construction.
C404.5	Possess the skills and techniques necessary for modern materials engineering practice
C404.6	Recognize how metals can be strengthened by alloying, cold-working, and heat treatment
C403	**Theory of Machines – I**
C403.1	Identify mechanisms in real life applications.
C403.2	Perform kinematic analysis of simple mechanisms.
C403.3	Perform static and dynamic force analysis of slider crank mechanism.
C403.4	Determine moment of inertia of rigid bodies experimentally.
C403.5	Analyze velocity and acceleration of mechanisms by vector and graphical methods.
C405	**Applied Thermodynamics**
C405.1	Classify various types of Engines, Compare Air standard, Fuel Air and Actual cycles and make out various losses in real cycles.
C405.2	Understand Theory of Carburetion, Modern Carburetor, Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation.

C405.3	Understand Fuel Supply system, Types of Injectors and Injection Pumps, Stages of Combustion in CI Engines, Theory of Detonation in CI Engines and Comparison of SI and CI Combustion and Knocking and Factors affecting, Criteria for good combustionchamber and types.
C405.4	Carry out Testing of I. C. Engines and analyze its performance.
C405.5	Describe construction and working of various I. C. Engine systems (Cooling, Lubrication, Ignition, Governing, and Starting) also various harmful gases emitted fromexhaust and different devices to control pollution and emission norms for pollution control.
C405.6	Describe construction, working of various types of reciprocating and rotary Compressors with performance calculations of positive displacement compressors.
C406	**Electrical and Electronics Engineering**
C406.1	Apply programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
C406.2	Develop interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
C406.3	Understand the operation of DC motor, its speed control methods and braking
C406.4	Distinguish between types of three phase induction motor and its characteristic features
C406.5	Explain about emerging technology of Electric Vehicle (EV) and its modular subsystems
C406.6	Choose energy storage devices and electrical drives for evs
C407	**Machine Shop – I**
C407.1	Produce spur gear on milling machine
C407.2	Perform surface grinding using table grinder
C407.3	Make sheet metal components by different operations using dies and press
C407.4	Understand the process of plastic processing
C501	**Design of Machine Elements-I**
C501.1	Identify and understand failure modes for mechanical elements and design of machine elements based on strength.
C501.2	design Shafts, Keys and Coupling for industrial applications
C501.3	Design machine elements subjected to fluctuating loads.
C501.4	Design Power Screws for various applications.
C501.5	Design fasteners and welded joints subjected to different loading conditions.
C501.6	Design various Springs for strength and stiffness.
C502	**Heat Transfer**

C502.1	Analyze the various modes of heat transfer and implement the basic heat conduction equation for steady one dimensional thermal system.
C502.2	Implement the general heat conduction equation to thermal system with and without internal heat generation and transient heat conduction.
C502.3	Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.
C502.4	Interpret heat transfer by radiation between objects with simple geometries.
C502.5	Analyze the heat transfer equipment and investigate the performance.
C503	**Theory of Machines-II**
C503.1	Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design
C503.2	Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
C503.3	The student to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
C503.4	Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
C503.5	The student will synthesize a four bar mechanism with analytical and graphical methods.
C503.6	The student will analyze the gyroscopic couple or effect for stabilization of Ship Aeroplane and Four wheeler vehicle.
C504	**Turbo Machines**
C504.1	Apply thermodynamics and kinematics principles to turbo machines with applications of impact of jet.
C504.2	Analyse the performance of impulse turbine and selection of impulse turbine along with model analysis.
C504.3	Analyse the performance of reaction turbine and selection of reaction turbines.
C504.4	Analyse the performance of nozzles and steam turbine.
C504.5	Understand the working of centrifugal pumps, their performance and selection of pumps for different applications.
C504.6	Analyse the performance of centrifugal and axial flow compressor.
C505	**Metrology and Quality Control**
C505.1	Understand basic concepts of metrology and measurement system
C505.2	Describe various linear measuring devices for different geometries and perform associated calculations.
C505.3	Understand advance Metrological instruments and their applications in industries
C505.4	Select and apply the seven basic quality tools in well-defined applications by Understanding different dimensions of quality and quality tools.
C505.5	Construct various control charts with the help of statistical quality control technique for process improvement

C505.6	To apply various quality improvement techniques and to understand quality management system.
C506	**Skill Development**
C506.1	To develop the skill for required in shop floor working.
C506.2	To have knowledge of the different tools and tackles used in machine assembly shop.
C506.3	Use of theoretical knowledge in practice.
C506.4	Practical aspect of the each component in the assembly of the machine.
C601	**Numerical Methods and Optimization**
C601.1	Use appropriate Numerical Methods to solve complex mechanical engineering problems
C601.2	Formulate algorithms and programming
C601.3	Use Mathematical Solver
C601.4	Generate Solutions for real life problem using optimization techniques
C602	**Design of Machine Elements-II**
C602.1	To understand and apply principles of gear design to spur gears and industrial spur gear boxes.
C602.2	To become proficient in Design of Helical and Bevel Gear
C602.3	To develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue.
C602.4	To learn a skill to design worm gear box for various industrial applications.
C602.5	To inculcate an ability to design belt drives and selection of belt, rope and chain drives.
C602.6	To achieve an expertise in design of Sliding contact bearing in industrial applications
C603	**Refrigeration and Air Conditioning**
C603.1	Illustrate the fundamental principles and applications of refrigeration and air Conditioning system.
C603.2	Obtain cooling capacity and coefficient of performance of vapour compression refrigeration systems.
C603.3	Illustrate the cooling capacity and coefficient of performance for various multipressure refrigeration systems
C603.4	Understand the various properties and factors of psychometric processes. Also Present the concept of human comfort
C603.5	Operate and analyze the different types and components of refrigeration and air Conditioning systems.
C603.6	Differentiate and Calculate the various parameters of duct for air conditioning systems used for various applications.
C604	**Mechatronics**

C604.1	Students will be to understand the principles of various types of sensors and actuators involved in Mechatronics system
C604.2	Students will be to Identify the Key elements of Mechatronics system and itsrepresentation in terms of block diagram, concept of transfer function and block diagram reduction
C604.3	Students will be to understand the concept of signal processing and Interfacing of sensors and actuators with DAQ system
C604.4	Students will be to Develop PLC ladder programming and implementation of real life systems
C604.5	Students will be to analyse the system model for control application in Time and Frequency domain.
C604.6	Students will be to understand the various control actions such as Proportional, derivative, integral, PID and LQR control.
C605	**Manufacturing Process-II**
C605.1	Student should be able to apply the knowledge of various manufacturing processes.
C605.2	Student should be able to identify various process parameters and their effect on processes.
C605.3	Student should be able to figure out application of modern machining.
C605.4	Students should get the knowledge of Jigs and Fixtures for variety of operations.
C606	**Machine Shop-II**
C606.1	Ability to develop the knowledge about the working and programming techniques for various machines and tools
C606.2	Understand various process planning sheets for job
C606.3	Prepare visit reports.
C607	**Seminar**
C607.1	Establish motivation for any topic of interest and develop a thought process for Technical presentation.
C607.2	Organize a detailed literature survey and build a document with respect to technical Publications.
C607.3	Analysis and comprehension of proof-of-concept and related data.
C607.4	Effective presentation and improve soft skills.
C607.5	Make use of new and recent technology (e.g. Latex) for creating technical reports
C608	**Audit course II**
C608.1	Identify fire hazards in the workplace and outline the Fire Fighting Techniques.
C608.2	Select and use appropriate firefighting equipment.
C608.3	Apply the knowledge in fire, safety and hazard management with due consideration for human life & property safety issues.
C608.4	Develop awareness about Industrial Aspects of Fire & Safety

Fourth Year Engineering(2015 Course)	
C701	**Hydraulics and Pneumatics**
C701.1	Understand working principle of components used in hydraulic & pneumatic systems
C701.2	Identify various applications of hydraulic & pneumatic systems
C701.3	Selection of appropriate components required for hydraulic and pneumatic systems
C701.4	Analyze hydraulic and pneumatic systems for industrial/mobile applications
C701.5	Design a system according to the requirements
C701.6	Develop and apply knowledge to various applications
C702	**CAD CAM Automation**
C702.1	Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
C702.2	Use analytical and synthetic curves and surfaces in part modeling.
C702.3	Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
C702.4	Generate CNC program for Turning / Milling and generate tool path using CAM software.
C702.5	Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturingtechnology.
C702.6	Understand the robot systems and their applications in manufacturing industries.
C703	**Dynamics of Machinery**
C703.1	Estimate natural frequency for single DOF undammed & damped free vibratory systems.
C703.2	Illustrate the response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
C703.3	Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
C703.4	Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
C703.5	Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
C703.6	Explain noise, its measurement & noise reduction techniques for industry and day today life problems.
C704	**Finite Element Analysis**
C704.1	To understand the theory of elasticity including strain/displacement and Hooke's law relationships.
C704.2	To analyze solid mechanics problems using classical methods and energy methods
C704.3	To solve torsion problems in bars and thin walled members.

C704.4	To solve for stresses and deflections of beams under unsymmetrical loading
C705 A	**Automobile Engineering**
C705.1	To compare and select the proper automotive system for the vehicle.
C705.2	To analyse the performance of the vehicle.
C705.3	To diagnose the faults of automobile vehicles.
C705.4	To apply the knowledge of EVs, HEVs and solar vehicles
C705 B	**Operation Research**
C705.1	Apply LPP and Decision Theory to solve the problems
C705.2	Apply the concept of transportation models to optimize available resources.
C705.3	Decide optimal strategies in conflicting situations.
C705.4	Implement the project management techniques.
C705.5	Minimize the process time
C705.6	Optimize multi stage decision making problems
C705 C	**Energy Audit and Management**
C705.1	Compare energy scenario of India and World.
C705.2	Carry out Energy Audit of the Residence / Institute/ Organization
C705.3	Evaluate the project using financial techniques
C705.4	Identify and evaluate energy conservation opportunities in Thermal Utilities
C705.5	Identify and evaluate energy conservation opportunities in Electrical Utilities.
C705.6	Identify the feasibility of Cogeneration and WHRUse a CFD tool effectively for practical problems and research.
C706	**Project-I**
C706.1	Identify a topic in advanced areas of Mechanical Engineering and its allied fields.
C706.2	Ability to effectively gather and interpret information from literature survey. And usethis knowledge to identify, formulate, analyse and solve complex problems and to evaluate and interpret various solutions.
C706.3	Ability to use modern design and analysis tools.
C706.4	Students will be able to carry out calculations involved in design, consider and evaluate alternate assumptions, approaches, and procedures.
C706.5	Gain the ability to communicate effectively with written, oral, and visual means in a technical setting.
C706.6	Ability to serve as effective team member to plan and complete the project/task within a specified budget and time.
C801	**Energy Engineering**

C801.1	Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
C801.2	Analyze the steam condensers, recognize an environmental impacts of thermal power plant and method to control the same
C801.3	Recognize the layout, component details of hydroelectric power plant and nuclear power plant
C801.4	Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
C801.5	Emphasize the fundaments of non-conventional power plants
C801.6	Describe the different power plant electrical instruments and basic principles of economics of power generation
C802	**Mechanical System Design**
C802.1	Students will be able to design machine tool gear boxes using standard procedure and modify them for enhanced efficiency
C802.2	Students will be able to assess the data by using statistical concepts and provide correct interpretation
C802.3	Students will be able to identify different conveyors, categorize them for respective material handling systems and design them using related concepts
C802.4	Students will be able to recognize thick & thin cylinders, categorize different pressurevessels and design them using Indian (IS-2825) & International (ASME Code for pressure vessel design) Standards
C802.5	Students will be able to identify materials for IC engine components and apply design procedure to design them
C802.6	Students will be able to outline objectives of optimum design and develop ability to apply optimum design principles for design for manufacturing, assembly & safety.
C803 B	**Industrial Engineering**
C803.1	Apply the Industrial Engineering concept
C803.2	Understand, analyze and implement different concepts involved in method study.
C803.3	Design and Develop different aspects of work system and facilities.
C803.4	Understand and Apply Industrial safety standards, financial management practices.
C803.5	Undertake project work based on modeling & simulation area.
C804 A	**Advanced Manufacturing Processes**
C804.1	Classify and analyze special forming processes
C804.2	Analyze and identify applicability of advanced joining processes
C804.3	Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
C804.4	Select appropriate micro and nano fabrication techniques for engineering applications
C804.5	Understand and apply various additive manufacturing technology for product development
C804.6	Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.

C804 C	**Product Design and Development**
C804 C.1	Understand essential factors for product design
C804 C.2	Design product as per customer needs and satisfaction
C804 C.3	Understand Processes and concepts during product development
C804 C.4	Understand methods and processes of Forward and Reverse engineering
C804 C.5	Carry various design processes as DFA, DFMEA, design for safety
C804 C.6	Understand the product life cycle and product data management
C805	**Project-II**
C805.1	Identification / Selection of methods and materials to carry out Experiments/simulations.
C805.2	Reorganize the procedures of design, development & manufacturing with a concern for society, environment and ethics
C805.3	Analyse and discuss the results to draw valid conclusions and prepare a report as per recommended format for defense.

Program Outcomes		
PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the Information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.

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

Program Specific Outcomes (PSO)

Sr. No.	Program Specific Outcomes	Bloom's Level
PSO1	Provide feasible solutions to civil engineering hindrance	L3: **Apply**
PSO2	Ability to apply design and development principles and use of current technique as a tool to evaluate engineering practices.	L6: **Create**

SE CIVIL 2019 Pattern	
C301 - Building Technology and Architectural Planning	
C301.1	Identify types of building and basic requirements of building components.
C301.2	Make use of Architectural Principles and Building byelaws for building construction.
C301.3	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
C301.4	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
C301.5	Understand different services and safety aspects
C302 - Mechanics of Structures	
C302.1	Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
C302.2	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
C302.3	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
C302.4	Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
C302.5	Analyze axially loaded and eccentrically loaded column. 6. Determine the slopes and deflection of determinate beams and trusses.
C303 - Fluid Mechanics	
C303.1	Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
C303.2	Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
C303.3	Understand the concept of Dimensional analysis using Buckingham's π theorem,

	Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
C303.4	Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
C303.5	Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
C303.6	Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body.
C304 - Engineering Mathematics III	
C304.1	Solve Higher order linear differential equations and its applications to modelling and analyzing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
C304.2	Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.
C304.3	Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
C304.4	Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems.
C304.5	Solve Partial differential equations such as wave equation, one- and two-dimensional heat flow equations.
C304.6	Solve Higher order linear differential equations and its applications to modelling and analyzing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
C305 – Engineering Geology	
C305.1	Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions.
C305.2	Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
C305.3	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.

C305.4	Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects.
C305.5	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.

C401 - Surveying

C401.1	Define and Explain basics of plane surveying and differentiate the instruments used for it.
C401.2	Express proficiency in handling surveying equipment and analyze the surveying data from this equipment.
C401.3	Describe different methods of surveying and find relative positions of points on the surface of earth.
C401.4	Execute curve setting for civil engineering projects such as roads, railways etc.
C401.5	Articulate advancements in surveying such as space-based positioning systems.
C401.6	Differentiate map and aerial photographs, also interpret aerial photographs.

C402 - Concrete Technology

C402.1	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
C402.2	Able to check the properties of concrete in fresh and hardened state.
C402.3	Get acquainted to concreting equipment, techniques and different types of special concrete.
C402.4	Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques
C402.5	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
C402.6	Able to check the properties of concrete in fresh and hardened state.

C403 -Structural Analysis

C403.1	Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
C403.2	Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
C403.3	Implement application of the slope deflection method to beams and portal frames.
C403.4	Analyze beams and portal frames using moment distribution method.

C403.5	Determine response of beams and portal frames using structure approach of stiffness matrix method.
C403.6	Apply the concepts of plastic analysis in the analysis of steel structures.

C404 - Project Management

C404.1	Describe project life cycle and the domains of Project Management.
C404.2	Explain networking methods and their applications in planning and management
C404.3	Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
C404.4	Demonstrates resource allocation techniques and apply it for manpower planning.
C404.5	Understand economical terms and different laws associated with project management
C404.6	Apply the methods of project selection and recommend the best economical project.

C406 - Project Based Learning

C406.1	Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service.
C406.2	Analyze and design the physical/ mathematical/ ICT model in order to solve identified problem/project.
C406.3	Create, work in team and applying the solution in practical way to specific problem. Test hardened concrete with destructive and nondestructive testing instruments.

TE CIVIL 2019 Pattern

C501 - Hydrology and water resource engineering

C501.1	Understand government organizations, apply & analyze precipitation & its abstractions.
C501.1	Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
C501.1	Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
C501.1	Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics.
C501.1	Understand water logging & water management, apply & analyze ground water hydrology
C501.1	Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement

C502 - Water Supply Engineering	
C502.1	Define identify, describe reliability of water sources, estimate water requirement for various sectors
C502.2	Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
C502.3	Design various components of water treatment plant and distribution system.
C502.4	Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants.
C502.5	Design elevated service reservoir capacity and understand the rainwater harvesting.
C502.6	Understand the requirement of water treatment plant for infrastructure and Government scheme.
C503 - Design of Steel Structure	
C503.1	Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.
C503.2	Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
C503.3	Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
C503.4	Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
C503.5	Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.
C503.6	Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections
C504 - Engineering Economics and Financial Management	
C504.1	Understand basics of construction economics.
C504.2	Develop an understanding of financial management in civil engineering projects.
C504.3	Prepare and analyze the contract account.
C504.4	Decide on right source of fund for construction projects.
C504.5	Understand working capital and its estimation for civil engineering projects.
C504.6	Illustrate the importance of tax planning & understand role of financial regulatory bodies

C505.C - Elective I: Construction Management	
C505.C.1	Understand the overview of construction sector.
C505.C.1	Illustrate construction scheduling, work study and work measurement.
C505.C.1	Acquaint various labor laws and financial aspects of construction projects.
C505.C.1	Explain elements of risk management and value engineering.
C505.C.1	State material and human resource management techniques in construction.
C505.C.1	Understand basics of artificial intelligence techniques in civil engineering
C505.D - Elective I: Advanced Concrete Technology	
C502.D.1	Understand the chemistry of cement and its effect on properties of concrete
C502.D.2	Apply the knowledge of supplementary cementitious materials to produce sustainable concretes
C502.D.3	Understand the mechanism of working of admixtures and their effect on properties of concrete
C502.D.4	Evaluate the characteristic properties of fiber reinforced concrete
C502.D.5	Understand the durability properties of concrete
C502.D.6	Interpret the properties of concrete through advance testing methods
C601 - Waste Water Engineering	
C601.1	Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
C601.2	Design preliminary and primary unit operations in waste water treatment plant
C601.3	Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
C601.4	Understand and design suspended and attached growth wastewater treatment systems
C601.5	Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
C601.6	Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
C602 - Design of Reinforced Concrete Structures	

C602.1	Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete.
C602.2	Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections.
C602.3	Design & detailing of rectangular one way and two-way slab with different boundary conditions
C602.4	Design & detailing of dog legged and open well staircase
C602.5	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
C602.6	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.
C603 - Remote Sensing and Geographic Information System	
C603.1	Articulate fundamentals and principles of RS techniques.
C603.2	Demonstrate the knowledge of remote sensing and sensor characteristics.
C603.3	Distinguish working of various spaces-based positioning systems.
C603.4	Analyze the RS data and image processing to utilize in civil engineering
C603.5	Explain fundamentals and applications of RS and GIS
C603.6	Acquire skills of data processing and its applications using GIS Learn how to apply scheduling and planning in projects.
C604.C – Advanced Surveying	
C604.1	To Study the concepts of Triangulation & SBPS and apply to Well-conditioned Triangle for indivisibility & height of station
C604.2	To Study the concepts of Hydrographic Survey for application of Sounding and Solve Three-point problem
C604.3	To Study Remote Sensing & GIS with application of LIDAR & DEM and Use of image interpretation Technique for Data Analysis.
C604.4	To Study Triangulation Adjustment with determination of most Probable values of conditioned and independent quantities
C604.5	Understand Aerial Photogrammetric with Technique of flight planning & product of Digital photogrammetric
C604.6	To Study concept of Trigonometric leveling to determine difference in elevation by single and reciprocal observation

C604.E - Architecture and Town Planning	
C604.E.1	Apply the principles of architectural planning and landscaping for improving quality of life
C604.E.2	Understand the confronting issues of the area and apply the acts..
C604.E.3	Evaluate and defend the proposals.
C604.E.4	Appraise the existing condition and to develop the area for betterment.
C605 - Internship	
C605.1	To develop professional competence through industry internship
C605.2	To apply academic knowledge in a personal and professional environment
C605.3	To build the professional network and expose students to future employees
C605.4	Apply professional and societal ethics in their day-to-day life
C605.5	To become a responsible professional having social, economic and administrative considerations
C605.6	To make own career goals and personal aspirations
C606- Seminar	
C606.1	Appraise the current civil engineering research / techniques / developments / interdisciplinary areas.
C606.2	Review and organize literature survey utilizing technical resources, journals etc.
C606.3	Evaluate and draw conclusions related to technical content studied.
C606.4	Demonstrate the ability to perform critical writing by preparing a technical report.
C606.5	Develop technical writing and presentation skills.
BE CIVIL 2015 Pattern	
C701- Environmental Engineering II	
C701.1	To study the concept quantity and quality of sewage, to be able to estimate its quantity and various quality parameters and its relation with stream sanitation

C701.2	To study the effects of improper disposal of sewage and hence necessity of proper treatment of wastewater and its processes
C701.3	To study theory and to be able to design secondary treatment units such as activated sludge process and trickling Filter.
C701.4	To study low-cost treatment methods for rural areas
C701.5	To study the onsite treatment methods and concepts of anaerobic digester
C701.6	To understand the concept of industrial wastewater treatment and learn the basics of recycle and reuse of treated water.

C702 -Transportation Engineering

C702.1	Receive the introduction and history of highway engineering and economics also which will remain correct for long period of time.
C702.2	Calculate and design the different component of the highway such as sight distances, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves
C702.3	Will get the knowledge about the traffic engineering and components of traffic such as traffic signs, signals, design of traffic signals design, rotary intersection, Volume studies, speed
C702.4	Examine and test materials of highway such as Soil, Stone Aggregate, Bitumen, Marshal Stability Test etc. Also get knowledge about construction of highway.
C702.5	Learn about the design criteria of pavements by IRC guideline.
C702.6	Learn construction of various types of flexible pavements and rigid pavements

C703 -Structural Design and Drawing III

C703.1	Understand the design Philosophy and be able to understand the application of different specification of IS 456-2000.
C703.1	To analyze the design of RC Beams and slab based on guidelines given in IS 456-2000
C703.1	To analyze and design of two-Way slab and staircase for different Support Conditions.
C703.1	To design flexure member for different Support Condition.
C703.1	To design the structures for Limit Sate of Serviceability for Deflection and Cracking (i.e. Singly, Doubly, Fanged beam sections), Bond, Torsion and for Shear.
C703.1	To analyze and design RC Columns and footing.

C704.A - Elective I: System Approach in Civil Engineering

C704.A.1	To introduce students to optimization techniques and applications of same in Civil Engineering
C704.A.2	To impart the knowledge of different Stochastic Methods of optimization
C704.A.3	To Apply various types of Linear Programming techniques.
C704.A.4	To equip the students with advance Linear Programming techniques
C704.A.5	To impart the knowledge of Non-Linear Programming through unconstrained optimization techniques.
C704.A.6	To apply techniques of Dynamic Programming for problems related to project investment

C704.B - Elective I: Advanced Concrete Technology

C704.B.1	To explore information about cement , Aggregate & Concrete.
C704.B.2	Know the information about Special Concrete
C704.B.3	Design of concrete mix and grade as per IS code
C704.B.4	To gain properties of fibres
C704.B.5	To study Quality control and physical properties of GFRC, SFRC , SIFCON.
C704.B.6	To acquire Properties & specification of ferrocement

C705.A -Elective II: Integrated Water Resources planning & Management

C705.A.1	To understand the constitutional provisions and water policies and laws of government.
C705.A.2	Understand the scarcity, crises, availability and requirements of water.
C705.A.3	Understand the water logging, ground water, salinity problems and manage flood and drought conditions
C705.A.4	To study demand and supply of water for management
C705.A.5	Understand the seriousness of consequences on environment and water resources

C705.A.6	Understand the development of basin and watershed management

C705.B -Elective II: TQM & MIS in civil Engineering

C705.B.1	Able to Memorize the various definition of quality and its interpretations, important of quality in construction
C705.B.2	Able to interpret concept of Total quality Management & its tools
C705.B.3	Able to Summarize concept of Quality Manual and ISO principles
C705.B.4	Able to Explain concept of Kaizen, cost of Quality and Quality circle
C705.B.5	Able to Explain term called of 5S, zero defect and FEMA
C705.B.6	Able to Explain Management information system structure based on management and various types of planning

C801- Dams and Hydraulic Structures

C801.1	To introduce Students with types of dams, various instruments used for dams safe working
C801.2	To study analysis of gravity dam, various galleries and types of arch and other dam.
C801.	To infer various types of spillways and design of ogee spillway, and understanding hydropower structures.
C801.4	To study various types earth dam, its failure pattern, and diversion head work.
C801.5	To study various types of canals, types of canal lining, types of canal structures and design of canal
C801.6	To study the various types of river training structures

C802 - Quantity Surveying, Contracts and Tenders

C802.1	Able to describe types of estimates and importance of approximate estimate
C802.2	Able to prepare detailed estimate for civil engineering structures
C802.3	Able to draft suitable specification to meet expectations of client and prepare the rate analysis
C802.4	Able to choose suitable method of valuation of property and implement it

C802.5	Able to explain execution of works in PWD and tendering
C802.6	Able to Illustrate meaning, Validity, the conditions and laws of buildings

C803 - Project

C803.1	To Apply the knowledge for solving realistic problem
C803.2	To develop problem solving ability
C803.3	To Organize, sustain and report on a substantial piece of team work over a period of several months
C803.4	To Evaluate alternative approaches, and justify the use of selected tools and methods,
C803.5	To Reflect upon the experience gained and lessons learned
C803.6	To Consider relevant social, ethical and legal issues.

C804.A- Construction Management

C804.A.1	Develop understanding of importance of construction industry in development of various sectors in India
C804.A.2	Learn basics of Construction Scheduling for the application onsite construction
C804.A.3	Understand and acquire the knowledge of labor laws for better practice at site
C804.A.4	Understand the basics of risk management and value engineering
C804.A.5	Summarize basics of Material management and Human resource management
C804.A.6	Comprehend use of Artificial intelligence in the field of construction industry

STES's
Sinhgad Institute of Technology and Science, Narhe, Pune-41
Department of Electronics and Telecommunication Engineering
Academic Year 2020-21

Program Outcomes

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.

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

Program Specific Outcomes (PSO)

A graduate of the Electronics and Telecommunication Program will demonstrate-

Sr. No.	Program Specific Outcomes	Bloom's Level
PSO 1	Apply the basic concepts of Electronics and Telecommunication in designing different hardware and software systems for solutions towards societal problems with the knowledge of Analog and Digital communication, Signal processing, Mechatronics, Embedded systems, Information theory, Internet of Things, Machine Learning, etc.	L3: **Apply**
PSO2	Develop usable solution towards complicated Electronics and Telecommunication Engineering issues by using recent hardware and software co-design tools with appropriate analytical and managerial skills.	L6: **Create**
PSO3	Propose energy efficient solutions for various social and environmental issues in real world applications by keeping pace with new technologies.	L6: **Create**

	Course Outcomes (COs)
Second Year Engineering	
C301	**Engineering Mathematics-III**
C301.1	Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
C301.2	Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
C301.3	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.
C301.4	Perform vector differentiation & integration, analyze the vector fields, and apply to electro-magnetic fields & wave theory.
C301.5	Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.
C302	**Electronic Circuits**
C302.1	Assimilate the physics, characteristics, and parameters of MOSFET towards its application as amplifier.
C302.2	Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
C302.3	Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
C302.4	Explain internal schematic of Op-Amp and define its performance parameters.
C302.5	Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
C302.6	Understand and compare the principles of various data conversion techniques and PLL

	with their applications.
C303	**Digital Circuits**
C303.1	Identify and prevent various hazards and timing problems in a digital design.
C303.2	Use the basic logic gates and various reduction techniques of digital logic circuit.
C303.3	Analyze, design, and implement combinational logic circuits.
C303.4	Analyze, design, and implement sequential circuits.
C303.5	Differentiate between Mealy and Moore machines.
C303.6	Analyze digital system design using PLD.
C304	**Electronic Circuits**
C304.1	Analyze the simple DC and AC circuit with circuit simplification techniques.
C304.2	Formulate and analyze driven and source free RL and RC circuits.
C304.3	Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
C304.4	Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
C304.5	Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.
C304.6	Analyze and select a suitable motor for different applications.
C305	**Data Structures**
C305.1	Solve mathematical problems using C programming language.
C305.2	Implement sorting and searching algorithms and calculate their complexity.
C305.3	Develop applications of stack and queue using array.
C305.4	Demonstrate applicability of Linked List.
C305.5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
C305.6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.
C306	**Electronic Circuit Lab**
C306.1	Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
C306.2	Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
C306.3	Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
C306.4	Explain internal schematic of Op-Amp and define its performance parameters.
C306.5	Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
C306.6	Understand and compare the principles of various data conversion techniques and PLL with their applications.
C307	**Digital Circuit Lab**
C307.1	Design and Implement circuit using Multiplexer IC and Demultiplexer IC
C307.2	Understand Implementation of Combination logic design using different IC's
C307.3	Understand Implementation of Sequential logic design using different IC's
C307.4	Verify voltage and current parameters of TTL and CMOS logic families
C308	**Electrical Circuit Lab**
C308.1	Analyze the simple DC and AC circuit with circuit simplification techniques.
C308.2	Formulate and analyze driven and source free RL and RC circuits.
C308.3	Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
C308.4	Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.

C308.5	Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.	
C308.6	Analyze and select a suitable motor for different applications.	
C309	**Data Structures Lab**	
C309.1	Discuss the computational efficiency of the principal algorithms such as sorting & searching.	
C309.2	Write and understand the programs that use arrays & pointers in C	
C309.3	Describe how arrays, records, linked structures are represented in memory and use them in algorithms.	
C309.4	Implement stacks & queues for various applications.	
C309.5	Understand various terminologies and traversals of trees and use them for various applications.	
C309.6	Understand various terminologies and traversals of graphs and use them for various applications.	
C310	**Electronic Skill Development**	
C310.1	Understand electronic component working and application development using programming language.	
C310.2	Explain Hardware Design, Fault Finding, Testing, Repair and Measurement procedures	
C310.3	Understand assembling of mechanical part and calculate total power budget	
C401	**Signals and Systems**	
C401.1	Identify, classify basic signals, and perform operations on signals.	
C401.2	Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.	
C401.3	Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.	
C401.4	Resolve the signals in complex frequency domain using Laplace Transform and will be able to apply and analyze the LTI systems using Laplace Transforms.	
C401.5	Define and describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.	
C401.6	Compute the mean, mean square, variance and standard deviation for given random variables using PDF.	
C402	**Controls Systems**	
C402.1	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.	
C402.2	Determine the (absolute) stability of a closed-loop control system	
C402.3	Perform time domain and frequency domain analysis of control systems required for stability analysis.	
C402.4	Perform time domain and frequency domain correlation analysis.	
C402.5	Apply root-locus, Frequency Plots technique to analyze control systems.	
C402.6	Express and solve system equations in state variable form.	
C403	**Principles of Communication Systems**	
C403.1	To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.	
C403.2	Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.	
C403.3	Explain generation and detection of FM systems and compare with AM systems.	
C403.4	Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).	
C403.5	Characterize the quantization process and elaborate digital representation techniques	

	(PCM, DPCM, DM and ADM).
C403.6	Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.
C404	**Object Oriented Programming**
C404.1	Describe the principles of object-oriented programming.
C404.2	Apply the concepts of data encapsulation, inheritance in C++.
C404.3	Understand Operator overloading and friend functions in C++.
C404.4	Apply the concepts of classes, methods inheritance, and polymorphism to write programs C++.
C404.5	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
C404.6	Describe and use of File handling in C++
C405	**Signals and Control System Lab**
C405.1	Identify, classify basic signals and perform operations on signals.
C405.2	Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
C405.3	Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
C405.4	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
C405.5	Determine the (absolute) stability of a closed-loop control system
C405.6	Apply root-locus, Frequency Plots technique to analyze control systems.
C406	**Principles of Communication Systems Lab**
C406.1	Understand AM generation by graphical method and observing spectrum.
C406.2	Explain different pulse modulation techniques in communication system.
C406.3	Understand generation and detection of DM and ADM.
C406.4	Verify communication system using Software.
C407	**Object Oriented Programming Lab**
C407.1	Apply the concepts of data function overloading, inheritance in C++.
C407.2	Apply the concepts of Operator overloading and friend functions in C++.
C407.3	Understand the programming related to constructors and destructors in C++.
C407.4	Develop concepts for programming models to understand concepts of classes, methods inheritance and polymorphism in C++.
C407.5	Understand Templates, Namespaces and Exception Handling concepts to develop programming applications in C++.
C407.6	Understand and perform the File handling opertaions in C++
C408	**Data Analytics Lab**
C408.1	Explain different packages in python.
C408.2	Understand various visualization libraries in python.
C408.3	Learn different preprocessing techniques for data mining.
C408.4	Analyze data using various statistical data analysis techniques.
C408.5	Explain relationship in data using exploratory data analysis
C408.6	Explore the hidden relationships in the data
C409	**Emploability Skill Development**
C409.1	Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
C409.2	Develop effective communication skills (listening, reading, writing, and speaking), self-management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.

C409.3	Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
C409.4	Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
C409.5	Develop practically deployable skill set involving critical thinking, effective presentations, and leadership qualities to hone the opportunities of employability and excel in the professional environment.
C410	**Project Based Learning**
C410.1	Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
C410.2	Contribute to society through proposed solution by strictly following professional ethics and safety measures.
C410.3	Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
C410.4	Analyze the results and arrive at valid conclusion.
C410.5	Use of technology in proposed work and demonstrate learning in oral and written form.
C410.6	Develop ability to work as an individual and as a team member.
Third Year Engineering	
C501	**Digital Communication**
C501.1	Understand working of waveform coding techniques and analyze their performance.
C501.2	Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
C501.3	Perform the time and frequency domain analysis of the signals in a digital communication system.
C501.4	Design of digital communication system.
C501.5	Understand the random signal and processes.
C501.6	Understand working of spread spectrum communication system and analyze its performance.
C502	**Digital Signal Processing**
C502.1	Identify the characteristics different digital systems and concept of sampling theorem.
C502.2	Understand analog and digital systems in frequency domain analyse, realization and implementation.
C502.3	Understand concept of z transform and design with pole zero plot.
C502.4	Design and analyse different methods of IIR digital filters.
C502.5	Design and analyse different methods of FIR digital filters.
C502.6	Design and apply DSP concept in real life applications.
C503	**Electromagnetics**
C503.1	Correlate the concept of mathematical Coordinate System with real world problems and understand the concept of Coulombs law, Gauss's law and its applications.
C503.2	Understand the work, energy, potential for different coordinate systems. Use Laplace's and Poisson's equation for finding Electric field intensity and different types of capacitance.
C503.3	Understand the Biot Savarts law and Amperes Circuital law to find out the magnetic field intensity. Use Lorentz force equation, Scalar and Vector magnetic potential in magnetostatics.
C503.4	Distinguish between stationery and time varying field by Faradays law and Maxwells contribution with the help of four equations for different Media. Use Poynting theorem to evaluate the power associate with EM fields.

C503.5	Understand to calculate the line parameters mathematically, analytically and using graphical method.	
C503.6	Understand the different wave equations for uniform plane wave in different mediums.	
C504	**Microcontrollers**	
C504.1	Learn importance of microcontroller in designing embedded application.	
C504.2	Learn use of hardware and software tools.	
C504.3	Develop interfacing to real world devices.	
C505	**Mechatronics**	
C505.1	Explain key aspects of the mechatronics system and its block diagram.	
C505.2	Understand basic working principles of Sensors and Transducers.	
C505.3	Distinguish various categories of mechatronics system elements and its applications.	
C505.4	Describe case study of the mechatronics system.	
C506	**Signal Processing and Communication Lab**	
C506.1	Implement various baseband and passband modulation techniques.	
C506.2	Explore different characteristics related to Spread Spectrum Techniques	
C506.3	Understand and simulate performance parameters of baseband and passband modulation techniques using MATLAB	
C506.4	Understand analog and digital systems in frequency domain analyze, realization and implementation.	
C506.5	Design and analyze different methods of IIR digital filters.	
C506.6	Design and analyze different methods of FIR digital filters.	
C507	**Microcontroller and Mechatronics Lab**	
C507.1	Understand programming in assembly language for 8051 and interfacing of peripheral device	
C507.2	Explain interfacing of peripheral devices using Embedded C for PIC18FXX Microcontroller	
C507.3	Explain interfacing of peripheral devices using different communication protocol.	
C507.4	Understand the key components of Mechatronics design method and the basic concepts of engineering system with dynamic response of the approach.	
C507.5	Realize the models of real time interfacing and data acquisition and examine the operating principles of hydraulic and Pneumatic systems.	
C507.6	Understanding the concepts of Mechatronics system through explanation of case studies.	
C508	**Electronics System Design**	
C508.1	Apply the fundamental concepts and working principles of electronics devices to design electronics systems.	
C508.2	Shall be able to interpret datasheets and thus select appropriate components and devices	
C508.3	Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition system.	
C508.4	Design an electronic system/sub-system and validate its performance by simulating the same.	
C508.5	Shall be able to use an EDA tool for circuit schematic and simulation.	
C508.6	Create, manage the database and query handling using suitable tools.	
C601	**Power Electronics**	
C601.1	Design & implement a triggering / gate drive circuit for a power device	
C601.2	Understand, perform & analyze AC to DC converters	
C601.3	Understand, perform & analyze DC to AC converters	
C601.4	Understand, perform & analyze DC to DC converters	
C601.5	Evaluate battery backup time & design a battery charger	
C601.6	Design & implement over voltage / over current protection circuit	
C602	**Information Theory, Coding and Communication Networks**	

C602.1	Perform information theoretic analysis of communication system.
C602.2	Design a data compression scheme using suitable source coding technique
C602.3	Design a channel coding scheme for a communication system
C602.4	To Understand and design BCH and RS codes.
C602.5	Understand and apply fundamental principles of data communication and networking.
C602.6	Apply flow and error control techniques in communication networks.
C603	**Business Management**
C603.1	To get introduction to Business Management in business organizations.
C603.2	To learn the concept of Quality Management in business organizations.
C603.3	To learn the concept of Financial Management and Project Management in business organizations.
C603.4	To learn Human Resource Management in Business organizations.
C603.5	To learn Entrepreneurship
C603.6	To learn marketing management in Business organizations.
C604	**Advanced Processors**
C604.1	Describe the ARM microprocessor architectures and its feature.
C604.2	Describe about ARM based microcontroller LPC2148 architectures and its peripherals.
C604.3	Interface the peripherals to ARM based microcontroller LPC2148 to design embedded system with available resources.
C604.4	Interface the advanced peripherals to ARM based microcontroller LPC2148 to design embedded system with available resources.
C604.5	Describe the need, Architecture, and features of DSP processors.
C604.6	Use of DSP Processors and resources for signal processing applications.
C605	**System Programming and Operating Systems**
C605.1	To understand system software concepts, like the use and implementation of assembler, macros.
C605.2	To get acquainted with software tools for program development. To implement linker, loaders, and compiler.
C605.3	To study basic of Operating System and implement various processes scheduling techniques
C605.4	To study Inter process communication and dead lock prevention, avoidance, detection schemes in operating system.
C605.5	To explore memory allocation methods, input output devices and file system w. r. t. various operating system.
C605.6	To study Input and Output Devices, File Management and implement Disk Scheduling Algorithm
C606	**Power and ITCT Lab**
C606.1	To Design coding and decoding techniques of Linear Block Codes
C606.2	To Design coding and decoding techniques of Cyclic Codes
C606.3	Implement BCH and RS Codes.
C606.4	Design & implement a triggering / gate drive circuit for a power device
C606.5	Understand, perform & analyze AC to DC converters
C606.6	Understand, perform & analyze DC to AC converters
C607	**Advanced Processors and System Programming Lab**
C607.1	To understand basic instruction set of ARM 7
C607.2	To implement basic programs using Keil
C607.3	To understand basic instructions of Lpc2148 and implement basic programs for electronic circuits
C607.4	To understand basic Linux commands and write a shell script
C607.5	To write simple programs for Page Replacement Algorithm.
C607.6	To write simple programs for Scheduling Algorithm.

C608	**Employability Skills and Mini Project**
C608.1	Understand, plan and execute a Mini Project with team.
C608.2	Prepare appropriate Title and system block diagram of entire project
C608.3	Select appropriate transducer and signal conditioning circuit, ADC/DAC, microcontrollers to design prototype.
C608.4	Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
C608.5	Prepare a technical report based on the Mini project.
C608.6	Deliver technical seminar based on the Mini Project work carried out.
Final Year Engineering	
C701	**VLSI Design and Technology**
C701.1	Write effective HDL coding for digital design.
C701.2	Apply knowledge of real time issues in digital design.
C701.3	Model digital circuit with HDL, simulate, synthesize and prototype in PLDs.
C701.4	Design CMOS circuits for specified applications.
C701.5	Analyze various issues and constraints in design of an ASIC
C701.6	Apply knowledge of testability in design and build self-test circuits.
C702	**Computer Networks and Security**
C702.1	Understand fundamental underlying principles of computer networking
C702.2	Describe and analyze the hardware, software, components of a network and their interrelations.
C702.3	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
C702.4	Have a basic knowledge of installing and configuring networking applications.
C702.5	Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
C702.6	Have a basic knowledge of the use of cryptography and network security.
C703	**Radiation and Microwave Techniques**
C703.1	Differentiate various performance parameters of radiating elements.
C703.2	Analyze various radiating elements and arrays.
C703.3	Apply the knowledge of waveguide fundamentals in design of transmission lines.
C703.4	Design and set up a system consisting of various passive microwave components.
C703.5	Analyze tube based and solid state active devices along with their applications.
C703.6	Measure various performance parameters of microwave components.
C704	**Internet of Things**
C704.1	To Understand the various concepts, terminologies and architecture of IoT systems.
C704.2	Use sensors and actuators for the design of IoT.
C704.3	Understand and apply various protocols for design of IoT systems
C704.4	Use various techniques of data storage and analytics in IoT
C704.5	Understand various applications of IoT
C705	**Electronic Product Design**
C705.1	Familiar with various stages of Hardware, Software and PCB design.
C705.2	Identify different factors of analog, digital and mixed circuit design.
C705.3	Acquainted with different concerns of software design and testing methods.
C705.4	Get familiarized with methods of PCB design and different tools.
C705.5	Realize the importance of product test and test specification.
C705.6	Get familiarized with the process and significance of documentation.
C706	**Lab Practice-I (CNS+RMT)**
C706.1	Analyze various radiating elements and arrays.
C706.2	Design and set up a system consisting of various passive microwave components.
C706.3	Analyze tube based and solid state active devices along with their applications.

C706.4	To implement Local Area Network and study different commands.
C706.5	To study network analyzer tools and capture different protocols.
C706.6	To install IIS Web Server and create webpages using HTML.
C707	**Lab Practice-II (VLSI+IOT)**
C707.1	Understand implementation of various combinational and sequential circuits using HDL and simulate using EDA tool.
C707.2	Design and implementation of Digital Design in FPGA board.
C707.3	Design and implementation of CMOS Digital circuits using EDA tool.
C707.4	Study various IOT boards and IOT platforms.
C707.5	Explain interfacing of different peripherals using IOT.
C707.6	Understand controlling of different peripherals using IOT.
C708	**Project Stage-I**
C708.1	Employ their learned skills to describe problem statements and its purpose.
C708.2	Summarize abstract and synopsis for certain problems.
C708.3	Evaluate related research work and encapsulate in the form of literature survey.
C708.4	Explain their knowledge about technological tools and techniques for planning and execution of project.
C801	**Mobile Communication**
C801.1	Explain and apply the concepts telecommunication switching, traffic and networks
C801.2	Analyze the telecommunication traffic.
C801.3	Analyze radio channel and cellular capacity.
C801.4	Explain and apply concepts of GSM and CDMA system.
C801.5	Explore the architecture of GSM.
C801.6	Differentiate thoroughly the generations of mobile technologies.
C802	**Broadband Communication Systems**
C802.1	Understand basics of fiber optic communication system their types and applications.
C802.2	Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.
C802.3	Understand basics of WDM system, components used in FOC, amplifiers.
C802.4	Understand basics of satellite communications, orbital mechanics, and launchers.
C802.5	Understand satellite subsystems and different types of antennas.
C802.6	Carry out Satellite Link design for Uplink and Downlink
C803	**Machine Learning**
C803.1	Distinguish among various learning methods and explain the steps involved in constructing a different machine learning algorithm.
C803.2	Explain the use of supervised learning algorithms like regression and classification for solving real world challenges.
C803.3	Build unsupervised learning algorithms to explain complex problems with an interpretation of the trade-offs engaged.
C803.4	Understand basic concepts of neural networks and different learning mechanisms for community applications.
C803.5	Explore various neural network algorithms to solve real world problems.
C803.6	Understand applications of Convolutional Neural Networks (CNN's) for image recognition applications.
C804	**Audio Video Engineering**
C804.1	After learning the AVE course, students will benefit to learn and understand the working of real-life video systems and the different elements of video systems plus the encoding/decoding techniques.
C804.2	The learners will be groomed to understand different channel allocations, differences between various systems present in this world, their transmission and reception techniques.

C804.3	Students will get insight on functioning of individual blocks, different standards of compression and they will be acquainted with different types of analog, digital TV and HDTV systems.
C804.4	The students will get overview of fundamentals of Audio systems and basics Acoustics
C804.5	After learning the AVE course, students will benefit to learn and understand the working of real-life video systems and the different elements of video systems plus the encoding/decoding techniques.
C805	**Wireless Sensors Networks**
C805.1	Understand the basic concepts of wireless sensor networks and architecture.
C805.2	Basic concepts of radio links and analyze different protocols in WSN.
C805.3	Justifying ideas and concepts of wireless protocols stacks in WSN.
C805.4	Design and analyze different routing protocols.
C805.5	Find different attacks in the network and study different issues in security.
C805.6	Design and deploy WSN applications in real life.
C806	**Renewable Energy Sources**
C806.1	Interpret energy reserves of India and potential of different energy sources.
C806.2	Measure the solar radiation parameters and performance of different solar collectors.
C806.3	Calculate different parameters of the wind turbine rotor.
C806.4	Implicit the importance and applications of geothermal and ocean energy.
C806.5	Find different attacks in the network and study different issues in security.
C806.6	Demonstrate knowledge in the field of fuel cell and potential for power generation.
C807	**Lab Practice-III(MCS+BCS)**
C807.1	Students will be able to establish the communication link between different users using the PSTN module and test various AT commands.
C807.2	Learners will analyze the traffic performance using Hata outdoor propagation model and calculate the bit error rate for CDMA/OFDM modulation technique.
C807.3	Students will understand the GSM working principle, VoIP measurement setup and Lost call system model to analyze the blocking probability of the network.
C807.4	Understand the functioning of optical fiber communication.
C807.5	Understand the theory of satellite communication.
C807.6	Understand the idea of satellite link design.
C808	**Lab Practice-IV(ML+AVE)**
C808.1	Understand the fundamental concepts in neural networks.
C808.2	Explain different Machine Learning algorithms to solve real world problems.
C808.3	Understand concepts of deep neural networks and CNN.
C808.4	Understand and interpret different issues of color television systems.
C808.5	Understand basics of television systems.
C808.6	Understand audio systems in television system.
C809	**Project Stage-II**
C809.1	Design solution for the problem defined.
C809.2	Implement the project to discover a solution which is professional.
C809.3	Prepare a complete report of work carried in the process of implementation of the project.
C809.4	Demonstrate oral, written, and practical skills acquired during the process of completion of the project.