ADHIYAMAAN COLLEGE OF ENGINEERING (AUTONOMOUS)

Dr.M.G.R Nagar - Hosur

Criteria II

2.6.1- List of Course Outcomes for all Courses

Program Name	B.Arch (ARCHITECTURE)
Semester	I
Course Name	*MATHEMATICS*
	On successful completion of the course the students will be able to:
CO1	Acquire the knowledge of basic statistics and graphical representation tools.
CO2	Understand the applications of probability concepts.
CO3	Apply the techniques to solve ordinary differential equations.
CO4	Evaluate integrals involving rational and irrational functions which have an application in many application fields.
CO5	Associate the concept of three dimensional analytical geometry to real time applications.
Course Name	*HISTORY OF ARCHITECTURE I*
	On successful completion of the course the students will be able to:
CO1	Enabled the students to understand the development of architecture in the Ancient Western World and the cultural and contextual determinants that produced that architecture
CO2	An understanding about the spatial and stylistic qualities associated with architecture
CO3	Understanding of architecture as an outcome of various social, political and economic upheavals, and as a response to the cultural and context.
CO4	Comprehend the evolution and characteristics of cities.
CO5	The students understood Indian architecture as a response to the political and socio cultural conditions present in India at different points of time.
Course Name	*ARCHITECTURAL DRAWING I*
	On successful completion of the course the students will be able to:
CO1	Understood the nature of geometrical forms and simple building forms
CO2	Understood on the building representation in 2D and 3D among students in addition to preparation of measured drawing.
CO3	Enabled the students to understand concepts and fundamentals of architectural drawing to develop representation skill.
CO4	Understood axonometric projections as well as representation skills are imparted.
Course Name	*MATERIALS & CONSTRUCTION I*
	On successful completion of the course the students will be able to:
CO1	Understood the properties, characteristics, strength and application of naturally occurring building materials such as Stone, Bamboo, Lime and Mud.
CO2	Exposed the principles of designing components of load bearing structures – foundation
CO3	Students learned on construction details using building materials such as stone through drawing as well as doing a literature or live case study.
CO4	Understood Students are to submit drawing plates comprising of technical plan, elevation and section along with sketches and details showing method of construction.
Course Name	*ART STUDIO*
	On successful completion of the course the students will be able to:
CO1	The students are exposed to various mediums, techniques and tools.
CO2	The students gain mastery in sketching, visualizing and expression through manual drawing.
CO3	Sensitized to culture, craft and context.
CO4	Skill Development in Handling Materials and in Making Products.
Course Name	*BASIC DESIGN*
	On successful completion of the course the students will be able to:
CO1	An understanding of the qualities of different elements as well as their composite fusions.

CO2	An ability to engage and combine the elements of design in spontaneous as well as intentional ways in order to create desired qualities and effects.
CO3	Development of required skills – observation / analysis / abstractions / interpretation/representations / expressions through models and drawings.
CO4	Students are trained to develop abstract and real compositions in drawings.
CO5	Simultaneously workshop exercises involving real and abstract models made of match sticks, Card boards, wires, wood pieces to familiarize students with such skills shall be given importance.
Course Name	*PERSONALITY DEVELOPMENT*
	On successful completion of the course the students will be able to:
CO1	Attained Confidence and improved thought process.
CO2	Understood the behavioural aspects and built attitude.
CO3	Exposed to a team work to implement in project management.
CO4	Students are trained in communication skills.
CO5	Gained knowledge in time management.
Course Name	*ART APPRECIATION*
	On successful completion of the course the students will be able to:
CO1	Ability to understand and appreciate art as a fundamental human expression.
CO2	Awareness of important art productions in the West and India.
CO3	Sensitivity towards individual and collective human cultural productions as unique expressions of historical and geographic context
CO4	Ability to understand art through ages with different approaches.
CO5	Understood the traditional context, art forms through various works.
Semester	**II**
Course Name	*MECHANICS OF STRUCTURES- I*
	On successful completion of the course the students will be able to:
CO1	Apply the concepts of action of forces on a body and should be able to apply the equilibriumconcepts.
CO2	Analyze any type of determinate trusses with different end conditions.
CO3	To solve the sectional properties for any geometrical shapes.
CO4	The concepts of elastic constants and its applications for various types of problems with a thorough understanding of stresses and strain
CO5	To Understand the relationship between elastic constants and solving problems.
Course Name	*PRINCIPLES OF ARCHITECTURE*
	On successful completion of the course the students will be able to:
CO1	A thorough understanding on the definition of architecture; elements of architectures of form and space.
CO2	An exposure to the principles of architecture and applications of the same in buildings
CO3	Explore the principles of architecture and applications of the same in buildings.
CO4	More Understanding of the interaction that happens between form and spaces in building.
CO5	Getting more knowledge on how movement and circulation is enhanced in and around buildings
Course Name	*HISTORY OF ARCHITECTURE AND CULTURE - II*
	On successful completion of the course the students will be able to:
CO1	The students understood Indian architecture as a response to the political and socio cultural conditions present in India at different points of time.
CO2	An understanding of the diversity of architecture in India and sensitivity towards its syncretic aspects.

CO3	Ability to appreciate particular cultural, symbolic, spatial and material qualities in architecture and cities as givers of meaning and continuity.
CO4	The architectural responses were understood with respect to technology style and character
CO5	More understanding on regional Islamic architecture and its style of building.
Course Name	**ARCHITECTURAL DRAWING– II**
	On successful completion of the course the students will be able to:
CO1	The techniques and skills gained learned through this subject Architectural drawing II is very useful to their profession
CO2	Able to construct the perspective drawings of the buildings and 3d views as well the documentation of buildings through drawings.
CO3	Got exposed to the perspective method.
CO4	Gained Knowledge on the principle of shade and shadows.
Course Name	**MATERIALS & CONSTRUCTION II**
	On successful completion of the course the students will be able to:
CO1	An understanding of timber products and methods of construction and detailing.
CO2	Exposed the students to various wooden joinery details of furniture's.
CO3	An Understanding ofcost effective building technologies.
CO4	With the above knowledge students got to know more about partition details.
Course Name	**ARCHITETURAL DESIGN STUDIO I**
	On successful completion of the course the students will be able to:
CO1	The characteristics of site, importance of site planning and built form/open space relationship hasbeen understood.
CO2	User group responses were ascertained through case-studies.
CO3	Presentation ofconcepts was enabled through 2D drawings, sketches of model.
CO4	To develop the ability to translate abstract principles of design into architectural solutions for simple problems.
Course Name	**CLAY MODELING**
	On successful completion of the course the students will be able to:
CO1	Experiments through various types of materials combinations.
CO2	Dexterity; gain knowledge of materials used and their properties, craft skills; visualization skills.
CO3	With the above knowledge the students should make a useful interior product or sculpture with necessary detail.
CO4	Students got exposed to various forms of structure and its characteristics.
CO5	An Expressive thoughts to the 3D sculpture.
Course Name	**PRESENTATION AND RENDERING TECHNIQUES**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge on the rendering techniques and presentation skills.
CO2	Explore different materials in model making of small scale building components.
CO3	Developed the presentation skills, visual expression and representation, imaginative thinking and creativity through a hands on working with various mediums and materials.
CO4	Exposed to various medium and its applicability.
CO5	Developed the dexterity of hand in manipulation of different materials.
Course Name	**MODEL MAKING**
	On successful completion of the course the students will be able to:
CO1	Exploration of conventional and less conventional techniques of representation in an attempt to creative visualization and to understand drawings as vehicles of thinking.

CO2	Versatility in making models ranging from study to presentation and in varying scalesand materials.
CO3	Gained knowledge on the dynamic act of constructing in thinking process.
CO4	Exposed students to proper craftsmanship.
CO5	Students experienced the tools and techniques use in model making.
Course Name	*CREATIVE WORKSHOP*
	On successful completion of the course the students will be able to:
CO1	Understanding of different types of materials and its feasibility in model making.
CO2	Understand the basic relations of frames in architecture
CO3	Students shall be exposed to forces, moments, and resolution that are to be resolved.
CO4	Experienced simultaneously workshop exercises involving real and abstract models to familiarize students with such skills
CO5	Exposed the relation between structural resolution and architectural design concept.
Semester	**III**
Course Name	*MECHANICS OF STRUCTURES – II*
	On successful completion of the course the students will be able to:
CO1	Apply the concepts of determining the techniques of finding the stresses.
CO2	Use the theory of simple bending theory to find the deflection in beams.
CO3	Analyze and solve the different types of columns.
CO4	Analyze the different types of indeterminate beams.
CO5	Understand the concepts of slab
Course Name	*HISTORY OF ARCHITECTURE – III*
	On successful completion of the course the students will be able to:
CO1	A detailed understanding of western (Christian) architecture.
CO2	an understanding about the spatial and stylistic qualities associated with church architecture
CO3	An understanding of the architecture as an outcome of various social, political and economic upheaveals, and as a response to the cultural and climate conditions.
CO4	Understand about the impact of renaissance architecture.
CO5	Knowledge gained on French revolution.
Course Name	*CLIMATE RESPONSIVE ARCHITECTURE*
	On successful completion of the course the students will be able to:
CO1	Understanding of climate and its factors.
CO2	Conceptual understanding of designing the solar shading in Buildings.
CO3	Understanding of Thermal balance in Human beings.
CO4	Conceptual understanding of Air flow in Buildings.
CO5	Designing Climate responsive structure.
Course Name	*MATERIALS AND CONSTRUCTION - III*
	On successful completion of the course the students will be able to:
CO1	Understanding the properties of cement and its uses in building component.
CO2	Understanding the properties and grading of concrete in buildings & an exercise to understand the concrete foundation, flooring and slabs.
CO3	Understanding through detail construction techniques of walls and staircases.
CO4	Understanding through detail construction techniques of composite systems of wall, flooring and roof & its detailing of various components.
Course Name	*COMPUTER AIDED DESIGN STUDIO*
	On successful completion of the course the students will be able to:

CO1	The students benefit by learning software which helps them to better visualize complicated forms
CO2	To introduce to tools of productivity, concept of object linking and editing session, with a thrust on 2D drafting
CO3	Gained knowledge on construction planes, 3D surfaces, use of dynamic projections, techniques of setting to create photo realistic pictures.
CO4	It is also proposed to cover environment setting and image filing as an additional presentation technique and also helps in producing photo realistic images of those 3D forms and it's rendering as a necessity for architects
Course Name	**ARCHITECTURAL DESIGN - II**
	On successful completion of the course the students will be able to:
CO1	The students were exposed to the various components and aspects associated with design concepts and its evolution in public spaces.
CO2	They were also explored to the anthropometric detail for physically handicapped persons in public buildings.
CO3	Students were also asked to document and present the related details collected for the design and are to be given exposure in computer usage.
CO4	The students were exposed into the process of design articulate; glorify spaces in respect of buildings of small scale, small span, horizontal and vertical movements (two or three levels), incorporating barrier free elements and details.
Course Name	**BEHAVIORAL STUDIES IN BUILT ENVIRONMENT**
	On successful completion of the course the students will be able to:
CO1	The students were made to understand the behavior in built environment and analysis how the space making is done.
CO2	Understood the interaction with the personal space and human behavior.
CO3	Gained knowledge about this relatively new field, born out of the synthesis between architecture and behavioral psychology.
CO4	Understood with behavioral design process model for different environment.
CO5	To analyze and do a presentation on psychological issues of urban environment considering the neighborhood contexts.
Course Name	**MODULAR CONSTRUCTION TECHNIQUES**
	On successful completion of the course the students will be able to:
CO1	The students understood the role of different material and techniques adopted in modular construction.
CO2	They were made aware of various aspects in prefabricate structures.
CO3	Gained knowledge on the latest construction techniques and presentation to be done on the live case studies of the known architects.
CO4	Understood model making on tensile structures, space frames etc to get the get better understating.
CO5	Exposed to the impact of industrialization on the space requirements.
Course Name	**VERNACULAR ARCHITECTURE OF INDIA**
	On successful completion of the course the students will be able to:
CO1	Students will be able to understand the character of the multi cultured architectural expression through case studies.
CO2	Documented and presentation on planning principles of different towns for their better understanding of local culture.
CO3	Gained knowledge on various manmade and nature forces behind the evolution of traditional architecture.
CO4	Also understood the overlapping and the influence of anthropology, sociology and culture in the architecture style and character of a region.

CO5	Enabled them to understand the impact of colonial architecture on settlement pattern and houses.
Course Name	**THEORY OF DESIGN**
	On successful completion of the course the students will be able to:
CO1	They"ll be able to analyze various stages of design process and implement the same in their design.
CO2	They"ll get exposed to the works of eminent architects and be able to analyses the design thinking process.
CO3	The students were made to understand how architectural design solutions generated are linked to philosophy, strategies that lead to creativity in architecture
CO4	Exposed on the design solution based on intuition, creativity and goals.
CO5	Understood on how architectural design solutions generated are linked to philosophy, strategies that lead to creativity in architecture.
Semester	**IV**
Course Name	**ANALYSIS & DESIGN OF STRUCTURES – I**
	On successful completion of the course the students will be able to:
CO1	Design of steel joints for maximum efficiency and strength.
CO2	Tension members and columns are designed for various conditions by applying the codal provisions.
CO3	Design of axially loaded steel columns.
CO4	Basic knowledge about concrete.
CO5	Design of one way and two way RC slabs.
Course Name	**ENVIRONMENTAL SCIENCE AND SERVICES**
	On successful completion of the course the students will be able to:
CO1	The students are exposed about environment and its ecosystem to Indian geographical context.
CO2	They are also exposed to various issues and pollutions related to environment and acts and policies to protect environment.
CO3	Students understood various techniques and methods involved in water treatment and disposal
CO4	Gained knowledge on modern techniques of sewage disposal and storm water.
CO5	Knowing alternate Sustainable practices for Water harvesting and environmental challenges.
Course Name	**SITE PLANNING & ANALYSIS**
	On successful completion of the course the students will be able to:
CO1	The contextual importance on site analysis can be understood based on the various site factor with respect to the study area.
CO2	Various scientific and analytic site analysis techniques is understood.
CO3	To document on-site and off-site factors , site analysis diagram.
CO4	To prepare the contour analysis, understood the development control regulation, understood the building surrounding analysis.
CO5	To prepare site analysis diagram from the above units for commercial and institutional projects.
Course Name	**MATERIALS & CONSTRUCTION - IV**
	On successful completion of the course the students will be able to:
CO1	An Understanding of ferrous metals in terms of its properties, manufacture and their applications in architectural construction.
CO2	The students are able to understand in detail the method of construction of various building components using steel and steel components.

CO3	An Understanding of Non-ferrous metals in terms of its properties, manufacture and their applications in architectural construction.
CO4	This also helps the student to understand the different construction practices adapted for the various components specific to the material in which its made.
CO5	Students to understand that ferrous metals and Non-Ferrous metals are equally important in construction industry
Course Name	**ARCHITECTURAL DESIGN - III**
	On successful completion of the course the students will be able to:
CO1	Student"s ability to understand the concept of community and settlement evolution and the built environment as influenced by Socio-economic, Cultural, Environmental and Technical factors.
CO2	Ability to provide a sensitive approach to the design of the built environment taking into account the above mentioned factors
CO3	Educated the student into the process of design in different context (Rural) by choosing relevant topics of community or civic importance.
CO4	Thrust was given on rural materials, construction techniques and design details.
CO5	Students gained knowledge the physical, technical and visual characteristics of a settlements at micro level.
Course Name	**ENERGY EFFICIENT ARCHITECTURE**
	On successful completion of the course the students will be able to:
CO1	The students are exposed to alternative sources of energy and are exposed to passive design considerations
CO2	An understanding on site design conditions for various climatic zones in creating sustainable built environment. Also gained knowledge in passive heating techniques for various building.
CO3	Understood the concepts of passive cooling techniques satisfying the demand of future needs.
CO4	Exposed the students to various design concepts with model making.
CO5	To understand the importance of Energy conservation in general and solar energy particularly and to incorporate energy efficient techniques in Planning, design and detailing of buildings.
Course Name	**TRADITIONAL INDIAN ARCHITECTURE**
	On successful completion of the course the students will be able to:
CO1	The students are exposed to the traditional architecture of India, which is rooted in its history.
CO2	Gained knowledge on concept of vastu with examples.
CO3	Understood about different space from site level to building level.
CO4	An understanding on site design conditions for various vastu principle sbased on energy in creating a suitable built environment.
CO5	The students are enabled to incorporate the traditional unique system of measurement in design of buildings.
Course Name	**ERGONOMICS IN BUILDING DESIGN**
	On successful completion of the course the students will be able to:
CO1	Understand the relevance of human factors and anthropometrics to environmental design.
CO2	Explain the importance of ergonomic design in the built environment.
CO3	Analyze anthropometric dimensions for designing interior spaces and products for children, men, women, elderly and physically challenged individuals.
CO4	Demonstrate design analysis that follows the principles of human factors/ergonomics.
CO5	This also helps the student to understand the ergonomic necessities in design.
Course Name	**SPATIAL PLANNING STRATEGIES**

	On successful completion of the course the students will be able to:
CO1	Space planning for public areas- restaurant, café, theatre lounge, waiting rooms, hotel foyer based on analysis of human behavior and perception of space.
CO2	Understanding the Human behavior in various public and private areas.
CO3	Study on Relationship between spatial elements and human behavior
CO4	Understood the key issues in historical and contemporary global and urban psychology.
CO5	Gained knowledge about the relationship between man and space through the behavioral pattern
Semester	**V**
Course Name	*ANALYSIS & DESIGN OF STRUCTURES – II*
	On successful completion of the course the students will be able to:
CO1	Gain basic knowledge about RCC column.
CO2	Design of dog legged staircase
CO3	Design of isolated column footing and combined footing.
CO4	Understanding the various methods in designing the members such as beams and slabs.
CO5	Apply the limit state design methods to design RCC beams and slabs and present the same.
Course Name	*HISTORY OF MODERN ARCHITECTURE*
	On successful completion of the course the students will be able to:
CO1	An insight into the development of modern architecture and its transformation across the world.
CO2	Presentation on various other philosophies like futurism, expressionism, brutalism, constructivism, and the pioneers of these Philosophies through study of select works of them.
CO3	Able to analyze the Bahaus school of thought and understand contemporary trends in Indian and western architecture in terms of ideas and direction through the works of outstanding architects.
CO4	An understanding of architecture in India under influence of colonialism and colonial modernity.
CO5	Gain knowledge about the "Art Nouveau Movement" the pioneers of the movement and early architecture works of architect F.L.Wright with documents and present the same.
Course Name	*MATERIALS & CONSTRUCTION V*
	On successful completion of the course the students will be able to:
CO1	The students understood various components of buildings in terms of damp proofing and waterproofing through case study of swimming pool and collections of materials and catalogue.
CO2	The construction techniques of thermal insulation in a cold storage to be presented as a report.
CO3	Analyze and present the different construction practices adapted for the various components specific to the material and finishes in the floor and wall coverings.
CO4	The students are asked to the documentation through materials, catalogue, photograph and video presentation the various exterior finishes of paints, cladding, structural glazing and their contextual application in buildings.
Course Name	*BUILDING SERVICES I*
	On successful completion of the course the students will be able to:
CO1	Electrical Drawing with the basics of Electricity and wiring system to be submitted for a residential building.
CO2	Catalogues on various types of lights Tobe collected and displayed.
CO3	Prepare, Design and estimate the electrical load required for any building.
CO4	Apply the illumination required for different occupancies and tasks.

CO5	Case study visit to recording to understand the spatial design characteristics of studios and materials used.
Course Name	**ARCHITECTURAL DESIGN - IV**
	On successful completion of the course the students will be able to:
CO1	Ability to provide a sensitive approach to the design of the built environment taking into the social and cultural needs of contemporary urban life.
CO2	The various components and aspects associated with the urban environment in terms of physical infrastructure, socio cultural aspects, gender issues etc. are looked at ways to address them through their designs.
CO3	Mapping and diagramming techniques were detailed in the design process to help them explore the design.
CO4	Students ability to understand the DCR and its applications
CO5	An orientation to Computer Aided Drafting to explore the design of buildings addressing the socio –cultural& economic needs of contemporary urban society.
Course Name	**WASTE MANAGEMENT AND RECYCLING**
	On successful completion of the course the students will be able to:
CO1	Understood about the waste generation factor and traditional ways of disposing the waste.
CO2	Created awareness about the role of NGO's and the waste from the residential sectors.
CO3	Explore new alternative energy resources and building materials for healthy environments through literature studies.
CO4	Ensure a sustainable design approach through waste recycling methods.
CO5	Understand the significances of sustainable development and the need to enforce the environmental acts.
Course Name	**STRUCTURE AND ARCHITECTURE**
	On successful completion of the course the students will be able to:
CO1	The structural design in the pre-industrial and post-industrial era is presented with detailed drawings and sketches.
CO2	Literature review and presentations of the world renowned buildings as case examples.
CO3	A critique of any one case example of Architects works mentioned above to be discussed.
CO4	It will encourage the student to exercise judgment in areas of structure, form and process.
CO5	A seminar presentation including the structural expression , architectural form and building services to be presented in detail with case examples.
Course Name	**SAFETY SYSTEMS AND BUILDING MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Ability to understand the safety requirements for a high rise building as per the National Building Code.
CO2	Identify and define the basic concepts of Fire Alarm System, Technology of detection, and Type of Statutory Standards.
CO3	Students learn and use the basic knowledge about Design of Fire Alarm System and installation, Essential components of a Fire Suppression System, different types of Fire Suppression Systems.
CO4	Ability to understand the different types of Security Systems and various types of technologies employed in these Systems and design and installation with suitable case studies.
CO5	Apply the basic knowledge about Integrated Building Management System (IBMS) and design and installation of IBMS in any case and present the same.
Course Name	**CONTEMPORARY BUILDING MATERIALS**
	On successful completion of the course the students will be able to:
CO1	Exposure to the need and use of various contemporary materials in creating innovation and ultra-performance in building design.

CO2	An understanding of characteristics and performance of the newer materials in terms of detailing and application to the context.
CO3	Ability to know the application of composite material in various buildings.
CO4	Insight to Nano material and its application in current scenario.
CO5	The students gained knowledge on the various digital technologies
Semester	**VI**
Course Name	*SPECIFICATION, ESTIMATION AND BUDGETING*
	On successful completion of the course the students will be able to:
CO1	An understanding of the art of building construction through specification writing.
CO2	Ability to work out the approximate estimate of building.
CO3	An understanding on detailed estimate for small scale building projects and low cost housing.
CO4	An understanding on valuation for building on sinking fund, purchase, and depreciation.
CO5	An understanding on cash flow, capital investment and budget.
Course Name	*INTERIOR DESIGN PRINCIPLES*
	On successful completion of the course the students will be able to:
CO1	An understanding of interior design as an integral part of architecture and as an interdisciplinary and allied field related to architecture.
CO2	An overall exposure to the ways in which interior spaces can be enriched through the design of specific interior components.
CO3	Understand the various components in interior space and present the same through drawings.
CO4	Analysis of interior lighting through case study or video presentations.
CO5	Provide interior landscape design with necessary details and drawings for terrace garden courtyards etc.
Course Name	*BUILDING SERVICES III*
	On successful completion of the course the students will be able to:
CO1	Familiarity with different air conditioning systems, their context of use and basics of planning involved.
CO2	An understanding of fire safety, fire fighting, fire prevention and installations in buildings.
CO3	An understanding of mechanical transportation systems in a building.
CO4	Ability to integrate services in buildings.
CO5	Exposed the students to specialized service in buildings like air-conditioning, its principles, components, applications, safety measures, fire-safety in buildings, fire resistant materials, devices for safety detection of fire, gadgets involved, precautionary measures, and integration of these in architectural design.
Course Name	*MATERIALS & CONSTRUCTION - VI*
	On successful completion of the course the students will be able to:
CO1	How to innovate better technology through the recent research building materials and its advantage in building industry.
CO2	Knowing the advance and techniques used for the large precast foundation and large span slabs supports.
CO3	Acknowledge on the Elevators and Escalators its function and their installation details.
CO4	Exercise the knowing it on the Conveyors system in building and their advantage and usages.
CO5	Understanding the modern usages of built- furniture and fitting, the aesthetic appeal and efficiency in building construction
Course Name	*ARCHITECTURAL DESIGN - V*
	On successful completion of the course the students will be able to:

CO1	The student would be able to balance diverse aspects of buildings by makingright choices in design situations after studying various criteria. They would be able to apply knowledge in realms such as sustainable built environment, services and complex building designs.
CO2	They would be able to apply knowledge in realms such as sustainable built environment, services and complex building designs.
CO3	Student enabled to confidently design large complex buildings and campuses, which involves structural synthesis, effective movement systems within and around buildings, complying with all rules and regulations demonstrated in at least two large projects.
CO4	Understood that stress also shall be on making such buildings barrier free and adopting green building practices in design and detailing.
CO5	Gained knowledge about the importance of services integration and construction in spatial planning with repsect the site context.
Course Name	**DIGITAL ART**
	On successful completion of the course the students will be able to:
CO1	The student has sufficient knowledge to edit video and image using editing software.
CO2	Indentify the techniques used in animating movies.
CO3	Understanding the concepts of scripting through exercises
CO4	The student can synchronize sound with patterns generated.
CO5	The student can make presentation using voice over.
Course Name	**PRODUCT DESIGN**
	On successful completion of the course the students will be able to:
CO1	The students will understand the role of product design as a discipline, and its role in understanding and interpreting a real life design. Various reading methods were explored, to understand the contemporary design process as well as manufacturing process of design.
CO2	Various reading methods were explored, to understand the contemporary design process as well as manufacturing process of design.
CO3	Exposed to the different types of product detailings.
CO4	Gained knowledge on the ergonomics of various product design.
CO5	Trained the students satisfy the user needs, concept generation, and prototype fabrication.
Course Name	**BUILDING INFORMATION MODELING**
	On successful completion of the course the students will be able to:
CO1	This is a project-based course where students gain knowledge on the implementation of BIM concepts throughout the lifecycle of a building, from planning and design, to construction and operations.
CO2	The students will learn about how to use BIM for building energy performance simulation, construction administration.
CO3	Students will learn different aspects of collaborative modelling, BIM based scheduling, estimating.
CO4	Student got exposed to the BIM energy simulation.
CO5	Understood about the BIM cost estimating, project phasing.
Semester	**VII**
Course Name	**LANDSCAPE ARCHITECTURE & DESIGN**
	On successful completion of the course the students will be able to:
CO1	Awareness of the role of landscape design with respect to macro scale of sustainability and ecology as well as in the micro scale of shaping of outdoor environments.
CO2	Knowledge about the elements of landscape design and their scope.
CO3	Sensitivity towards evolution of different garden and landscape design across time and context.

CO4	An understanding of landscape design with respect to site planning and different functional typologies of spaces.
CO5	Gained knowledge on urban open spaces and principles of urban landscape.
Course Name	***HUMAN SETTLEMENTS & PLANNING***
	On successful completion of the course the students will be able to:
CO1	Understanding on evolution of Human settlements and role of human in growth of settlements.
CO2	Various reading methods were explored, to understand the historical as well as present urban form, the dynamics of Urban Form and various Human Settlements pattern
CO3	Understanding on planning principles of various town planners.
CO4	Exposure given to the urban renewal schemes and planning concepts.
CO5	An understanding of the interrelationship between Human Settlements structure and Social Dynamics.
Course Name	***ARCHITECTURAL WORKING DRAWING & DETAILING***
	On successful completion of the course the students will be able to:
CO1	An understanding of all the aspects that go into the making of a building through drawings related to construction.
CO2	Understanding on the drawings related to the structural services.
CO3	Ability to resolve spatial concerns with technical aspects of a building.
CO4	Understood on the preparation drawings of rooms, layouts of service.
CO5	Ability to design and detail components within a building.
Course Name	***ARCHITECTURAL DESIGN VI***
	On successful completion of the course the students will be able to:
CO1	Design advanced and complex problem comprising of group and multistoried structures and infrastructures.
CO2	Use computer for drawing and presentation skills using appropriate softwares
CO3	Understanding from pre-final stage, to be conversant with all challenges in large complex design, in group, multi storied developments covering structural innovations, energy conservation, awareness to costing of projects and legal implications.
Course Name	***SUSTAINABLE PLANNING AND ARCHITECTURE***
	On successful completion of the course the students will be able to:
CO1	The course ends with the completion of an "impact project ", where students will collaborate to design/learn and implement a short project that addresses the myriad problems and opportunities presented by sustainability.
CO2	To provide student with the ability to distinguish between renewable & non-renewable sources.
CO3	Understanding on green organizations worldwide and with Indian context.
CO4	Exposed to the Rating systems with Indian Examples.
CO5	To sensitize students about the importance and need for Sustainable Planning concept and Appropriate Architectural Design concepts as an emerging thrust area.
Course Name	***ARCHITECTURAL ACOUSTICS***
	On successful completion of the course the students will be able to:
CO1	To understand design fundamental of sound and its influences in design typologies.
CO2	To knowledge on the acoustical design of shapes and building interior acoustics.
CO3	To understand get exposed to integrate acoustic materials.
CO4	To understand construction and fitting typologies of acoustic and its materials.
CO5	To understand designing of various acoustical building design in apart of acoustic.
Course Name	***CONTEMPRORY PROCESS INARCHITECTURE***

	On successful completion of the course the students will be able to:
CO1	Student shall gain insight to the various contemporary design process/theories and theirrelation to computation.
CO2	Students would be able understand the approach towards biomimicry and nano technologies.
CO3	Students would be able to identify and go in depth into specific and appropriate aspects relating to the discipline of architecture and reflect this in the realm of design
CO4	To sensitize students explores how contemporary processes, in the pursuit of creativity and fluidity, have become more abstract
CO5	Experimental, attempting to overcome the pragmatic determinism attributed to more conventional working methods.
Course Name	**SERVICES IN HIGH- RISE BUILDINGS**
	On successful completion of the course the students will be able to:
CO1	Understanding of various service systems for a high rise building as per the National Building Code.
CO2	Knowing the advanced technologies used for water management and sewage treatment.
CO3	The students are exposed to various heating, Ventilation, air conditioning systems and their applications.
CO4	An understanding of fire safety, firefighting, fire prevention and installations in buildings.
CO5	A detail understanding of design guidelines of vertical transportation system in current trends.
Semester	**VIII**
Course Name	**URBAN DESIGN**
	On successful completion of the course the students will be able to:
CO1	Awareness of the evolution and characteristics of urban forms, their components and interdependencies through case studies.
CO2	Understanding of urbanism through theories, aspects, issues and solutions.
CO3	Knowledge of ways to look at and interpret urbanism today.
CO4	Student understood how architecture is related to urban design in the planning process and how cities have aesthetic and visual impacts.
CO5	Gained Knowledge how architects can contribute to city's re building and renewal through understanding of space articulation in cities of east and west; analysis of various implementation techniques and involving public in the process.
Course Name	**PROFESSIONAL PRACTICE AND ETHICS**
	On successful completion of the course the students will be able to:
CO1	Awareness of the architect''s role in society, managements and its acts.
CO2	To understand the services to do the profession with scale off charges and ethics.
CO3	Understanding the tender and document and types of competition.
CO4	Understanding the bye laws and duties of architect in the society.
CO5	Understanding the conducts and duties and its liabilities
Course Name	**DISSERTATION**
	On successful completion of the course the students will be able to:
CO1	A dissertation report with a coherent line of thought as reflected in the written structure and the core content which could be open ended.
CO2	Ability to research deeply into a subject and develop depth in thought in any specific area based on point of view, observation, analysis and study.
CO3	Ability to look at architecture from an informed, analyzed and well thought out personally unique or objective perspective which would help strengthen the thesis process.

CO4	Students explored on the tools and methodology adopted to collect the required data relevant to the study.	
CO5	Strengthen the analysis skill and identifying root cause of problems.	
Course Name	**ARCHITECTURAL DESIGN- VII**	
	On successful completion of the course the students will be able to:	
CO1	Ability to perceive and design buildings as contributing to/transforming the urban fabric.	
CO2	Ability to bring inclusivity into the architectural design process.	
CO3	Exposed to urban environment and its architectural design decision.	
CO4	Students explored the integral part of city environment and its impacts.	
CO5	Understood about the topography, geology, Hydrology, micro climate, vegetation, urban density and various aspects with respect to urbanized places.	
Course Name	**ARCHITECTURAL CONSERVATION**	
	On successful completion of the course the students will be able to:	
CO1	An understanding of the importance of heritage and scope of conservation.	
CO2	Familiarity with issues and practices of conservation through case studies.	
CO3	Knowledge about methods for preserving and repairing historic buildings.	
CO4	Familiarity with conservation strategies through principles and project case studies.	
CO5	Familiarity with the status of conservation in India and the various agencies involved in the field of conservation worldwide and their policies.	
Course Name	**INDUSTRIAL ARCHITECTURE**	
	On successful completion of the course the students will be able to:	
CO1	The importance of industrial architecture and can be understood based on the various aspects such as history and materials and technology	
CO2	The students get an exposure to various style and design aspects of industrial architecture	
CO3	The students get an exposure to Zoning principles, factories Act and Rules	
CO4	The students get an exposure to Environmental control details with respect to various industries	
CO5	The students can understand the Contemporary trends involved in the industrial architecture	
Course Name	**PROJECT MANAGEMENT**	
	On successful completion of the course the students will be able to:	
CO1	Ability to apply project management techniques in achieving objectives of a project like client needs quality, time and cost.	
CO2	An understanding of principles of management, construction scheduling, scope definition and team roles.	
CO3	Ability to understand a project from concept to commissioning, feasibility study and facility programme, design, construction to commissioning.	
CO4	Got exposed to the computerized project management and reporting its progress.	
CO5	understood about the application of project management in various spaces of project embracing various processes.	
Course Name	**DISASTER MITIGATION AND MANAGEMENT**	
	On successful completion of the course the students will be able to:	
CO1	Students ability to understand the formation and causes of various disasters and the factors to be considered in the Design of buildings and services to resist them.	
CO2	Case study of the disasters happened worldwide could be presented.	
CO3	Exposed the students to the different types of natural and man-made disasters.	
CO4	Understood the architectural and structural design for hazardous structure.	
CO5	Gained knowledge about the post-operative measures for disaster management.	

Course Name	URBAN AND REGIONAL PLANNING
	On successful completion of the course the students will be able to:
CO1	The student will understand and exposed to classification of settlements, land-use, zoning, types of development plan, will be acquainted with the current issues in urban planning. The students will be familiarized with simple Town planning techniques and futuristic concepts.
CO2	The students will be familiarized with simple Town planning techniques and futuristic concepts.
CO3	Understood the changing scenario in the context of globalization.
CO4	Exposed to the planning techniques of various region.
CO5	Gained the knowledge about the Futuristic concepts of urban & Regional planning through Theories.
Course Name	CONTEMPORARY HOUSING
	On successful completion of the course the students will be able to:
CO1	Knowledge of various issues concerning housing and housing development in Indian and global context covering a cross section of income groups.
CO2	Ability to appreciate socio-economic aspects in housing.
CO3	An understanding of housing standards, site planning principles, housing concepts and types.
CO4	An understanding of key issues in housing today
CO5	Student understood the field of housing and its significance through different typologies owing to its geographical, cultural, social and economic distinctions.
Course Name	STEEL IN ARCHITECTURE AND DESIGN
	On successful completion of the course the students will be able to:
CO1	Ability to understand the concepts of designing with steel structures and its components.
CO2	Understanding about the tubular members to provide efficient design with aesthetically slender members
CO3	Student can able to understand the combination of form and function of steel and as an expression of a whimsical playful intent while at the same time functioning as a primary load carrying system
CO4	An understanding of steel as a structural, functional and aesthetic material in design and construction practice.
CO5	Understood the significance of the use of steel technologies and evidence to support the architects' needs and also outlines how the steel construction procurement process works in the construction fields.
Course Name	ENVIRONMENTAL PLANNING AND DESIGN
	On successful completion of the course the students will be able to:
CO1	Understanding the basic environmental resources and its pro"s and con"s.
CO2	Understanding the EIA methods and datasheets development.
CO3	Understanding the legislation and its norms adopted to overcomes the causes
CO4	Understanding the planning techniques and its measurement to value the EIA through different cases.
CO5	Provided Insights to students on the recent environmental planning. And understood the impact of man's activities on the environment & knowledge about the methods to ameliorate the negative impacts.
Semester	IX
Course Name	INTERNSHIP PROGRAM
	On successful completion of the course the students will be able to:
CO1	Clarity about the field of architecture with the various stages of works.

CO2	An understanding about the total process that goes into the making of a building and execution.
CO3	An overall idea of the nuances of architectural practice.
CO4	To give familiarity about client meeting and tendering.
CO5	To provide exposure to the various dimensions of architectural practice through an intensive internship program.
Semester	**X**
Course Name	*THESIS*
	On successful completion of the course the students will be able to:
CO1	Skill, knowledge and expertise in the domain of architectural design.
CO2	Ability tohandle a major architectural project independently through all stages.
CO3	Exposed the students to choose their topic as per the demand in the current scenario.
CO4	Student understood the relationship between Architecture Engineering systems, social science and humanities.
CO5	Ability to independently handle an Architectural Design Project, research the requirements of a project, Prepare a brief, try alternative approaches/ concepts, and evaluate them on way to make a final comprehensive proposition.

Programme Name	B.Tech Biotechnology
Semester I	
Course name	*Technical English*
	On successful completion of the course the students will be able to:
CO1	Readtechnicaltextsandwritearea-specifictextseffortlessly.
CO2	Listen andcomprehend lecturesandtalksin theirarea ofspecializationsuccessfully.
CO3	Speakappropriatelyandeffectivelyinvariedformalandinformalcontexts.
CO4	Understandthebasicgrammaticalstructuresanditsapplications.
Course name	*Engineering Mathematics-I*
	On successful completion of the course the students will be able to:
CO1	Develop the knowledge of basic linear algebraic concepts.
CO2	Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects.
CO3	Acquire the basic knowledge of ordinary differential calculus.
CO4	Compute maxima and minima of a function.
CO5	Apply Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields
Course name	*Engineeirng Physics*
	On successful completion of the course the students will be able to:
CO1	To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.
CO2	To understand basic concepts of high frequency sound waves and its applications.
CO3	To understand basic concepts of quantum mechanical behavior of wave and particle along with applications.
CO4	To understand the concepts of production of laser and its behavior with diffraction principle of interference.
CO5	To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication.
Course name	*Engineering Chemistry*
	On successful completion of the course the students will be able to:
CO1	Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
CO2	Construct an electrochemical cell and identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.
CO3	Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes.
CO4	Differentiate the polymers used in day-to-day life based on its source, properties and applications.
CO5	Analyse the three types of fuels based on calorific value for selected application.
Course name	*Engineering Graphics*
	On successful completion of the course the students will be able to:

CO1	Recognize the conventions and apply dimensioning concepts while drafting simple objects.
CO2	Draw the orthographic projection of points, line, and plane surfaces.
CO3	Draw the orthographic projection of simple solids.
CO4	Draw the section of solid drawings and development of surfaces of the given objects.
CO5	Apply the concepts of isometric and perspective projection in engineering practice.
Course name	*Engineeirng Chemistry Laboratory*
	On successful completion of the course the students will be able to:
CO1	Carry out the volumetric experiments and improve the analytical skills.
CO2	Understand the maintenance and usage of analytical instruments and thereby develop their
CO3	skills in the field of engineering.
CO4	Understand the principle and handling of electrochemical instruments and Spectrophotometer.
CO5	Apply their knowledge for protection of different metals from corrosion by using different inhibitors
Course name	*Engineeirng Practice Laboratory*
	On successful completion of the course the students will be able to:
CO1	Prepare simple Lap, Butt and T- joints using arc welding equipments.
CO2	Prepare the rectangular trays and funnels by conducting sheet metal operation.
CO3	Prepare the pipe connections and identify the various components used in plumbing.
CO4	Prepare simple wooden joints using wood working tools.
CO5	Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions
Course name	*Basic Civil And Mechanical Engineering*
	On successful completion of the course the students will be able to:
CO1	The usage of surveying and properties of construction materials.
CO2	The stress strain of various building and material such as substructure, road transport and bridge.
CO3	The concept of manufacturing methods encountered in engineering practice such as foundry, welding and forging processes.
CO4	The working of internal combustion engines and its types.
CO5	The concept of energy conservation in practical, power plant refrigeration air condition and its types.
Semester II	
Course name	*Communicative English*
	On successful completion of the course the students will be able to:
CO1	Comprehend conversations and talks delivered in English.
CO2	Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English.
CO3	Read short stories, magazines, novels and other printed texts of a general kind.
CO4	Write short paragraphs, essays, letters and develop hints in English.
Course name	*Engineering Mathematics II*

	On successful completion of the course the students will be able to:
CO1	Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields.
CO2	Learn the basic concepts of analytic functions and transformations of complex functions.
CO3	Master the integration in complex domain.
CO4	Understand the use of improper integrals' applications in the core subject.
Course name	*Environmental Science And Engineering*
	On successful completion of the course the students will be able to:
CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
CO2	Public awareness of environmental is at infant stage.
CO3	Ignorance and incomplete knowledge has led to misconceptions
CO4	Development and improvement in std. of living has led to serious environmental disasters
Course name	*Engineering Mechanics*
	On successful completion of the course the students will be able to:
CO1	Explain the differential principle applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
CO2	Find solution for problems related to equilibrium of particles.
CO3	Solve the Moment of inertia for different 2-D plane figures.
CO4	Analyze the forces in any structures.
CO5	Solve rigid body subjected to frictional forces.
Course name	*Problem Solving And Python Programming*
	On successful completion of the course the students will be able to:
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs.
CO3	Structure simple Python programs for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries.
Course name	*Engineering Physics Lab*
	On successful completion of the course the students will be able to:
CO1	Understanding the moduli of elasticity by determining Young's modulus and Rigidity modulus of a beam and cylinder respectively.
CO2	Understanding the phenomenon of diffraction, dispersion and interference of light using optical component
CO3	Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid
CO4	Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity.
Course name	*Problem Solving And Python Programming Lab*
	On successful completion of the course the students will be able to:

CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Develop Python programs step-wise by defining functions and calling them.
CO4	Use Python lists, tuples, dictionaries for representing compound data.
CO5	Read and write data from/to files in Python.
Course name	***Material Science***
	On successful completion of the course the students will be able to:
CO1	Have the necessary understanding on the functioning of crystalline in solids of materials
CO2	Gain knowledge on classical and quantum electron theories, and energy band structures.
CO3	Acquire knowledge on basics of semiconductor physics and its applications in various devices.
CO4	Get knowledge on dielectric and nano materials and their applications.
CO5	Understand the basics of modern engineering materials
Semester III	
Course name	***Biochemistry***
	On successful completion of the course the students will be able to:
CO1	To ensure students have a strong foundation in the structure and reactions of biomolecules
CO2	To understand metabolic pathways of the major biomolecules and relevance to clinical conditions.
CO3	To correlate biochemical processes with biotechnology applications.
CO4	To understand about metabolic regulation and intermediate compounds.
CO5	To understand about protein secretion, folding, transportation and degradation
Course name	***Cell Biology***
	On successful completion of the course the students will be able to:
CO1	To develop integral knowledge on cell structure, molecular organisation and function of cell organelles.
CO2	To learn the cell is the basic unit of life in the entire living world.
CO3	To Understand the basic knowledge on cell structure and function as well as on the molecular basis of chromatin organization
CO4	Understand cell at structural and functional level.
CO5	Understand the molecular interaction between cells abd signal transduction, secondary messengers.
Course name	***Microbiology***
	On successful completion of the course the students will be able to:
CO1	students attains knowledge on the principles of Microbiology and biochemical aspects of various microbes
CO2	Knowledge on the microorganism structure and its different types, growth and metabolism
CO3	The interactions between contaminants, soil, water and microorganisms and its control
CO4	Knowledge on the production process and preservation techniques
CO5	An ability to conduct experiments, as well as to analyze and interpret data
Course name	***Instrumental Methods of Analysis***
	On successful completion of the course the students will be able to:

CO1	Understand and apply the concept of optical and thermal methods
CO2	Understand spectroscopy.
CO3	Understand principle of surface microscopy and its application
CO4	Acquire knowledge on separation techniques used for biological products
CO5	Acquire knowledge on different chromatographic methods for separation of biological products
Course name	*Basic Industrial Biotechnology*
	On successful completion of the course the students will be able to:
CO1	Understand of the steps involved in the production ofbioproducts
CO2	Understand the basic biotechnological engineering principles and models to do tasks
CO3	Understand the Design and deliver useful modern biotechnology products to the society.
CO4	Understand the bulk production of commercially important modernbioproducts.
CO5	Understand the production and purification of Industrial Enzymes and products of plant and animal cell cultures.
Course name	*Biochemistry Lab*
	On successful completion of the course the students will be able to:
CO1	Learning the principles behind the qualitative estimation of biomolecules.
CO2	Understanding the principles behind quantitative estimation of biomolecules.
CO3	Understanding the analysis of the same in the body fluids professional career.
CO4	Understanding the preparation of standard buffer solution.
CO5	To ensure students have a strong foundation in the structure and reactions of Biomolecules.
Course name	*Cell Biology Lab*
	On successful completion of the course the students will be able to:
CO1	To learn the basic skills in light microscopy, cell fractionation, and spectroscopy.
CO2	To be able to perform light microscopy techniques, to isolate plastids, nucleus or other organelles and cell division.
CO3	To be able to identify the various stages of mitosis.
CO4	To understand the basic techniques to work with cells
CO5	To understand and perform cell staining techniques
Course name	*Microbiology Lab*
	On successful completion of the course the students will be able to:
CO1	Understand the advanced technical information pertaining to laboratory bio-safety and preventive measures from pathogenic microorganism.
CO2	Know the various aseptic techniques and sterilization methods
CO3	Understand the interactions between contaminants, soil, water and microorganisms and its control
CO4	Gain knowledge on the microorganism structure and its different types, growth and metabolism
CO5	Develop the skills to work on several important techniques for the study of microorganisms in the laboratory.
Semester IV	
Course name	*Molecular Biology*
	On successful completion of the course the students will be able to:
CO1	Ensure Have the basic knowledge of structure and biochemistry of nucleic acids and proteins and discriminate between them;

CO2	Understand the principles of DNA replication, transcription and translation and explain how they relate to each other;
CO3	Correlate Biochemical processes with molecular biology applications;
CO4	Understand metabolic regulation and intermediate compounds;
CO5	Understand gene organization and mechanisms of control of the gene and expression in various organisms.
Course name	**Stoichiometry and Process Calculations**
	On successful completion of the course the students will be able to:
CO1	Solve problems related to units and conversions and fit the given data using different methodologies;
CO2	Solve problems related to material balance concepts & design reactors for biochemical processes;
CO3	Solve problems related to energy balance concepts & design reactors for biochemical processes;
CO4	Apply their knowledge in describing the physical properties of fluid and calculating the pressure distribution for incompressible fluids and
CO5	Design a system, component, or process to meet desired needs within realistic constraints such as economic, manufacturability, and sustainability.
Course name	**Fundementals of Unit Operations**
	On successful completion of the course the students will be able to:
CO1	Understand about the transport of momentum (fluid flow) in chemical engineering systems;
CO2	Improve their of knowledge in techniques of agitation, mixing of liquids, filtration operations and sedimentation separation;
CO3	Uunderstand modes of heat transferring techniques during extraction, distillation, evaporation;
CO4	Evaluate effects of process variables while scaling up the bioprocess equipment and
CO5	Comprehend the important mechanical aspects while designing bioprocess equipment.
Course name	**Enzyme Technology**
	On successful completion of the course the students will be able to:
CO1	Develop knowledge on enzymes and enzyme reactions which is the key step towards understanding various concepts in biotechnology;
CO2	Analyse theoretical and practical aspects of kinetics provide the importance towards interpreting the results;
CO3	Apply the process for commercial production of enzymes;
CO4	Implement ideas on processing, production and purification of enzymes on an industrial scale and
CO5	Design and novel biosensor products with better quality and wide commercial application.
Course name	**Environmental Biotechnology**
	On successful completion of the course the students will be able to:
CO1	Develop and improve in standard of living;
CO2	Understand the dynamic process integrated themes related to biodiversity;
CO3	Envision the surrounding environment its function with technology;
CO4	Understand the structure and biochemical aspects of various microbes and
CO5	Acquire kknowledgeabout the renewable forms of energy and its features of biomass and its utilization.
Course name	**Molecular Biology Lab**
	On successful completion of the course the students will be able to:

CO1	Demonstrate knowledge and understanding of the principles underpinning importanttechniques in molecular biology;
CO2	Present advanced knowledge in the specialized fields of Molecular Biology;
CO3	Demonstrate knowledge and understanding of applications of these techniques;
CO4	Demonstrate the ability to carry out laboratory experiments and interpret the results;
CO5	Understand and be aware of hazardous chemicals and safety precautions in case of an emergency.
Course name	***Instrumental Methods of Analysis Lab***
	On successful completion of the course the students will be able to:
CO1	Understand calibration of instruments;
CO2	Acquire knowledge on separation techniques used for biological products;
CO3	Understand and apply optical methods;
CO4	Acquire knowledge on different chromatographic methods for separation of biological products.
CO5	Acquire knowledge of purification by chromatography.
Course name	***Enzyme Technology Lab***
	On successful completion of the course the students will be able to:
CO1	Demonstrate the activity of enzyme with various factors
CO2	Learnt the various process of enzyme immobilization
CO3	Awareness about various kinetic studies on enzymes
CO4	Demonstrate the ability to carry out laboratory experiments and interpret the results.
CO5	Explain about Enzyme kinetics and characterization and how to use them for practical applications.
Semester V	
Course name	***Bioinformatics***
	On successful completion of the course the students will be able to:
CO1	Develop bioinformatics tools with programming skills.
CO2	Apply computational based solutions for biological perspectives.
CO3	Pursue higher education in this field.
CO4	Pursue higher education in this field.
CO5	Practice life-long learning of applied biological science.
Course name	***Genetic Engineering***
	On successful completion of the course the students will be able to:
CO1	Understand the basics of biotechnology
CO2	Understand the value of and the processes involved with the polymerase chain Reaction (PCR).
CO3	Understand the concept of recombinant DNA technology or genetic engineering
CO4	Analyze a research problem and step-by-step instructions for conducting experiments or testing hypothesis
CO5	Explain the general principles of generating transgenic plants, animals and Genetically modified organisms.
Course name	***Bioprocess Engineering I***
	On successful completion of the course the students will be able to:
CO1	Developskillsofthestudentsintheareaofbioprocesstechnologywithemphasisan bioprocess principles

CO2	Discuss and distinguish the medium requirements and optimization methods CO
CO3	Explain the sterilization kinetics of medium and equipments
CO4	Learn about fermentation processes, metabolic stoichiometry, energetic, kinetics of microbial growth etc
CO5	Understand the kinetics of microbial growth that plays a vital role in the fermentation process
Course name	*Fundamentals of Mass Transfer*
	On successful completion of the course the students will be able to:
CO1	define the basic principles of mass transfer operations and the measurement of diffusivity, mass transfer coefficient;
CO2	understand the importance of mass transfer phenomena in the design of process equipment in distillation operations;
CO3	understand the HETP, NTU and HTU concepts of various gas absorption packed tower columns;
CO4	understand the design aspects of extraction and various leaching equipments and
CO5	understand the importance of adsorption and drying processes and their industrial applications.
Course name	*Chemical Thermodynamics & Biothermodynamics*
	On successful completion of the course the students will be able to:
CO1	Knowledge on ideal and non-ideal behavior in thermodynamics on properties of fluids
CO2	Knowledge on solutions thermodynamics to determine the properties in the processes.
CO3	Description of properties criteria in order to maintain the phase change coexist in equilibrium
CO4	Descriptionof properties criteria in order to maintain the chemical reactions coexist in equilibrium
CO5	Knowledge on energy utilization and to interpret thermodynamic properties data in the bio processing
Course name	*Genetic Engineering Lab*
	On successful completion of the course the students will be able to:
CO1	An ability to design and conduct experiments, as well as to analyzeand interpretdata
CO2	Apply of genetic engineering techniques in basic and applied experimental biology.
CO3	Apply of genetic engineering techniques in basic and applied experimental biology.
CO4	Develop proficiency in designing and conducting experiments involving genetic manipulation.
CO5	An ability to use the techniques, skills, and modern engineering tools necessary for engineeringpractice.
Course name	*Bioprocess Engineering Lab I*
	On successful completion of the course the students will be able to:
CO1	Knowledge on preparation of medium and sterilization in upstream processes
CO2	Knowledge on optimization of cell growth
CO3	Exposure to upstream processes and preparation before the fermentation
CO4	Knowledge on preparation and utility of bioreactor
CO5	Knowledge on production of metabolites in lab scale fermentor
Course name	*Chemical Engineering Laboratory For Biotechnologists*
	On successful completion of the course the students will be able to:
CO1	Ability to apply the skill of unit process of chemical engineeringand biotechnology.

CO2	Ability to analyse the principles of chemical engineering and itsapplication on biologicalperspectives.
CO3	Ability to apply the skill of unit process of chemical engineeringand biotechnology.
CO4	Designandworkingprinciplesoffluidmovingmachineryandtransport phenomenon.
CO5	Designandworkingprinciplesoffluidmovingmachineryandtransport phenomenon.
Semester VI	
Course name	***Protein Engineering***
	On successful completion of the course the students will be able to:
CO1	To analyze the various interactions in protein makeup.
CO2	To be familiar with different levels of protein structure.
CO3	To know the role of functional proteins in various field of study.
CO4	To practice the latest applications of protein science in their research.
CO5	To analyze the various interactions in protein makeup.
Course name	***Chemical Reaction Engineering***
	On successful completion of the course the students will be able to:
CO1	Write the rate equation for most of the chemical reaction.
CO2	Relateandcalculatetheconversions,concentrationsandratesinareactionand
CO3	Identify, formulate and solve chemical engineering problems.
CO4	Designreactorsforheterogeneousreactionsandoptimizeoperatingconditions.
CO5	formulate and solve chemical engineering problems.
Course name	***Bioprocess Engineering II***
	On successful completion of the course the students will be able to:
CO1	Write the rate equation for most of the chemical reaction.
CO2	Relateandcalculatetheconversions,concentrationsandratesinareactionand
CO3	Identify, formulate and solve chemical engineering problems.
CO4	formulate and solve chemical engineering problems.
CO5	Designreactorsforheterogeneousreactionsandoptimizeoperatingconditions.
Course name	***Health & Pharmaceutical Biotechnology***
	On successful completion of the course the students will be able to:
CO1	Drugs, drugs action, drug metabolism
CO2	Various dosage forms of Biopharmaceuticals
CO3	The recent evolution in pharmaceutical biotechnology
CO4	evaluate different pharmaceutical parameters for the current and
CO5	future biotechnology related products on the market.
Course name	***Immunology***
	On successful completion of the course the students will be able to:
CO1	Awareness of immune system structure and functions
CO2	Awareness of immunity to various pathogens
CO3	Awareness of cellular and molecular aspects of lymphocyte activation, homeostasis differentiation, and memory.

CO4	Awareness of molecular basis of complex, cellular processes involved in inflammation and immunity, in state of healthy and diseased conditions
CO5	Awareness of tumor allergy and hypersensitivity reactions
Course name	**Bioprocess Engineering Lab II**
	On successful completion of the course the students will be able to:
CO1	Analyze various operational modes of bioreactor systems
CO2	Capable of handle bioreactor system for various industrial applications.
CO3	Design and conduct experiments on bioprocess engineering problems
CO4	Design and control the operating parameters of various types of bioreactors
CO5	Demonstrate advancement in their careers through increasing professional responsibility and continued life-long learning.
Course name	**Health & Pharmaceutical Biotechnology Lab**
	On successful completion of the course the students will be able to:
CO1	Understanding the recent trends in pharmaceutical biotechnology
CO2	Understanding the techniques, procedures, and equipments related to drug preparation, compounding and quality assurance
CO3	Understanding the basic Calculations of the quantity of medication to be compounded or dispensed
CO4	Understanding Pharmaceutical parameters for current and future biotechnology related products in the market.
CO5	Evaluate and interpret health science literature efficiently and accurately for pharmaceutical care, research and education
Course name	**Immunology Lab**
	On successful completion of the course the students will be able to:
CO1	Awareness of basic and state-of-the-art experimental methods and technologies
CO2	Awareness to develop an ability to summarize, integrate and organize information and relate it to disease outcomes
CO3	Awareness to evaluate the potential for current research and new discoveries to improve our understanding of immunology and its relevance to human health and to our society.
CO4	Awareness to use medical case reports, identify "disease defects" and define molecular or cellular targets for therapeutic intervention:
CO5	Awareness to understand basic mechanisms and preventive herapeutic measures
Course name	**Analytical Techniques In Biotechnology Lab**
	On successful completion of the course the students will be able to:
CO1	Knowledge on practical skills in analytical techniques and instrumentation of biotechnology
CO2	Analytical skills to do project
CO3	Learn various separation techniques involved in biotechnology industries
CO4	Knowledge on practical skills in analytical techniques and instrumentation of biotechnology
CO5	Understanding Pharmaceutical parameters for current and future biotechnology related products in the market.
Semester VII	
Course name	**Downstream Processing**
	On successful completion of the course the students will be able to:
CO1	Define the fundamentals of downstream processing for product recovery

CO2	Understand the requirements of successful operations of downstream processing
CO3	Describe the process of downstream equipments and explain the techniques in multifactorial manufacturing
CO4	Understood the knowledge in finishing operation in DSP
CO5	Understood the knowledge in finishing operation in DSP
Course name	*Animal Biotechnology*
	On successful completion of the course the students will be able to:
CO1	Understand animal cell culture, animal diseases and theirdiagnosis
CO2	Gain the knowledge of therapy for animalinfections
CO3	Know the concepts of micro manipulation technology and transgenic animal technology
CO4	The concepts of transgenic animals
CO5	Bulk production of animal cell cultures
Course name	*Genomics And Proteomics*
	On successful completion of the course the students will be able to:
CO1	Clone commercially important genes and recombinant proteins.
CO2	Understand of gene and genome sequencing techniques.
CO3	Understand of microarrays, Analysis of Gene expression and proteomics.
CO4	Analyze the various interactions in protein makeup and different levels of protein structure.
CO5	Apply the latest applications of protein science in their research.
Course name	*Plant Biotechnology*
	On successful completion of the course the students will be able to:
CO1	acquainted with principles, technical requirements, scientific and commercial applications in PlantBiotechnology;
CO2	understand and supportmethodologiesinplanttissue/cellculturetoplantimprovement,aswellas DNAhandlingwithPCR-baseddetectiondiagnostictools;
CO3	motivated to set goals towards pursuing graduate school and higher level positions, such as lab manager and key scientist in plant biotechnological research institutes and industries;
CO4	knowledge about plant tissue culture and transgenic plants;
CO5	gained knowledge use it for the development of therapeutic products;
Course name	*Downstream Processing Lab*
	On successful completion of the course the students will be able to:
CO1	Acquired knowledge for the separation of whole cells and other insoluble ingradients from the culture broth.
CO2	Learned various techniques like extraction, precipitation, membrane separation for concentrating biological products
CO3	Learned the basic principles and techniques of chromatography to purify the biological products and formulate the products for different end uses
CO4	motivated to set goals towards pursuing graduate school and higher level positions, such as lab manager and key scientist in plant biotechnological research institutes and industries;
CO5	Learned various techniques like extraction, precipitation, membrane separation for concentrating biological products
Course name	*Plant Biotechnology Lab*
	On successful completion of the course the students will be able to:
CO1	Understand the theoreticalbackgroundinplantsciencesneeded forplantbiotechnology;

CO2	Workingknowledgeoflaboratorytechniquesusedinplantbiotechnology;
CO3	Knowledge about capacitytoundertakeresearchinplantbiotechnology;
CO4	Supportmethodologiesinplanttissue/cellculturetoplantimprovement,aswellas DNAhandlingwithPCR-baseddetectiondiagnostictools;
CO5	Motivated to set goals towards pursuing graduate school and higher level positions, such as lab manager and key scientist in plant biotechnological research institutes and industries;
Course name	**Entrepreneurship Development Lab**
	On successful completion of the course the students will be able to:
CO1	Learn about the concept of saving and spending, planning and budgeting,
CO2	enterprises and financial-non financial institutions
CO3	Positively position themselves in their developmental environment.
CO4	Enhance their employability and entrepreneurial skills and gain knowledge on positive career choices
CO5	Plan start up business models by applying various entrepreneurial Skills.
Course name	**Clinical Research And Database Management**
	On successful completion of the course the students will be able to:
CO1	Knowledge on handling human and animal trials subjected to regulations
CO2	Knowledge of biostatistics subjected to validation on drug development
CO3	Develop ability to describe clinical research documentation and protocol
CO4	Plan start up business models by applying various entrepreneurial Skills.
CO5	Knowledge of biostatistics subjected to validation on drug development
Course name	**Transport Phenomena In Bioprocess**
	On successful completion of the course the students will be able to:
CO1	gain the knowledge of fundamental connections between the conservation laws in heat, mass, and momentum in terms of vector and tensor fluxes.
CO2	understand the mechanism of fluids in motion under different conditions.
CO3	understand the HETP, NTU and HTU concepts of various gas absorption packed tower columns;
CO4	understand the design aspects of extraction and various leaching equipments and
CO5	understand the importance of adsorption and drying processes and their industrial applications.
Course name	**Biosimilar Technology**
	On successful completion of the course the students will be able to:
CO1	a perspective of the complexity to establish biosimilarity of therapeutic proteins and biologics;
CO2	knowledge on novel biotechnological and pharmaceutical products, current medicines and their applications in therapeutic and diagnostic fields;
CO3	understand current topical and newly emerging aspects of pharmaceutical biotechnology;
CO4	understanding of the legal steps involved in bringing a new drug to the market;
CO5	acquainted with the current regulatory acts and safety norms of the modern pharmaceutical industries;
Course name	**Rational Drug Discovery**
	On successful completion of the course the students will be able to:

CO1	Learn various conventional Methods of drug discovery
CO2	Learn various now methods of drug discovery
CO3	Compare the convantional and now methods
CO4	Apply these methods in academics
CO5	Apply these methods in research Advanced methods employed in newdrug discovery process that will help them in for Academics and industry research.
Course name	**Bioterrorism And National Security**
	On successful completion of the course the students will be able to:
CO1	Understand the threats to national security, methods to tackle them
CO2	Understandlaw enforcement & the role of health agencies to handle them
CO3	Understandthe concept ofcivil rights and immigration, to private law, business, and environmental and economic issues
CO4	Understandthe concept of national security which also interpolates with a wide-range of domestic legal and policy issues,
CO5	Understandthe concept of national security which also interpolates with a wide-range of domestic legal and policy issues,
Course name	**Fundamentals Of Nanobiotechnology**
	On successful completion of the course the students will be able to:
CO1	Understand Nanotechnology the science of Nanomaterials
CO2	Understand how to prepare of Nanomaterials
CO3	Will develop knowledge in Nanobiotechnology
CO4	Learnaboutcancerdetectiontechniques.
CO5	Learnaboutcancerdetectiontechniques.
Course name	**Cancer Biology**
	On successful completion of the course the students will be able to:
CO1	Understand cancerandcausesofcancer
CO2	Learnaboutcancerdetectiontechniques.
CO3	Learnaboutidentificationanddetectionofoncogene
CO4	Learnaboutthenewmoleculesusedtotreatcancer
CO5	Learnaboutthenewmoleculesusedtotreatcancer
Course name	**Disaster Management**
	On successful completion of the course the students will be able to:
CO1	Differentiate the types of disasters, causes and their impact on environment and society.
CO2	Assess vulnerability and various methods of risk reduction measures as well as mitigation.
CO3	Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
CO4	Disaster damage assessment and management.
CO5	Learnaboutthenewmoleculesusedtotreatcancer
Course name	**Process Equipment And Plant Design**
	On successful completion of the course the students will be able to:
CO1	understand the working principles of heat exchangers, condensers and evaporators and develop a datasheet;

CO2	acquire basic knowledge to draw and design of storage vessel and pressure vessel as per ASME and ISIcodes;
CO3	understand the construction and assembly drawing of extraction towers, distillation towers and absorptiontowers;
CO4	learn working principles, constructions, usage of various pump, seals , valves andpipes;
CO5	apply modelling and simulation of bioprocesses so as to reduce costs and to enhance the quality of products and systems;
Course name	**Principles Of Food Processing**
	On successful completion of the course the students will be able to:
CO1	Different constituents present in food and microorganisms involved in the processing of food;
CO2	Principles and different preservations techniques of food;
CO3	Unit operations in modern food processing and impact of the process on foodquality;
CO4	Different techniques used in analysis of food additives;
CO5	Good Manufacturing Practices for maintaining food quality;
Semester VIII	
Course name	**Bioethics, IPR And Entrepreneurship**
	On successful completion of the course the students will be able to:
CO1	Touches on fundamental values, such as human dignity and the genetic integrity of humanity
CO2	Serve basic human needs such as human health, food and a safe environment,
CO3	Raise human rights issues such as access to health and benefits from scientific progress
CO4	Concerns over equitable access to the fruits of new technologies, the consent of those involved in research, and protection of the environment.
CO5	Obtaining a clear information on the entreneurship and understand their economic values
Course name	**Tissue Engineering**
	On successful completion of the course the students will be able to:
CO1	Understand the concept of tissue engineering application for regenerative medicines
CO2	Process carried out for tissue engineering application
CO3	Ability to know the techniques used for tissue engineering
CO4	Ability to grow ES in Lab
CO5	Understand the Fundamentals Of Tissue Repairing.
Course name	**Tele Medicine**
	On successful completion of the course the students will be able to:
CO1	Knowledge about the advances in healthcare system.
CO2	Analyze the various modes of communication system in healthcare.
CO3	Familiarize in the healthcare ethics.
CO4	Acquaint with the use of picture capturing technologies in telemedicine.
CO5	Examine the telemedicine applications in various fields.
Course name	**Molecular Pathogenesis**
	On successful completion of the course the students will be able to:
CO1	Knowledge of Different Types of Microscope and Types of Microbial Activity.
CO2	Host Interactions Mechanisms in Organisms
CO3	Concept About Modern Approaches to Control Pathogens

CO4	Knowledge About Different Molecular Pathogen Interactions and Host pathogen interactions at the level of cellular and molecularnetworks.
CO5	Modern therapeutic strategies on variouspathogens.
Course name	**Industrial Safety**
	On successful completion of the course the students will be able to:
CO1	The students will gain knowledge on the different disaster management skills
CO2	The students will analyse the effect of industrialization on the environment
CO3	Recognize different hazardous zones in Industries
CO4	The students will understand the role of hazardous waste management and use of critical thinking to identify and assess environmental health risks
CO5	To understand the functions and activities of Occupational health services identify notifiable occupational diseases arising out of Occupation
Course name	**Stem Cells In Health Care**
	On successful completion of the course the students will be able to:
CO1	Knowledge about various stemcells
CO2	Knowledge of Analysis on therapeutics using stemcell
CO3	Knowledge of application of stem cells in organregeneration
CO4	Knowledge of animal stem cell derived and itsproducts
CO5	Knowledge of Potential Uses Of Stem Cells in variousfields
Course name	**Total Quality Management**
	On successful completion of the course the students will be able to:
CO1	Discuss and describe the elements of effective management
CO2	Apply the planning, organizing and control processes.
CO3	Describe various theories related to the development of leadership skills, motivation techniques, team work and effective communication
CO4	Analysis of TQM tools & techniques
CO5	Controlling in Management skills
Course name	**Agricultural Biotechnology**
	On successful completion of the course the students will be able to:
CO1	Discuss and describe the elements of effective management
CO2	Apply the planning, organizing and control processes.
CO3	Describe various theories related to the development of leadership skills, motivation techniques, team work and effective communication
CO4	Analysis of TQM tools & techniques
CO5	Controlling in Management skills
Course name	**Medical Coding**
	On successful completion of the course the students will be able to:
CO1	Familiarize in the medical coding procedures for various treatmentprocess.
CO2	Acquire knowledge about ICD coding and medical billingprocess.
CO3	Acquire knowledge about human anatomy &physiology.
CO4	Familiarize in the softwareusage.
CO5	Acquire knowledge about E&M CodePractice.
Course name	**Computational Biology**

	On successful completion of the course the students will be able to:
CO1	Understand the difference between Old biotechnology and modern biotechnology
CO2	Understand and utilize the various pathways and cycles
CO3	Designanexperimentwithstep-by-stepinstructionstoaddressaresearchproblem.
CO4	Design an experiment with step-by-step instructions to address optimality in biology
CO5	Provide examples of current applications of biotechnology and advances in the different areas
Course name	*Bio Safety*
	On successful completion of the course the students will be able to:
CO1	Ability to understand the components of biosafety
CO2	The candidate at the end of the course will have a basic understanding on the basics of biological wastemanagement
CO3	Awareness about the properties and broad applications of genetically modified organisms
CO4	To understand the ethics and responsibility for safety
CO5	To carry out a safety audit and prepare a report for the audit.

Program Name	B.E. (AERONAUTICAL ENGINEERING)
Semester	III
Course Name	*Thermodynamics in Aero Engineering*
	On successful completion of the course the students will be able to:
CO1	Analyse open and closed systems using first law of thermodynamics
CO2	Apply the second law of thermodynamics for various engineering systems
CO3	Analyse Otto, Diesel, Dual and Bryton cycle under various operating conditions
CO4	Calculate the stoichiometric air fuel ratio required for combustion
CO5	Conduct experiments on various thermodynamics systems.
Course Name	*Fluid Mechanics and Machinery*
	On successful completion of the course the students will be able to:
CO1	Apply the basic equation of fluid statics to determine forces on planar and curved surfaces that are submerged in a static fluid.
CO2	Apply conservation laws to determine velocities, pressures, and accelerations for incompressible and inviscid fluids
CO3	Apply principles of dimensional analysis to identify non dimensional parameters
CO4	Explain the concepts of viscous boundary layers
CO5	Apply principles of impacts of jets in fluid machineries
Course Name	*Solid Mechanics*
	On successful completion of the course the students will be able to:
CO1	Students are able to understand the behavior of materials due to axial, bending, tensional and combined loads.
CO2	Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load
CO3	Determine the deflection of statically determinant beam
CO4	Solve the problems on torsion Circular Shafts
CO5	Demonstrate the experiments with UTM and Determinate Beam structures to determinate the predominant parameters
Course Name	*Production Technology*
	On successful completion of the course the students will be able to:
CO1	Familiarize with the basic casting concepts.
CO2	Know the various welding processes.
CO3	Use different machining process for component production
CO4	Familiarize with the various plastic moulding processes

CO5	Understand and carry out simple experiments in CNC machines
Course Name	*Strength of Materials Laboratory*
	On successful completion of the course the students will be able to:
CO1	Test and quantify the mechanical properties of Engineering Materials.
CO2	Acquire knowledge on bending properties of beams.
CO3	Estimate the performance of materials.
CO4	Apply the concepts torsion Circular Shafts characteristics to practical systems.
CO5	Demonstrate the experiments with UTM and Determinate Beam structures to determinate the predominant parameters
Course Name	*Fluid Mechanics and Machinery Laboratory*
	On successful completion of the course the students will be able to:
CO1	Explain and apply the basic principles of buoyancy
CO2	Determine discharge characteristics of flow meters.
CO3	Acquire knowledge on the impact characteristics of jets
CO4	Measure physical properties of fluids and characterize the performance of fluid machinery
CO5	Distinguish between laminar and turbulent flows
Course Name	*Aero EngineeringThermodynamics Laboratory*
	On successful completion of the course the students will be able to:
CO1	Acquire Knowledge on ignition aspects of fuels and thermal properties of fuels
CO2	Apply principles of convective heat transfer characteristics to practical systems.
CO3	Estimate the performance of heat exchangers.
CO4	Acquire knowledge onFree convective heat transfer from a flat plate
CO5	Demonstrate of Effectiveness of parallel flow heat exchangers.
Course Name	*Elements of Aeronautics*
	On successful completion of the course the students will be able to:
CO1	Determine the properties of atmosphere at a given altitude in ISA
CO2	Demonstrate different types of construction and materials used for aircraft structures.
CO3	Explain the operating principle of various systems used on airplanes
CO4	Differentiate power assisted and power operated flight control systems.
CO5	Explain the working of various instruments used for aircraft navigation.
Semester	**IV**
Course Name	*Aerodynamics – I*

	On successful completion of the course the students will be able to:
CO1	Understand the background of Fluid Mechanics to analyze internal and external flows relevant to aerospace applications.
CO2	Apply the Knowledge of Airfoil theory to predict airfoil performance and ability to analyze and optimize wing performance.
CO3	Understand the Generation of Lift with different airfoils, wing theory and boundary layer concepts.
CO4	Apply propeller theory to predict blade performance
CO5	An exposure to Boundary layer theory
Course Name	*Aircraft Systems and Instruments*
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge of Airplane Control Systems and different Aircraft systems to enhance the aircraft by advanced systems.
CO2	Design and analyze the Aircraft engine systems and Auxiliary systems for upcoming aircrafts
CO3	Asses the flight test instrumentation, components of instrumentation systems, and the signal condition required to deal with typical flight test sensors.
CO4	Acquire and interpret data from various aircraft instruments.
CO5	Identify the various cockpit controls.
Course Name	*Aircraft Structures - I*
	On successful completion of the course the students will be able to:
CO1	Apply knowledge of beams and columns to solve aeronautical engineering problems.
CO2	Handle design and analysis of aircraft structural components.
CO3	Understand the failure theory and its applications.
CO4	Create a structure to carry the given load.
CO5	Examine the structural failures using failure theories
Course Name	*Propulsion-I*
	On successful completion of the course the students will be able to:
CO1	Understanding the basics of propulsion system and different types of air breathing engine used in A/C
CO2	Understand the Performance of inlets, burners, nozzles, compressors and turbines.
CO3	Design and executive numerical propulsion analysis.
CO4	Apply ideal and actual cycle analysis to a gas turbine engine to relate thrust and fuel burn to component performance parameters.
CO5	Understanding the workings of multistage compressor and turbine
Course Name	*Metal Joining Process and NDT*
	On successful completion of the course the students will be able to:

CO1	Apply the knowledge of metal joining process and its applications to engineering field
CO2	Understand the concept of welding, riveting and soldering.
CO3	Evaluate the testing of materials and estimate different types of metal joining process
CO4	Students will be able to understand the concept of Ultrasonic Testing and Acoustic Emission
CO5	Understand the concept of Radiography
Course Name	*Aerospace Materials*
	On successful completion of the course the students will be able to:
CO1	Know the clear idea about the basics of Aerospace materials.
CO2	Understand the concept of Composite materials and types of manufacturing of Polymer matrix composites
CO3	Concept of creep, effects of creep and super alloys along with other materials
CO4	Exposure to high temperature materials for space applications
CO5	Provide the necessary mathematical knowledge that are needed in understanding their significance and operation.
Course Name	*Introduction to Space Technology*
	On successful completion of the course the students will be able to:
CO1	The broad view of the space technology with regard to rocket propulsion.
CO2	Understand the basic knowledge about satellite orbits, satellite dynamics and orbital elements
CO3	Know the different cases of satellite orbit transfer, orbit perturbations and Basic of rocket flight dynamics, and ballistic missile trajectories.
CO4	Estimate the trajectory/orbit of a space vehicle or a satellite in a suitable coordinate system.
CO5	Perform orbit perturbation analysis for satellite orbits.
Course Name	*Experimental Aerodynamics*
	On successful completion of the course the students will be able to:
CO1	Analyze the Basics flows in Low speed and Subsonic Wind tunnels.
CO2	Knowledge about the experiments in high speed tunnels for industrial applications.
CO3	Understand the measurement Techniques and special problems in different types of wind tunnels.
CO4	Analyze the model measurements, Lift and drag measurements through various techniques and testing of different models.
CO5	Apply the Wind tunnel boundary corrections and Scale effects
Course Name	*Mechanics of Machines*
	On successful completion of the course the students will be able to:
CO1	Able to apply fundamentals of mechanism for the design of new mechanisms and analyse them for optimum design.
CO2	An ability to analyze the gear and cam mechanisms.

CO3	An ability to use different mechanisms and Torsion vibration in aircraft systems.
CO4	Understand the importance of Governors and Gyroscopic effects.
CO5	Understand the importance of vibration
Semester	**V**
Course Name	*Aircraft Structures II*
	On successful completion of the course the students will be able to:
CO1	Understand the behavior of various aircraft structural components under different types of loads
CO2	Build the Knowledge about shear flow in open and closed sections of aircraft structural parts
CO3	Apply the concept of Buckling and Crippling stresses with different methods
CO4	Perform buckling calculations in plates
CO5	Simplify the Analysis of the stress in wing and fuselage with Shear and bending moment.
Course Name	*Aircraft Performance*
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge of Basics of Flight Performance under various conditions to Aircraft industry.
CO2	Understand the various climbing and turning performance of an aircraft
CO3	Analyze the condition for minimum drag and minimum power in an aircraft.
CO4	Examine the Special performances of an aircraft engines
CO5	Aquire the knowledge about propellers.
Course Name	*Aerodynamics II*
	On successful completion of the course the students will be able to:
CO1	Categorize the behavior of airflow both internal and external in compressible flow regime with particular emphasis on supersonic flows.
CO2	Compare the various concepts of shockwaves and Expansion waves
CO3	Apply the knowledge for High Speed flows in airfoils with Critical Mach numbers
CO4	Understand the different types of Wind tunnels
CO5	Understand the charecteristics of shock tubes
Course Name	*Propulsion II*
	On successful completion of the course the students will be able to:
CO1	Learn the concept Aircraft and Rocket propulsion systems
CO2	Classify the applications of various propellant systems and their properties
CO3	Analyze various propulsion systems, Performances and Advantages and apply the knowledge in Propulsion field.
CO4	Classify different types of propulsion systems

CO5	Concepts applied in nozzle propulsion
Course Name	*Aircraft Structures Lab II*
	On successful completion of the course the students will be able to:
CO1	Find the Bending in Symmetric and Unsymmetrical Sections
CO2	Compute the shear center location for open and closed sections
CO3	Calculate the Stress values of photo elastic techniques and vibration of beams
CO4	Analyze the Experiments on flexibility matrix for cantilever beam
CO5	Analyze the Beam with combined loading
Course Name	*Propulsion laboratory*
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge of Engine operations in Aeronautical field
CO2	Analyze the Performance of Propellers
CO3	Calculate the velocity of free jet apply in Industrial applications
CO4	Make use of Flow visualization and categorize the flow based on Reynolds number.
CO5	Calculate the velocity of wall jet experiments and apply in Industrial applications
Course Name	*Aircraft Rules and Regulation*
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge of Airworthiness regulations and CAR procedures which are being followed by DGCA.
CO2	Understand the Issuing of Airworthiness certificate and its requirements of aircraft
CO3	Analyze the concept of airworthiness and certification
CO4	Determine the Flight evaluation and Testing Procedures techniques for further applications
CO5	Certification & health monitoring in Aircraft industry
Course Name	*Airlines Operations and Management*
	On successful completion of the course the students will be able to:
CO1	Learn the Different Airline Operations and Air transport management.
CO2	Understand the Planning of different Airport and Air safety Management
CO3	Apply the knowledge of Air traffic control
CO4	Identify the Aircraft Management Safety Standards Guidelines and Apply to the respective issues.
CO5	Identify the Flight rules in aviation field
Course Name	*Aero-Engine Testing and Performance Evaluation*
	On successful completion of the course the students will be able to:

CO1	Apply the knowledge in Testing of Turbo engines and Evaluation
CO2	Analyze the Combustion chamber, Propellers and Nozzles in Aircraft Industry
CO3	Know about the Engine performance and quality testing in Aircrafts
CO4	Develop the knowledge of Performance of air breathing engines
CO5	Knowledge of Performance Wind tunnel tests
Course Name	*Aircraft Quality and Assurance*
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge of Quality concepts in aircraft industry
CO2	Describe the Importance of Quality control and Designing of Quality
CO3	Define about knowledge of Reliability Prediction
CO4	Analyze the Concepts of Probability and Scope for data analysis
CO5	Define about knowledge of Manufacturing of Quality Assurance
Course Name	*Space Flight Mechanics*
	On successful completion of the course the students will be able to:
CO1	Define the Basic concepts of Solar system and Earth atmosphere.
CO2	Analyze the Satellite operations and Satellite Injections
CO3	Understand the concept of Interplanetary Trajectories
CO4	Differentiate the Space craft materials and Selection of Spacecraft Material
CO5	Concept of Missile Trajectories
Course Name	*Aircraft Control Engineering*
	On successful completion of the course the students will be able to:
CO1	Describe the Feedback control systems and representation of control systems
CO2	Analyze the basic concepts of Mechanical and electrical components with the Development of flight control systems
CO3	Apply the knowledge of Characteristic Equation and Functions of control system with Sample data Systems
CO4	Learn the concept of stability, bode techniques with frequency response
CO5	Understand the aircraft stability analysis.
Course Name	*Unmanned Aircraft Systems*
	On successful completion of the course the students will be able to:
CO1	Understand the historical evaluation of Unmanned Aircraft Systems in Aeronautical Engineering Development
CO2	Design the Unmanned Aircraft Systems by considering all design parameters

CO3	Apply the Unmanned Aircraft Systems in the field of Surrivellance
CO4	Learn the Propulsion systems of unmanned aerial vehicle
CO5	\Stabilize the Unmanned Aircraft Systems
Course Name	***Introduction to Wind Tunnel Techniques***
	On successful completion of the course the students will be able to:
CO1	Define the basic concepts of measurement of forces and moments on models during the wind tunnel testing.
CO2	Analyze the application of various types of wind tunnels.
CO3	Develop the skills about measurement procedure involving wind tunnel testing
CO4	Classify wind tunnel measurement and Analyze different types of wind tunnels
CO5	Understand nature flow over the various components.
Course Name	***Fundamentals of Flight***
	On successful completion of the course the students will be able to:
CO1	Describe the concept of Basic properties and Basic terminologies of the Aircraft
CO2	Know about the performance characteristic of propeller and jet propulsion systems
CO3	Learn Different types of aircraft systems
CO4	Apply the Knowledge of Basic aerodynamics to Aircrafts
CO5	Apply the methods for estimating performance of aircraft
Course Name	***Introduction to Space Systems***
	On successful completion of the course the students will be able to:
CO1	Know about various orbits and orbit deviations
CO2	Learn the basic concept of control systems with mathematical modeling and Sub systems.
CO3	Analyze planet and their trajectories
CO4	Define about the concepts of Time response analysis and steady state analysis.
CO5	Analyze target planets and their trajectories
Course Name	***Aircraft Structures Repair Lab***
	On successful completion of the course the students will be able to:
CO1	Learn Patch repair work by using composites
CO2	Analyze the Weld for the given Material by using TIG welding setup
CO3	Use of sandwich panels for Aircraft industry
CO4	Know the use of Sheet Metals for Aircraft Body development and other works
CO5	Analyze the Weld for the given Material by using MIG welding setup

Course Name	MAT Lab
	On successful completion of the course the students will be able to:
CO1	Learn basic principles of programming and of implementing mathematical concepts in MATLAB
CO2	Compute the Variables and constants by Simple Calculations of MAT LAB
CO3	Do the Experiment on Matrix Operations and Functions in MATLAB
CO4	Analyze numerical algorithms and evaluate the computational results using graphical representations
CO5	Do the Experiment on dynamic analysis in MATLAB
Course Name	Computer Aided Modeling And Analysis Laboratory
	On successful completion of the course the students will be able to:
CO1	Lean basic principles of Computer Aided Modeling and Analysis by using Ansys software
CO2	Analyze the Stresses analysis in 2D problems
CO3	Compute the Conduction and Convection Boundary Conditions for Thermal Analysis.
CO4	Do experiment on Fluid flow Analysis - Potential distribution in the 2 - D bodies
CO5	Analyze the Stresses analysis in 3D problems
Course Name	Hypermesh Laboratory
	On successful completion of the course the students will be able to:
CO1	Define the basic principles of meshing and Discretization of solid models.
CO2	Develop the Mesh of Two dimensional model
CO3	Understand the concept of Meshing for Three dimensional model
CO4	Conduct Experiments on the Meshed models and to correct the meshing volumes
CO5	Understand the concept of Meshing for 2D dimensional model
Course Name	Aircraft System Control
	On successful completion of the course the students will be able to:
CO1	Understand the basic principles of Aircraft Operation and control techniques
CO2	Clear the problems in hydraulic and fuel systems.
CO3	Do Experiment on Flow tests and Maintenance of Aircraft
CO4	Analyze the pressure and Brake load in Aircraft
CO5	Basic principles of control techniques
Semester	VI
Course Name	Composite Materials and Structures
	On successful completion of the course the students will be able to:

CO1	Apply the various composite materials and structures used in aircraft Applications and their test methods.
CO2	Learn simple micromechanics and failure modes of composites.
CO3	Analyse the effect sandwich construction in the aircraft materials and its prevention methods.
CO4	Learn the various open and closed mould processes, fabrication process.
CO5	Construct the methods of manufacturing and analysis of different composite technique.
Course Name	*Heat Transfer*
	On successful completion of the course the students will be able to:
CO1	Derive the equation for temperature distribution in fins, to estimate the rate of heat transfer through conduction through slabs, cylindrical and spherical surface objects.
CO2	Knowledge about the rate of heat transfer and heat transfer coefficients for forced and free convection Heat transfer problems.
CO3	Evaluate the radiant heat transfer between solid bodies, black or gray.
CO4	Perform the LMTD & NTU analysis to the heat exchanger problems, to analyze and design the boiling heat transfer problems.
CO5	Apply heat transfer principles (conduction, convection and radiation) in solving aerospace engineering problems that are related to heat transfer.
Course Name	*Experimental Stress Analysis*
	On successful completion of the course the students will be able to:
CO1	Understood the Measuring instruments; factors affecting measurements, errors and corrective measurements
CO2	Demonstrate the principles of different types of extensometers.
CO3	Analyze the principles of rosettes and gather the requirements of the Strain gauges.
CO4	Get knowledge about photo elasticity, stress optic law, compensation and separation techniques, interpretation of fringe pattern.
CO5	Understand NDT, Radiography, ultrasonic, magnetic particle inspection, acoustic emission technique, holograph techniques were studied.
Course Name	*Finite Element Analysis*
	On successful completion of the course the students will be able to:
CO1	Understood the approximate analytical methods in FEA and concept of numerical analysis of structural components.
CO2	Analyze the mathematical models for physical system using principle of minimum potential energy / principle of Virtual Work
CO3	Acquired the finite element attributes, types, different types of boundary Conditions and interpolation functions. (2D & 3D)
CO4	Application of FEA to simple bars, Truss, Beam and Isoperimetric Element Formulation.
CO5	Derive global stiffness matrix for triangular plane and they will analyses using ANSYS.
Course Name	*Aircraft Design Lab*

	On successful completion of the course the students will be able to:
CO1	Based upon the mission of the aircraft the students designated for a collection of data are collected from different aircraft having the same mission.
CO2	Analyze the main design parameter for the aircraft design.
CO3	Knowledge about the approximate weight of the aircraft that they design by specifying the different types of weight of the aircraft, the types of power plant selected as well as aero foil selection and tail empennage.
CO4	Evaluate the overall drag of the newly designed aircraft for further calculation on performance of the aircraft.
CO5	Apply the physical design with its operations
Course Name	*Material Testing Lab*
	On successful completion of the course the students will be able to:
CO1	Acquired the knowledge to perform various mechanical testing.
CO2	Analyze the microstructure of various engineering materials.
CO3	Knowledge of performing various non-destructive tests.
CO4	Describe structures of metallic materials and their effects on mechanical properties.
Course Name	*Theory of Elasticity*
	On successful completion of the course the students will be able to:
CO1	Understood the Compatibility equations for stresses and strains
CO2	Describe the Numerical problems in assumption of elasticity.
CO3	Study the Equations of equilibrium for types of dimensional bodies
CO4	Understood the Kirsch, Michell's and Boussinesque problems.
CO5	Describe about the Plane stress and Strain
Course Name	*Intellectual Property Rights*
	On successful completion of the course the students will be able to:
CO1	Understood the commitments to WTO
CO2	Describe the General Agreement on Trade and Tariff
CO3	Study the strategies of Indian IPR legislations
CO4	Understood the Protection against unfair competition.
CO5	Describe about the types of property
Course Name	*Wind Tunnel Techniques*
	On successful completion of the course the students will be able to:
CO1	Understood about the Test section speed
CO2	Describe about the wind tunnel measurements

CO3	Study the flow visualization in wind tunnel techniques
CO4	Understand the Calibration of supersonic tunnels.
CO5	Describe about the model testing in wind tunnel
Course Name	*Boundary Layer Theory*
	On successful completion of the course the students will be able to:
CO1	Gain the basic principles of navigation system.
CO2	Understanding the control position of orbital Transfer under guidance system.
CO3	Analyze the various control system techniques and its performance.
CO4	Relate the control systems and guidance and control of launch vehicles.
CO5	Knowledge about injection of satellite Spacecraft control techniques.
Course Name	*Flight Testing*
	On successful completion of the course the students will be able to:
CO1	Understood the Level flight performance in aircraft testing
CO2	Describe the Flight Test methods in Stability & Control
CO3	Study the take-off, landing, turning flight methods in Performance flight testing
CO4	Understood the Dive testing for flutter, vibration and buffeting.
CO5	Describe about the Maneuvering stability methods & data reduction.
Course Name	*Aircraft Electronics Microprocessor and Applications*
	On successful completion of the course the students will be able to:
CO1	Evaluate the batteries which are used in aircraft and the various trouble shooting digital circuits.
CO2	Understood the basic concepts of transmitter and receiver in aircraft systems.
CO3	Design system using memory chips and peripheral chips for 16 bit 8086 microprocessor.
CO4	Evaluate the various microprocessor applications applied in flight control systems.
CO5	Apply the knowledge of automatic flight control systems and its microprocessor applications.
Course Name	*Space Flight Navigation and Guidance Control*
	On successful completion of the course the students will be able to:
CO1	Gain the basic principles of navigation system.
CO2	Understanding the control position of Orbital Transfer under guidance system.
CO3	Analyze the various control system techniques and its performance.
CO4	Relate the control systems and guidance and control of launch vehicles.
CO5	Knowledge about injection of satellite Spacecraft control techniques.

Course Name	**Applied Hydraulics and Pneumatics**
	On successful completion of the course the students will be able to:
CO1	Gaining the concept of fluid power systems and applications in industries.
CO2	Understanding the working principle of hydraulic and pneumatic systems.
CO3	Design the hydraulic and pneumatic circuits and exposure of diagnose or troubleshoot the power systems.
CO4	An ability to apply the applied hydraulics concepts to machining operations like shaping, punching, etc.
CO5	Recognize the standard symbols of the different components used in fluid power and pneumatics systems.
Course Name	**Structural Dynamics**
	On successful completion of the course the students will be able to:
CO1	Knowing various options of mathematical modeling of structures.
CO2	Analyze the equations of motion for vibratory systems and solving for the free and forced response.
CO3	Knowledge in natural modes of vibration of structures.
CO4	Evaluate the response of structures under various dynamically loaded conditions.
CO5	Gaining knowledge in numerical and approximate methods of evaluating dynamic response of the systems.
Course Name	**Aircraft Maintenance Practice**
	On successful completion of the course the students will be able to:
CO1	Gain the knowledge in various ground support system for aircraft operations.
CO2	Understood the operation of Air conditioning and pressurization systems in ground level conditions.
CO3	Identify the aircraft component safety and reliability of aircraft systems service and its environmental condition.
CO4	Ability to carry out the ground servicing of critical aircraft systems during the aircraft maintenance manual.
CO5	Knowledge in specifications standards of aircraft hardware systems.
Course Name	**Aero Engine Repair and Maintenance Laboratory**
	On successful completion of the course the students will be able to:
CO1	Identify the defects in an aircraft's piston engine and jet engine.
CO2	Start the piston and jet engines of an aircraft with the help of user manuals.
CO3	Evaluate the performance of various non-destructive tests.
CO4	Develop the knowledge of Performance of air breathing engines.
Course Name	**Aircraft Interior Design Laboratory**
	On successful completion of the course the students will be able to:

CO1	Understand the importance of drawing and design process and phases involved in the design process.
CO2	Ability to design various individual components, sub-assemblies and main assemblies in drawing lab.
CO3	Ability to Design various orthographic and isometric projections in drawing sheets.
CO4	Ability to develop and understand Basic Concepts of aircraft.
Course Name	*CAD/CAM Laboratory*
	On successful completion of the course the students will be able to:
CO1	Ability to develop 2D and 3D part models using modeling software.
CO2	Ability to prepare engineering drawing for industrial component using Indian standard code of practice.
CO3	Ability to prepare bill of materials for production drawings.
CO4	Ability to prepare the assembly models and apply the sectioning methods.
Course Name	*MAT Lab*
	On successful completion of the course the students will be able to:
CO1	Learn basic principles of programming and of implementing mathematical concepts in MATLAB.
CO2	Compute the Variables and constants by Simple Calculations of MAT LAB.
CO3	Do the Experiment on Matrix Operations and Functions in MATLAB.
CO4	Analyze numerical algorithms and evaluate the computational results using graphical representations.
Course Name	*Heat Transfer Laboratory*
	On successful completion of the course the students will be able to:
CO1	Understand the basic laws of heat transfer, account for the consequence of heat transfer in thermal analyses of engineering systems.
CO2	Analyze problems involving steady state heat conduction in simple geometries, develop solutions for transient heat conduction in simple geometries.
CO3	Obtain numerical solutions for conduction and radiation heat transfer problems, understand the fundamentals of convective heat transfer process.
CO4	Evaluate heat transfer coefficients for natural convection, inside ducts.
Semester	**VII**
Course Name	*Fracture Mechanics and Mechanisms*
	On successful completion of the course the students will be able to:
CO1	Understood the mechanical behavior of a material under various loading conditions
CO2	Acquire knowledge about the concept of stress concentration and able to plot S-N curves for various component fractures.
CO3	Exposure on nonlinear fracture-mechanics parameters, such as J and T integral.
CO4	Knowledge about the rate of stress concentration statistical aspects of fatigue behaviour and Finite Element analysis.
CO5	Analyze the effect of fatigue and fracture mechanics to engineering issues.

Course Name	Avionics
	On successful completion of the course the students will be able to:
CO1	Understood the needs of Avionics in Civil, Military Aircraft and Space systems.
CO2	Apply basic inputs to aircraft digital instruments for efficient output.
CO3	Knowledge about the various Avionics systems architecture and apply to sub systems in Aircraft.
CO4	Demonstrate the principles for different displays used in aircraft systems.
CO5	Awareness of communication and navigation systems and their applications in aircraft.
Course Name	Airline and Airport Management
	On successful completion of the course the students will be able to:
CO1	Analyze the design requirements related to Airport Management operations.
CO2	Estimate the runway requirements for performance of aircraft during takeoff and landing.
CO3	Understood the functions and operation of the aircraft control, ground electronics airfield lighting, runway and taxi way markings.
CO4	Appreciate the importance of weather, safety and collision avoidance to ensure Aviation safety and Security.
	Familiarize with next generation Radar, communication, ATC network and compliance to environmental acts.
Course Name	Vibrations and Aero elasticity
	On successful completion of the course the students will be able to:
CO1	Understood the basics of vibrations and simple harmonic motion.
CO2	Differentiate between types of vibrations according to dampness and particle motion.
CO3	Understood the need of a multi degrees of freedom particle and its characteristics.
CO4	Measuring the natural frequency of an object by using Rayleigh and Holzer method.
CO5	Understood the formation of Aileron reversal, flutter and wing divergence.
Course Name	Avionics Laboratory
	On successful completion of the course the students will be able to:
CO1	Design and analyze complex digital circuits.
CO2	Develop and execute assembly language programs using 8085 for any applications.
CO3	Interface and control stepper motors using 8085 microprocessor.
CO4	Integrate avionic systems using MIL-STD-1553B data bus.
CO5	Integrate avionic systems using ARINC 429 data bus.
Course Name	Aircraft Systems Laboratory
	On successful completion of the course the students will be able to:

CO1	Perform aircraft jacking in order to perform maintenance and inspection.
CO2	Remove and reinstall aircraft wings and undercarriage using manufacturer's manual.
CO3	Disassemble and assemble sub components of aircraft engines to perform maintenance and inspection.
CO4	Describe engine ground running procedure.
CO5	Troubleshoot various systems of aircraft.
Course Name	*Design and Fabrication of Aeromodelling*
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge of Mathematics, Science, and fundamentals of Aerodynamics, Structures, and Propulsion to identify and formulate the engineering problems in aerospace applications.
CO2	Analyze and estimate the cost and time
CO3	Simulate, analyze and interpret data using software tools such as MATLAB, ANSYS fluent, CFX, CFD++, ICEM CFD, GAMBIT, etc.
CO4	Develop a project planning strategy and work as an individual or as a member on project teams and communicate the results effectively by compiling project reports and presentations.
CO5	Develop an end product and prepare a technical report/paper.
Course Name	*Helicopter Maintenance*
	On successful completion of the course the students will be able to:
CO1	Helicopter basics are clearly understood and various maintenance procedures are followed
CO2	Get a clear idea about Head maintenance with flight and mast control systems.
CO3	Understand the transmission process in helicopter rotor and torque meter working.
CO4	Power plant rotors and tail rotor working is studied Concept of rigging is clearly understood.
CO5	Get an idea about fuselage maintenance procedures with special hardware requirements.
Course Name	*Helicopter Aerodynamics*
	On successful completion of the course the students will be able to:
CO1	Familiarize on major helicopter components, characteristics and configurations.
CO2	Apply Momentum and simple blade element theories to helicopter's rotor blades.
CO3	Analyze the power requirements in forward flight and associated stability problems of helicopter.
CO4	Apply the ground effect concept to ground effect machines.
CO5	Analyze the performance of VTOL and STOL aircrafts.
Course Name	*High Temperature Materials*
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge of creep and their different stages of creep curve.
CO2	Understood the mechanical behavior of material rupture life of brittle and ductile.

CO3	Analyze the concept of fracture and their mechanics due to elevated temperature.
CO4	Acquire the knowledge about oxidation and hot corrosion by addition of alloy elements.
CO5	Familiarize the various super alloys and other materials.
Course Name	*Airworthiness and certification*
	On successful completion of the course the students will be able to:
CO1	Explain the Airworthiness requirements for different categories of aircrafts
CO2	Discuss the various certifications, technical log book
CO3	Explain the procedure for development, test flight and certification
CO4	Discuss the accident investigation procedures
CO5	Explain components and equipment including instruments.
Course Name	*Theory of Plates and Shells*
	On successful completion of the course the students will be able to:
CO1	Explain classical plate theory and boundary conditions
CO2	Explain the various method of solution for different geometry of plates
CO3	Discuss the various approximate methods to vibration analysis in plates
CO4	Describe the basic concepts of shell type of structures
CO5	Understand the behaviour of the plates and shells with different geometry under various types of loads.
Course Name	**Total Quality Management**
	On successful completion of the course the students will be able to:
CO1	Get the knowledge on philosophies of management and basic concepts.
CO2	Gain the knowledge on leadership qualities and management tools of quality statistical concepts.
CO3	Gain the knowledge about the defect component analysis and quality enhancing technique for practical application.
CO4	Have exposure on concepts like Quality Function Deployment, Benchmarking, Total Productive Maintenance and Failure Mode Effective Analysis.
CO5	Gain the knowledge on the Quality certification procedure on ISO 9000, QS14000 and information on Auditing can be obtained.
Course Name	*Principles of Management and Business Concepts*
	On successful completion of the course the students will be able to:
CO1	Describe and discuss the elements of effective management.
CO2	Know about motivation theories.
CO3	Gain the knowledge on managerial skills and business activities.
CO4	Understanding of business concepts and its applications.

CO5	Discuss and apply the planning, organizing and control process.
Course Name	*Non Destructive Testing and Materials*
	On successful completion of the course the students will be able to:
CO1	Apply scientific and technical knowledge to the field of non-destructive testing.
CO2	Use the relevant non-destructive testing methods for various engineering practice.
CO3	Analyse and interpret the defects to improve the overall quality of products.
CO4	Develop their skills in inspection of the components.
CO5	Increase overall reliability of the products by selection of suitable inspection techniques.
Course Name	*Robotics and Automation*
	On successful completion of the course the students will be able to:
CO1	Analyzing the various parts of robots and fields of robotics.
CO2	Understanding the various kinematics and inverse kinematics of robots.
CO3	Determining the Euler, Lagrangian formulation of Robot dynamics.
CO4	Understanding the basic concepts of the trajectory planning for robot.
CO5	Understanding the Application of robot.
Course Name	*Industrial engineering and Management*
	On successful completion of the course the students will be able to:
CO1	Recall the history and describe the various management functions.
CO2	Identify the role of staffing, work study, incentives, health and safety in management.
CO3	Apply techniques of decision making, customer involvement, work-study, incentive schemes and process improvement.
CO4	Describe the various management behavioural technique.
CO5	Describe the various process improvement technique.
Semester	**VIII**
Course Name	*Rocket and Missiles*
	On successful completion of the course the students will be able to:
CO1	Design Consideration of liquid Rocket Combustion Chamber and Igniter.
CO2	Acquire the knowledge about Aerodynamic Forces and Moments. Lateral Damping Moment and Longitudinal Moment of a Rocket.
CO3	Learn about the 1D and 2D rocket Motions in Free Space and Homogeneous Gravitational Fields.
CO4	Understood the Vertical, Inclined and Gravity Turn Trajectories in rocket motion and also the rockets Separation Techniques.
CO5	Familiarize with the selection of suitable materials for different rocket systems

Course Name	Computational Fluid Dynamics
	On successful completion of the course the students will be able to:
CO1	Identify and predict the flow regime in a given engineering systems non-dimensional groups.
CO2	Calculate the hydrostatic forces and moments on planar and curved submerged and floating surfaces.
CO3	Decide when appropriate to use ideal flow concepts and the Bernoulli equation.
CO4	Construct an appropriate (fixed, deforming, or moving) control volume for a given engineering system.
CO5	Familiarize the principles of conservation of mass, momentum, and energy to this control volume.
Course Name	Experimental Aerodynamics
	On successful completion of the course the students will be able to:
CO1	Ability to explain the sources of friction, turbulence and drag.
CO2	Ability to carry out experiments in both subsonic and supersonic wind tunnels.
CO3	Ability to use Pitot static tube, hot wire anemometer, transducers.
CO4	Acquire the knowledge about wind tunnel re-entry problems.
CO5	Familiarize the aerodynamic flow properties and its experimental problems.
Course Name	Structural Dynamics
	On successful completion of the course the students will be able to:
CO1	Acquire the knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems
CO2	Solving for the free and forced response system structures.
CO3	Solve problems on dynamic loading and evaluation of dynamic response.
CO4	Determine the solutions for Un-damped systems.
CO5	Familiarize about aircraft flutter analysis in structures.
Course Name	Aerospace Quality Assurance
	On successful completion of the course the students will be able to:
CO1	Understood the impact of engineering solutions in a global and societal context.
CO2	Familiarize the concepts of aerospace Quality Assurance and analysis the quality concepts.
CO3	Optimize the management of the air traffic activities.
CO4	Implies to go beyond the perimeter of the air traffic to encompass the aircraft flight crew members.
CO5	Aircraft operators in their operational management of flights.
Course Name	Computer Integrated Manufacturing
	On successful completion of the course the students will be able to:
CO1	Solve the design problems of different type of transfer mechanism.

CO2	Perform design and analysis of automatic storage and retrieval system.
CO3	Evaluate the space requirements of different storage system.
CO4	Design the workstation requirement for unattended operations and automated production system.
CO5	Optimize the number of machines required for machine cell in a given production system
Course Name	*Entrepreneurship Development, Management & IPR*
	On successful completion of the course the students will be able to:
CO1	Recognize the importance of entrepreneurship and its role in economic development.
CO2	Identify various schemes of Central and State Governments and their agencies.
CO3	Identify & select various projects to become entrepreneur by feasibility studies
CO4	Prepare project report for starting an enterprise in line with guidelines.
CO5	Appraise of IP rights like patents, industrial design for effective protection
Course Name	*Computer Aided Design/Computer Aided Manufacturing*
	On successful completion of the course the students will be able to:
CO1	Select Input and Output Devices for Computer Systems for Requirements.
CO2	The learning outcomes are assessed through the assignments.
CO3	Apply Knowledge of Mathematical Concept For Geometry Manipulation.
CO4	Operate CAD/CAM Packages to Prepare Solid Model of Components.
CO5	Develop Computer Algorithm for Design and Analysis of Mechanical Systems
Course Name	*Human Values and Professional Ethics*
	On successful completion of the course the students will be able to:
CO1	Extrapolate and make awareness on the morality, integrity, honesty and spirituality.
CO2	Judgment and assistance based on the ethical theory to tackle the moral issues.
CO3	Professional reputation is witnessed due to the balanced outlook on law.
CO4	Develop safety and responsibilities for the development of the employee.
CO5	Drive to be a moral leader with the analysis of the global issues in the engineering society
Course Name	*Operational Research*
	On successful completion of the course the students will be able to:
CO1	Recall the history and describe the various management functions.
CO2	Identify the role of staffing, work study, incentives, health and safety in management.
CO3	Apply techniques of decision making, customer involvement, work-study, incentive schemes and process improvement.
CO4	Describe the various management behavioral technique.

CO5	Acquire the knowledge about graphical solution for all the problems.
Course Name	*Combustion*
	On successful completion of the course the students will be able to:
CO1	Familiar with the concepts of air transportation and the maintenance management of aircraft.
CO2	Apply the chemical kinetics and chemical equilibrium.
CO3	Describe the concepts of engines and combustion system of engines.
CO4	Apply the principles of combustion of rocket engines.
CO5	The students will acquire knowledge about pollution and reduction of pollutants.
Course Name	*Air Transportation And Aircraft Maintenance*
	On successful completion of the course the students will be able to:
CO1	Familiar with the concepts of air transportation.
CO2	The student will be able to forecast the factors affecting the choice of fleet.
CO3	Apply the principles of aircraft and crew scheduling
CO4	Describe the concepts of EROPS and ETOPS and aircraft reliability.
CO5	Apply the techniques of aircraft maintenance and monitoring.
Course Name	*Engineering Optimization*
	On successful completion of the course the students will be able to:
CO1	Familiar with the concepts of Fibonacci method, Golden section method
CO2	Apply the Rosen Brock's search and Simplex methods.
CO3	Describe the concepts of -Lagrangian method.
CO4	Apply the principles of Big-M & two-phase methods
CO5	The students will acquire knowledge about queuing & inventory
Course Name	**Gas Turbine Technology**
	On successful completion of the course the students will be able to:
CO1	Explain the Airworthiness requirements for different categories of aircrafts.
CO2	Discuss the various certifications, technical log book.
CO3	Explain the procedure for development, test flight and certification.
CO4	Discuss the accident investigation procedures.
CO5	Familiar with the performance predictions.

Program Name	B.E. (BIOMEDICAL ENGINEERING)
Semester	III
Course Name	ENGINEERING MATHEMATICS - III
	On successful completion of the course the students will be able to:
CO1	Know the methods to solve partial differential equations occurring in various physical and engineering problems.
CO2	Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.
CO3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.
CO4	Understand the effect of Fourier transform techniques and their applications.
CO5	Gain the concept of analysis of linear discrete system using Z-transform approach.
Course Name	ELECTRICAL MACHINES
	On successful completion of the course the students will be able to:
CO1	Understand the magnetic effects, Magnetic materials in magnetic circuits
CO2	Understand the Construction, operating principle, characteristics, and applications of transformers
CO3	Understand the construction, working, characteristics and applications of DC generators & DC motors
CO4	Understand the principle and operation of AC Machines
CO5	Gain the basic knowledge on Special Machines
Course Name	HUMAN ANATOMY AND PHYSIOLOGY
	On successful completion of the course the students will be able to:
CO1	Understand the importance of transport of substances across the cell membrane.
CO2	Gain knowledge of blood components in blood grouping
CO3	Understand and implement the knowledge on physiology of kidney, respiratory and cardiac cycle.
CO4	Understand the image formation and vision, sound perception and different types of deafness in the ears.
CO5	Know the significance of digestive system, various bones and reproductive system
Course Name	SENSORS AND MEASUREMENTS
	On successful completion of the course the students will be able to:
CO1	Describe the purpose and methods of measurements
CO2	Understand the principle of displacement, pressure and temperature sensors

CO3	Understand the working of photo electric and Piezo electric sensors
CO4	Design different types of signal conditioners and analyzers.
CO5	Analyze the different display and recording devices for various applications.
Course Name	**MEDICAL PHYSICS**
	On successful completion of the course the students will be able to:
CO1	Summarize the basic concepts of C
CO2	Develop programs for real time application using functions, structures, union
CO3	Gain knowledge on operations of linear data structures
CO4	Develop applications using nonlinear data structures
CO5	Apply appropriate sorting, searching technique for given problem.
Course Name	**FUNDAMENTALS OF DATA STRUCTURES IN C**
	On successful completion of the course the students will be able to:
CO1	Summarize the basic concepts of C
CO2	Develop programs for real time application using functions, structures, union
CO3	Gain knowledge on operations of linear data structures
CO4	Develop applications using nonlinear data structures
CO5	Apply appropriate sorting, searching technique for given problem.
Course Name	**HUMAN ANATOMY AND PHYSIOLOGY LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Demonstrate the contents of blood and how to analyze it
CO2	Estimation of hematological parameters
CO3	Analysis of special sensory organs test
Course Name	**SENSORS AND MEASUREMENTS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Describe the purpose and methods of measurements
CO2	Design and analyze different type of transducers and study its biomedical applications
CO3	Design the signal conditioning elements
Course Name	**FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Implement basic and advanced programs in C

CO2	Implement functions and recursive functions in C
CO3	Apply the different Linear Data Structures for Implementing Solutions to Practical Problems.
CO4	Apply and implement Graph Data Structures for Real Time Applications.
CO5	Implement various Searching, Sorting and hashing Algorithms.
Semester	**IV**
Course Name	**PROBABILITY AND RANDOM PROCESSES**
	On successful completion of the course the students will be able to:
CO1	Imbibe the knowledge of basic probability
CO2	Aquaint the ability of fitting the real time problems into probability distribution modals and interpret.
CO3	Learn the concept of two dimensional random variables helps to understand and analyse the statistical measures which describe an outcome of a random experiment.
CO4	Understand and characterizing the random variable phenomenon which evolve with respect to time in a probabilistic approach.
CO5	Gain the concept of the linear system with random inputs.
Course Name	**ANALOG INTEGRATED CIRCUITS**
	On successful completion of the course the students will be able to:
CO1	Design rectifiers using diode and apply suitable biasing circuits for BJT and FET.
CO2	To learnt the fundamentals feed back amplifiers & Current and voltage sources
CO3	Acquire the knowledge of inverting, non inverting amplifier, integrator and differentiator
CO4	Get the ability to design filters and signal generator circuits according to required output.
CO5	Apply Multivibrators, Converters and regulators in circuits.
Course Name	**DIGITAL LOGIC DESIGN**
	On successful completion of the course the students will be able to:
CO1	Compute the Postulates of Boolean algebra using different techniques
CO2	Design the Combinational circuits
CO3	Design the synchronous and asynchronous sequential circuit
CO4	Analyze the various memories and programmable logic device
CO5	Understand the concept of digital logic families
Course Name	**PATHOLOGY AND MICROBIOLOGY**
	On successful completion of the course the students will be able to:
CO1	Analyze Pathogenesis of Cell injury and Inflammation

CO2	Explain the concept of homeostasis, Haemorrhage and hematological disorders.
CO3	Discuss the basic concepts of Bacterial anatomy, Staining methods and Microscopy.
CO4	Describe the concepts on various infection and microbial diseases.
CO5	Gain the knowledge on immune system, antigen-antibody reactions
Course Name	**BIOCHEMISTRY**
	On successful completion of the course the students will be able to:
CO1	Explain the fundamentals of biochemistry
CO2	Gain knowledge on classification, structure and properties of carbohydrates and its metabolic pathways
CO3	Understand the properties of Lipids and disorders of lipid metabolism
CO4	Gain knowledge on structure of DNA, RNA and Proteins
CO5	Know about the overview of the classification of enzymes, their general effects and regulation
Course Name	**SIGNALS, SYSTEMS AND ANALYSIS**
	On successful completion of the course the students will be able to:
CO1	Categorize the properties and representation of discrete and continuous time signals.
CO2	Analyze the continuous time signal using Fourier and Laplace transform.
CO3	Determine total response, impulse response and frequency response of LTI-CT systems
CO4	Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform
CO5	Determine total response, impulse response and frequency response by using differential equations of LTI-DT Systems
Course Name	**INTEGRATED CIRCUITS LAB**
	On successful completion of the course the students will be able to:
CO1	Understand the practical application of various electronic circuits like rectifiers and Regulators
CO2	Acquire the designing knowledge of linear and non-linear applications of IC 741
CO3	Gain knowledge in design of filter circuits, oscillators and wave form generators.
CO4	Design the adder, encoder and decoder using logic gates ,
CO5	Understand the design concept in shift register and counters
Course Name	**PATHOLOGY AND MICROBIOLOGY LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Practice various staining methods

CO2	Diagnose typhoid fever using widal test
CO3	Perform histopathological examinations
Course Name	**BIOCHEMISTRY LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Demonstrate a qualitative and quantitative understanding of major biomolecules such as carbohydrates, lipids and proteins
CO2	Recognize and explain the basic features of chromatography and electrophoresis
Semester	**V**
Course Name	**BIOMEDICAL INSTRUMENTATION**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge about various biopotential Electrodes and its effects
CO2	Learn the different types of electrodes used to record ECG, EEG, EMG.ERG, and EOG with lead configuration.
CO3	Gain knowledge about the need for various bioamplifiers and isolation amplifiers.
CO4	Learn the instrumentation concerned with measuring the blood pressure, Temperature, Respiration rate.
CO5	Know the biochemical sensors and blood gas analyzers.
Course Name	**DIGITAL SIGNAL PROCESSING AND BIOMEDICAL APPLICATIONS**
	On successful completion of the course the students will be able to:
CO1	Compute FFT of a discrete time signal.
CO2	Design the various FIR filter techniques.
CO3	Design the various IIR filter techniques.
CO4	Analyze the finite word length effects in signal processing.
CO5	Learn the fundamentals of digital signal processors.
Course Name	**MICROPROCESSOR AND MICROCONTROLLER SYSTEM DESIGN**
	On successful completion of the course the students will be able to:
CO1	Understand the architecture and assembly language programming of microprocessors
CO2	Understand the architecture and assembly language programming of microcontrollers
CO3	Learn the concept of interrupts.
CO4	Learn about interfacing the microcontroller with real time applications.
CO5	Understand the architectural features of PIC
Course Name	**BIOCONTROL SYSTEMS**

	On successful completion of the course the students will be able to:
CO1	Gain knowledge in modeling of mechanical, electrical system with signal flow graph and block diagram reduction Techniques.
CO2	Measure the time domain and frequency domain specifications.
CO3	Plotting the responses in time domain and frequency domain analysis for the stability criteria.
CO4	Plotting the magnitude and phase for bode plot, Nyquist plot and Nichol's Plot for measuring stability.
CO5	Learn the concept of Physiological control systems.
Course Name	**ANALOG AND DIGITAL COMMUNICATION**
	On successful completion of the course the students will be able to:
CO1	Understand modulation and demodulation techniques.
CO2	Understand various pulse modulation techniques.
CO3	Acquire knowledge on different phase shift keying techniques.
CO4	Learn the basics of coding and decoding methods.
CO5	Know the recent trends in wireless technology.
Course Name	**BIO MEDICAL INSTRUMENTATION LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Record the biosignals like ECG, EEG, EMG.
CO2	Record the various physiological parameters.
CO3	Measure nonelectrical parameters using the chemical sensors.
CO4	Know about the safety aspects of surgical diathermy.
Course Name	**MICROPROCESSOR AND MICROCONTROLLER LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Develop the code in assembly language programming.
CO2	Test and develop code using 8085, 8086 processors and 8051 controllers.
CO3	Demonstrate the interface peripherals with microprocessor and micro controller
Course Name	**DIGITAL SIGNAL PROCESSING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Compute FFT and IFFT of a discrete time signal.
CO2	Design and analyze the various FIR filter techniques
CO3	Design and analyze the various IIR filter techniques

CO4	Demonstrate Finite word length effects
CO5	Analyze the Biomedical signals
Semester	**VI**
Course Name	**DIAGNOSTIC EQUIPMENT**
	On successful completion of the course the students will be able to:
CO1	Understand the basics of Cardiac and neurological equipment
CO2	Gain knowledge on EEG signal and EEG machine.
CO3	Understand the mechanism of measurements in respiratory
CO4	Understand about the different sensory measurement techniques
CO5	Learn the working of ICU/CCU equipment and applications in ECG and EEG Transmission.
Course Name	**THERAPEUTIC EQUIPMENT**
	On successful completion of the course the students will be able to:
CO1	Learn the types and usesof diathermy technique and application.
CO2	Understand the defibrillator and pacemaker devices
CO3	Study the working of physiotherapy and electrotherapy equipment
CO4	Understand the working of extra-corporeal devices like Heart-lung machine, oxygenator.
CO5	Gain the knowledge on patient's electrical environment and electrical safety codes
Course Name	**RADIOLOGICAL EQUIPMENT**
	On successful completion of the course the students will be able to:
CO1	Learn X ray equipments, their imaging techniques, appreciate their usage in the radiology department of hospital
CO2	Gain an adequate knowledge about the fundamentals of CT imaging techniques
CO3	Know about the MRI imaging and their usage
CO4	Gain adequate knowledge about Nuclear medicine system
CO5	Understand about radiation therapy and its safety
Course Name	**BIOMATERIALS AND ARTIFICIAL ORGANS**
	On successful completion of the course the students will be able to:
CO1	Gain Knowledge about the characteristics of biomaterials.
CO2	Study the applications of metallic implants.
CO3	Learn the properties, characteristics and applications of polymeric implants
CO4	Learn about skin implants and blood interfacing implants

CO5	Gain knowledge on the artificial organs.
Course Name	**MEDICAL SAFETY AND QUALITY ASSURANCE**
	On successful completion of the course the students will be able to:
CO1	Understand how safety is important for health care systems.
CO2	Gain knowledge about shocks and leakage current.
CO3	Know about the need for standards and codes.
CO4	Learn about safety codes, standards and regulations.
CO5	Learn the responsibility to maintain quality management, risk management.
Course Name	**BIO SIGNAL PROCESSING**
	On successful completion of the course the students will be able to:
CO1	Draw different types of biomedical signals and identify their spectral components.
CO2	Use different filters on biomedical signals and judge filter performance.
CO3	Identify physiological interferences and artifacts affecting ECG signal.
CO4	Compute power and correlation spectra of EEG signal.
CO5	Propose an algorithm to classify biomedical signals
Course Name	**CLINICAL ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Know the role of clinical engineer in the health care industry.
CO2	Gain knowledge about maintenance and running of hospitals.
CO3	Understand about healthcare standards and quality policies.
CO4	Study about physiologic monitoring and clinical information systems
CO5	Learn about safety precautions in healthcare.
Course Name	**PHYSIOLOGICAL MODELLING**
	On successful completion of the course the students will be able to:
CO1	Explain the application of Physiological models
CO2	Describe the methods and techniques for analysis and synthesis of Linear and dynamic systems
CO3	Develop differential equations to describe the compartmental physiological model
CO4	Describe nonlinear models of physiological systems
CO5	Illustrate the simulation of physiological systems
Course Name	**BIOTELEMETRY**

	On successful completion of the course the students will be able to:
CO1	Understand basic system of telemetry.
CO2	Understand basic biotelemetry principles and its components.
CO3	Gain knowledge about applications of radio pill in healthcare industry.
CO4	Know about the types of biotelemetry systems.
CO5	Identify biotelemetry applications and its importance in medical field.
Course Name	**DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Understand the basic and principle of ultrasound.
CO2	Know about telemetry and the various bio-telemetric units
CO3	Identify the types and uses of diathermy units.
CO4	Know the tissue responses and about electro-surgical units
Course Name	**EMPLOYABILITY SKILLS LAB**
	On successful completion of the course the students will be able to:
CO1	Enhancing the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
CO2	Improving their soft skills, including report writing, necessary for the workplace situations
CO3	Creating effective PPTs and presenting the visuals effectively
CO4	Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
Course Name	**HOSPITAL TRAINING**
	On successful completion of the course the students will be able to:
CO1	Advocate a patient-centred approach in healthcare
CO2	Communicate with other health professionals in a respectful and responsible manner
CO3	Recognize the importance of inter-professional collaboration in healthcare.
CO4	Propose a patient-centred inter-professional health improvement plan based upon the patient's perceived needs
CO5	Use the knowledge of one's own role and those of other professions to address the healthcare needs of populations and patients served.
Semester	**VII**
Course Name	**MEDICAL OPTICS**
	On successful completion of the course the students will be able to:

CO1	Identify the light interaction with the tissues.
CO2	Analyze the optical fibers and dispersive devices.
CO3	Formulate the laser surgery and therapy.
CO4	Summarize the applications of OCT in clinical imaging.
CO5	Understand the principles and applications of photodynamic therapy.
Course Name	**DIGITAL IMAGE PROCESSING**
	On successful completion of the course the students will be able to:
CO1	Summarize the digital image fundamentals and classify the transform techniques.
CO2	Apply the concept in image enhancement techniques for digital images.
CO3	Dissect the images using segmentation technique.
CO4	Determine the restoration technique for digital images and examine its recognition.
CO5	Evaluate the digital images using compression techniques
Course Name	**BIOMECHANICS**
	On successful completion of the course the students will be able to:
CO1	Define the relationship between various motions by the principles of mechanics.
CO2	Explain about the fluid motion and interaction inside the human body
CO3	Outline the Functional Arrangement of Muscles
CO4	Summarize the movements and the loads on knee, shoulder and hip.
CO5	Analyze the mechanical properties of bone, joints and cartilage
Course Name	**MEDICAL INFORMATICS**
	On successful completion of the course the students will be able to:
CO1	Analyze the health informatics and bioinformatics.
CO2	Summarize the importance of Medical standards
CO3	Identify the concept in radiation therapy planning
CO4	Elaborate the applications of telemedicine
CO5	Understand the importance of smart medical homes
Course Name	**BIOSENSORS AND TRANSDUCERS**
	On successful completion of the course the students will be able to:
CO1	Summarize the working principle of physico-chemical.
CO2	Analyze the applications of surface micromachining.
CO3	Classify the biosensors based on the transducer elements.

CO4	Elaborate applications of biosensors in drug delivery and detection.
CO5	Understand piezoelectric and acoustic-wave transducers.
Course Name	**PATTERN RECOGNITION AND NEURAL NETWORKS**
	On successful completion of the course the students will be able to:
CO1	Distinguish the different pattern recognition techniques and its application.
CO2	Analyze the supervised and unsupervised algorithms suitable for pattern classification.
CO3	Summarize the fundamentals of Artificial neural network
CO4	Design the back propagation neural networks based on competition
CO5	Develop the Genetic algorithms used in soft computing.
Course Name	**EMBEDDED SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Build the architecture and develop programming in ARM processor.
CO2	Analyze the system level performance.
CO3	Create Program validation and testing tools.
CO4	Identify the system design techniques to develop software for embedded systems.
CO5	Develop an embedded system for different medical devices.
Course Name	**REHABILITATION ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Apply the levels of prevention in rehabilitation.
CO2	Develop the orthotic devices for the differently abled.
CO3	Explain about the importance Therapeutic exercise techniques and the training methods.
CO4	Demonstrate the virtual reality based rehabilitation aids.
CO5	Estimate the amputation level & choosing appropriate Prosthetic devices.
Course Name	**ICU AND OPERATION THEATRE EQUIPMENT**
	On successful completion of the course the students will be able to:
CO1	Classify the automated drug delivery system
CO2	Summarize different types of oxygenators
CO3	Elaborate the instruments for operation
CO4	Examine the gas pipeline system
CO5	Understand the concept of hazards in operation rooms

Course Name	HOSPITAL WASTE MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Analyze various hazards, accidents and its control
CO2	Design waste disposal procedures for different biowastes
CO3	Categorize different biowastes based on its properties
CO4	Design different safety facility in hospitals
CO5	Propose various regulations and safety norms
Course Name	INTELLECTUAL PROPERTY RIGHTS
	On successful completion of the course the students will be able to:
CO1	Review an intellectual property portfolio and comprehend the extent of their protection.
CO2	Develop a business plan that advances the value of their intellectual property portfolio
CO3	Develop a strategy of marketing their intellectual property and understand some negotiation basics.
CO4	Explain some of the limits of their intellectual property rights and comprehend some basic legal pitfalls.
CO5	Explore the legal & business issues surrounding marketing of new products related to technology.
Course Name	TOTAL QUALITY MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Be aware of the quality and basic concepts of TQM and Customer satisfaction
CO2	Comprehend the TQM Principles
CO3	Evaluate the TQM Tools and techniques and apply Bench marking process and FMEA
CO4	Recognize the concepts of Six Sigma and Taguchi quality loss function and performance measures of TPM
CO5	Implement the different standard Quality systems
Course Name	DISASTER MANAGEMENT & MITIGATION
	On successful completion of the course the students will be able to:
CO1	Understood the basic concepts of fundamentals of Disaster Management
CO2	Get the knowledge of environmental Disaster
CO3	Analyzed the prediction of earthquake and Tsunami
CO4	Analyzed the prediction of cyclone
CO5	Understood the application of technology in disaster management

Course Name	PROFESSIONAL ETHICS AND HUMAN VALUES
	On successful completion of the course the students will be able to:
CO1	Generate an awareness on Human Values and Ethics
CO2	Analyze the theories in Senses of 'Engineering Ethics
CO3	Inculcate Moral , Social Values and Loyalty
CO4	Identify the Safety ,Responsibilities and Appreciate the rights of Others
CO5	Reflect on the various global issues and sample code of Ethics.
Course Name	DIGITAL IMAGE PROCESSING LAB
	On successful completion of the course the students will be able to:
CO1	Perform filtering operations in the image
CO2	Use transforms and analyzes the characteristics of the image.
CO3	Analyze the texture of the image
CO4	Implement project on simple image processing applications.
Course Name	MINI PROJECT
	On successful completion of the course the students will be able to:
CO1	Culminate in gaining of major design experience in the related area of specialization.
Course Name	INTERPERSONAL SKILLS/LISTENING & SPEAKING
	On successful completion of the course the students will be able to:
CO1	Listen and respond appropriately.
CO2	Participate in group discussions
CO3	Make effective presentations
CO4	Participate confidently and appropriately in conversations both formal and informal
Semester	VIII
Course Name	HOSPITAL ENGINEERING AND MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Understand the concepts of hospital administration and biomedical waste management
CO2	Apply the ideas of man power management in hospitals
CO3	Analyze the marketing information system
CO4	Explore various clinical and management information systems
CO5	Know the medical standards and safety aspects in hospitals

Course Name	NANOTECHNOLOGY
	On successful completion of the course the students will be able to:
CO1	Understand a broad view of the nanoparticles
CO2	Interpret the concept of biosynthesis of nanomaterials
CO3	Infer the optical properties and measurement of nanomaterials
CO4	Demonstrate the applications of nanostructures
CO5	Categorize the diagnostic applications of nanotechnology
Course Name	**CELL BIOLOGY AND TISSUE ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Know the concept of DNA/RNA in cell biology
CO2	Understand about cell adhesion and migration
CO3	Recall the concept of cell mechanics
CO4	Interpret the scope of basic tissue engineering
CO5	Analyze about the concept of organ tissue engineering
Course Name	**ASSIST DEVICES**
	On successful completion of the course the students will be able to:
CO1	Apply various mechanical techniques that will help failing heart.
CO2	Analyze the functioning of the unit which does the clearance of urea from the blood
CO3	Understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss.
CO4	Make use of the concepts of orthotic devices and prosthetic devices
CO5	Illustrate the principles of TENS and Bio feedback
Course Name	**BioMEMS**
	On successful completion of the course the students will be able to:
CO1	Learn various MEMS materials and fabrication techniques.
CO2	Categorize different types of Mechanical and Thermal Sensors and Actuators and their principles of operation
CO3	Classify different types of Electrostatic and Piezoelectric Sensors and Actuators
CO4	Gain knowledge on Microfluidic Systems
CO5	Analyze the application of BIOMEMS in various field of medicine.
Course Name	**INTERNET OF THINGS IN MEDICAL APPLICATIONS**
	On successful completion of the course the students will be able to:

CO1	Explain the concept of IoT.
CO2	Analyze various protocols for IoT.
CO3	Design a PoC of an IoT system using Rasperry Pi/Arduino
CO4	Analyze the real-time remote patient health monitoring.
CO5	Analyze applications of IoMT in real time scenario
Course Name	**ADVANCED MEDICAL INSTRUMENTATION**
	On successful completion of the course the students will be able to:
CO1	Distinguish between neuromuscular stimulator and spine fusion stimulator.
CO2	Apply the concept of evoked potential response.
CO3	Infer about impedance technique
CO4	Construct biochemical analysis system
CO5	Develop cloud computing technology in medical application
Course Name	**BRAIN COMPUTER INTERFACE AND APPLICATIONS**
	On successful completion of the course the students will be able to:
CO1	Categorize invasive and noninvasive of brain computer interface
CO2	Classify the various types of BCIs
CO3	Learnt about PCA and ICA used in BCI
CO4	Understood the concept various classification techniques
CO5	Learnt about the ethics of BCI
Course Name	**MEDICAL ROBOTICS**
	On successful completion of the course the students will be able to:
CO1	Demonstrate the basics automation in robots
CO2	Construct basic Robotics system and formulate Kinematics
CO3	Analyze Template matching and Camera calibration
CO4	Know about stimulation of planar motion
CO5	Adapt orthopaedic application in Robotic systems
Course Name	**WEARABLE SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Distinguish different Wearable motion Sensors
CO2	Know about light weight signal processing
CO3	Make use of the concept of solar cell and thermopile

CO4	Build BAN architecture in Wireless communication techniques.
CO5	Apply the applications of smart fabrics
Course Name	**BIOMETRICS**
	On successful completion of the course the students will be able to:
CO1	Maximize the technologies of biometric systems.
CO2	Analyze the general principles of design of biometric fingerprint systems and the underlying trade-offs.
CO3	Apply the concept of Multibiometrics.
CO4	Identify issues in the realistic evaluation of biometrics based systems.
CO5	Make use of the principles of Biometric Authentication
Course Name	**PROJECT WORK**
	On successful completion of the course the students will be able to:
CO1	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

Program Name	B.Tech (CHEMICAL ENGINEERING)
Semester	**I**
Course Name	*TECHNICAL ENGLISH*
	On successful completion of the course the students will be able to:
CO1	Read technical texts and write area- specific texts effortlessly
CO2	Listen and comprehend lectures and talks in their area of specialization successfully
CO3	Speak appropriately and effectively in varied formal and informal contexts
CO4	Understand the basic grammatical structures and its applications
CO5	Write reports and winning job applications
Course Name	*ENGINEERING MATHEMATICS-I*
	On successful completion of the course the students will be able to:
CO1	Develop the knowledge of basic linear algebraic concepts
CO2	Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects
CO3	Acquire the basic knowledge of ordinary differential calculus
CO4	Compute maxima and minima of a function
CO5	Apply Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields
Course Name	*ENGINEERING PHYSICS*
	On successful completion of the course the students will be able to:
CO1	To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.
CO2	To understand basic concepts of high frequency sound waves and its applications
CO3	To understand basic concepts of quantum mechanical behavior of wave and particle along with applications
CO4	To understand the concepts of production of laser and its behavior with diffraction principle of interference
CO5	To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication
Course Name	*ENGINEERING CHEMISTRY*
	On successful completion of the course the students will be able to:
CO1	Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications
CO2	Construct an electrochemical cell and Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications
CO3	Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes

CO4	Differentiate the polymers used in day to day life based on its source, properties and applications
CO5	Analyse the three types of fuels based on calorific value for selected application
Course Name	*ENGINEERING GRAPHICS*
	On successful completion of the course the students will be able to:
CO1	Recognize the conventions and apply dimensioning concepts while drafting simple objects
CO2	Draw the orthographic projection of points, line, and plane surfaces
CO3	Draw the orthographic projection of simple solids
CO4	Draw the section of solid drawings and development of surfaces of the given objects
CO5	Apply the concepts of isometric and perspective projection in engineering practice.
Course Name	*BASIC CIVIL AND MECHANICAL ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	The usage of surveying and properties of construction materials.
CO2	The stress strain of various building and material such as substructure, road transport and bridge.
CO3	The concept of manufacturing methods encountered in engineering practice such as foundry, welding and forging processes.
CO4	The working of internal combustion engines and its types.
CO5	The concept of energy conservation in practical, power plant refrigeration air condition and its types.
Course Name	*ENGINEERING CHEMISTRY LABORATORY*
CO1	Carry out the volumetric experiments and improve the analytical skills
CO2	Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering
CO3	Understand the principle and handling of electrochemical instruments and Spectrophotometer
CO4	Apply their knowledge for protection of different metals from corrosion by using different inhibitors
Course Name	*ENGINEERING PRACTICE LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Prepare simple Lap, Butt and T- joints using arc welding equipments
CO2	Prepare the rectangular trays and funnels by conducting sheet metal operation
CO3	Prepare the pipe connections and identify the various components used in plumbing.
CO4	Prepare simple wooden joints using wood working tools
CO5	Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions
Semester	**II**

Course Name	COMMUNICATIVE ENGLISH
	On successful completion of the course the students will be able to:
CO1	Comprehend conversations and talks delivered in English.
CO2	Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English
CO3	Read short stories, magazines, novels and other printed texts of a general kind.
CO4	Write short paragraphs, essays, letters and develop hints in English
Course Name	ENGINEERING MATHEMATICS-II
	On successful completion of the course the students will be able to:
CO1	Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields
CO2	Learn the basic concepts of analytic functions and transformations of complex functions
CO3	Master the integration in complex domain.
CO4	Understand the use of improper integrals' applications in the core subject
CO5	Evaluate the integrals using complex integration
Course Name	ENVIRONMENTAL SCIENCE AND ENGINEERING
	On successful completion of the course the students will be able to:
CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course
CO2	Public awareness of environmental is at infant stage
CO3	Ignorance and incomplete knowledge has led to misconceptions
CO4	Development and improvement in std. of living has led to serious environmental disasters
Course Name	ENGINEERING MECHANICS
	On successful completion of the course the students will be able to:
CO1	Explain the differential principle applies to solve engineering problems dealing with force, displacement, velocity and acceleration
CO2	Find solution for problems related to equilibrium of particles.
CO3	Solve the Moment of inertia for different 2-D plane figures
CO4	Analyze the forces in any structures
CO5	Solve rigid body subjected to frictional forces
Course Name	PROBLEM SOLVING AND PYTHON PROGRAMMING
	On successful completion of the course the students will be able to:
CO1	Develop algorithmic solutions to simple computational problems

CO2	Read, write, execute by hand simple Python programs.
CO3	Structure simple Python programs for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries and read and write data from/to files in Python Programs
Course Name	**CHEMISTRY FOR TECHNOLOGISTS**
	On successful completion of the course the students will be able to:
CO1	Apply gas laws in various real life situations.
CO2	Able to explain the characteristic properties and behaviour of solutions
CO3	Apply the basic concepts of thermodynamics for engineering stream.
CO4	Familiar in reaction pathways
CO5	Able to understand the chemistry behind dyes and drugs
Course Name	**ENGINEERING PHYSICS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Understanding the moduli of elasticity by determining Young's modulus and Rigidity modulus of a beam and cylinder respectively
CO2	Understanding the phenomenon of diffraction, dispersion and interference of light using optical component
CO3	Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid
CO4	Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity
Course Name	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Develop Python programs step-wise by defining functions and calling them.
CO4	Use Python lists, tuples, dictionaries for representing compound data.
CO5	Read and write data from/to files in Python.
Semester	**III**
Course Name	**ENGINEERING MATHEMATICS – III**
	On successful completion of the course the students will be able to:
CO1	Know the methods to solve partial differential equations occurring in various physical and engineering problems
CO2	Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply

CO3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods
CO4	Understand the effect of Fourier transform techniques and their applications
CO5	Gain the concept of analysis of linear discrete system using Z-transform approach
Course Name	*ORGANIC CHEMISTRY*
	On successful completion of the course the students will be able to:
CO1	Understanding organic reactions mechanism and rearrangements
CO2	Learn and understand synthetic utilityof solvents and reagents
CO3	Learn the synthetic and biological importance of heterocycles
CO4	Learn the basics chemistry principles behind amino acids and proteins
CO5	Understand chemistry of carbohydrates
Course Name	*CHEMICAL PROCESS CALCULATIONS*
	On successful completion of the course the students will be able to:
CO1	Clear idea of various types of unit systems and they will be able to convert units from one form of the unit to other and able to find the equations for fitting data.
CO2	Develop strategy for solving problems involving gases, vapours etc.
CO3	Adopt the tools learned from the course to solve numerical problems which contain one or more unit operations.
CO4	Ability to solve material balance problems involving reactions.
CO5	Develop mathematical relations for both mass and energy balances for different processes
Course Name	*INSTRUMENTATION METHODS AND ANALYSIS*
	On successful completion of the course the students will be able to:
CO1	Understanding the basics of electromagnetic spectrum.
CO2	Learning analysis using UV-Visible spectroscopy
CO3	Learning analysis through IR spectroscopy
CO4	Understanding various separation techniques.
CO5	Learning analysis using Flame spectroscopy and XRD
Course Name	*PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Acquired good understanding of basics of DC electrical circuits
CO2	Acquired good understanding of basics of AC fundamentals
CO3	Capable of understanding the construction, working principle of electrical machines

CO4	Gained knowledge on construction and characteristics of various semiconductor devices
CO5	Learnt about the steady state behavior of electrical drive
Course Name	*ANALYTICAL CHEMISTRY*
	On successful completion of the course the students will be able to:
CO1	Understand basic wet chemical methods of analysis.
CO2	Familiarize the concept of two dimensional random variables helps to understand and analyze the statistical measures which describe an outcome of a random experiment.
CO3	Implement electro analytical techniques, separation techniques.
CO4	Understand separation techniques
CO5	Familiarize thermal methods of analysis, sampling and evaluation.
Course Name	*PROCESS ORGANIC SYNTHESIS*
	On successful completion of the course the students will be able to:
CO1	Understand the various unit processes in synthesis of organic compounds
CO2	Understand the application of organic compounds in various industries
CO3	Analyze chemical reactions and identify reaction schemes
CO4	Solve mechanisms for a number of important reactions used in organic synthesis
CO5	Understand the synthesis of important dyes and drugs
Course Name	*GREEN CHEMISTRY AND ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Familiarize the 12 principles of green chemistry
CO2	Familiarize with synthetic design
CO3	Understand the applications of green solvents
CO4	Understand the design concepts of various reactor design
CO5	Understand the alternate energy sources and inherent safety
Course Name	*MATERIAL TECHNOLOGY*
	On successful completion of the course the students will be able to:
CO1	Understand the properties of materials and criteria for selecting the material
CO2	Apply the principles of metallurgy and phase equilibrium
CO3	Predict the properties, manufacture and the applications of building materials
CO4	Describethe importance of the chemistry of ferrous metal and non-ferrous metals in industries
CO5	Describe the composite materials, its importance and the different applications

Course Name	SOLID MECHANICS FOR TECHNOLOGISTS
	On successful completion of the course the students will be able to:
CO1	Perform calculations related to stress, strain and deformation of solids
CO2	Understand the concept of beam loadings
CO3	Design the support column, beams, pipelines, storage tanks and reaction columns
CO4	Solve all the problems related to beams, shafts and columns
CO5	Apply the principles of solid mechanics in real time problems
Course Name	COMPOSITE MATERIALS
	On successful completion of the course the students will be able to:
CO1	Find the properties of composite materials
CO2	Analyze the composite materials
CO3	Describe the manufacturing processes of composite materials
CO4	Describe the reinforcement concept
CO5	Describe the effect of reinforcement and matrix materials
Course Name	ORGANIC CHEMISTRY LABORATORY
	On successful completion of the course the students will be able to:
CO1	The student is able to identify what distinguishes a strong and weak nucleophile and recall the rules of reactions.
CO2	The student shows their mastery of nomenclature since ethyl bromide is not drawn out
CO3	The student analyses a list of compounds and determines their reactivity.
Course Name	TECHNICAL ANALYSIS LABORATORY
	On successful completion of the course the students will be able to:
CO1	Familiarization with equipment like viscometers, flash and fire point apparatus, etc.
CO2	Familiarization of methods for determining COD.
CO3	Familiarization of a few simple synthetic techniques for soap.
Course Name	ELECTRICAL ENGINEERING LABORATORY
	On successful completion of the course the students will be able to:
CO1	Analyze the characteristics of DC generators
CO2	Analyze and test different DC motors
CO3	Test and analyze the different AC motors & transformers
Semester	IV
Course Name	NUMERICAL METHODS

		On successful completion of the course the students will be able to:
	CO1	Apply numerical methods such as direct and iterative methods to solve algebraic or transcendental equations and system of equations
	CO2	Use the concept of interpolation and apply to real life situations.
	CO3	Appreciate numerical solutions for differential and integral calculus as a handy tool to solve problems.
	CO4	Implement numerical algorithms to find solutions for intial value problems for ordinary differential equations.
	CO5	Demonstrate algorithms using finite differences to obtain solutions to boundary value problems
Course Name		PHYSICAL CHEMISTRY
		On successful completion of the course the students will be able to:
	CO1	Understand the thermo chemical reactions and applications of it
	CO2	Understand Distribution law and can determine Equilibrium Constant from Partition Coefficient
	CO3	Understand types, classification and applications of colloids
	CO4	Understand the applications of electrochemistry
	CO5	Determine the kinetics of all types of reaction
Course Name		CHEMICAL PROCESS INDUSTRIES
		On successful completion of the course the students will be able to:
	CO1	Acquire knowledge about basics of various aspects of process industries and understands the methods of production of different chemicals.
	CO2	Get fundamental knowledge about plant and equipment design
	CO3	Apply knowledge about sulphur, nitrogen and fertilizer industry.
	CO4	Acquire knowledge about the Manufacturing and processing of paper and pulp, Sugar, by products of sugar and starch and oil, fat products.
	CO5	Get skilled in monomers, types of polymers, properties and applications of Resins, types of rubbers. Know the properties and manufacture of Natural and synthetic fibers and films.
Course Name		CHEMICAL ENGINEERING FLUID MECHANICS
		On successful completion of the course the students will be able to:
	CO1	Students can get the knowledge about the unit and dimensions and also about the role of pressure in the fluid flow and pressure measurement.
	CO2	Students can get the knowledge about the types of fluid flow and also on the discharge measurement by using different equipment at different conditions.
	CO3	Students would have knowledge on Fluid properties, their characteristics while static and during flow through ducts, pipes and porous medium.
	CO4	Students get the idea about different types of forces, losses and their effects in the fluid flow
	CO5	Students get the knowledge about several machineries used to transport the fluid and their performance

Course Name	MECHANICAL OPERATIONS
	On successful completion of the course the students will be able to:
CO1	Decide the usage of equipment for industrial application with respect to size reduction.
CO2	Decide the necessary equipment to screen different particles.
CO3	Apply the knowledge of different blends and mixing techniques to liquids and solids.
CO4	Students will be able to understand the concept of filtration techniques.
CO5	Apply the usage of various filtration equipments and thickeners.
Course Name	POLYMER SCIENCE & TECHNOLOGY
	On successful completion of the course the students will be able to:
CO1	Survey the current usage of Polymer and Compounding ingredients
CO2	Compare the use and general properties of Polymers with traditional materials
CO3	Recognize the different types of polymers preparation methods
CO4	Understand the properties of polymers
CO5	Understand the technology involved in the manufacturing processes of various types of polymers
Course Name	SUGAR TECHNOLOGY
	On successful completion of the course the students will be able to:
CO1	Get knowledge about the scenario of sugar industry in India
CO2	Understand the process of sugar juice purification and evaporation processes
CO3	Understand the kinetics and applications of crystallization in sugar industry
CO4	Understand the usage of different types of centrifugation equipments
CO5	Find the usage of byproducts of sugar industry; treatment of effluent with different technologies
Course Name	RENEWABLE ENERGY TECHNOLOGY
	On successful completion of the course the students will be able to:
CO1	Recognize the renewable energy sources with their situation and exploration in detail.
CO2	Understand the different types of energy conversion systems in wind and geothermal energy.
CO3	Understand the various energy conversion systems for solar and ocean energy harnessing.
CO4	Familiarize multiple methods in biomass and biogas conversion and its application
CO5	Familiar with principle operation and application of energy produced from Fuel and MHD in industries.
Course Name	PLASTICS ENGINEERING
	On successful completion of the course the students will be able to:

CO1	Classify the different types of plastics and demonstrate an idea about structure property relation of different plastics and its uses.
CO2	Understand different methods of preparation of plastic materials
CO3	Understand engineering of plastics.
CO4	Understand the preparation, properties and applications of high performance plastics.
CO5	Design various plastic products.
Course Name	**HEAT POWER ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Understand the conceptual laws of thermodynamics for application in thermodynamic cycles
CO2	Analyze different thermodynamic cycles and calculate their thermal efficiencies
CO3	Perform simple calculations of boiler efficiencies
CO4	Identify the energy conservation opportunities in steam systems
CO5	Perform calculations for turbine design and efficiencies
Course Name	**FUEL AND COMBUSTION TECHNOLOGIES**
	On successful completion of the course the students will be able to:
CO1	Understand different characterization methods of fuel
CO2	Understand classification and purification methods of solid and liquid fuels
CO3	Understand classification and purification methods of gaseous fuels
CO4	Determine the kinetics and mechanism of combustion process
CO5	Design equipment for combustion process
Course Name	**FLUID MECHANICS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Conduct experiments for fluid flow in circular pipes, orifice and venture meters.
CO2	Estimate the coefficient of rectangular and triangular notches.
CO3	Estimate head loss in pipe fittings.
CO4	Estimate coefficient of discharge for flow through open and closed channels, show relationship between Reynolds number and friction factor
CO5	Perform characteristic studies of submersible and centrifugal pump
Course Name	**PHYSICAL CHEMISTRY LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Understand the principles, properties and characteristics of solvents and mixtures
CO2	Determine the molecular weight of solute using different methods

CO3	Determine the Critical Micelle Concentration (CMC) of a metal salt
CO4	Apply the kinetics to hydrolysis of ester
CO5	Determine the molecular weight of a polymer
Course Name	*MECHANICAL OPERATIONS LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Determine work index, average particle size through experiments by crushers, ball mill, rod mill and conducting size analysis by various size sieves.
CO2	Design size separation equipments such as cyclone separator, pressure and vacuum filters
CO3	Determine thickener area from batch sedimentation experiment
Semester	**V**
Course Name	*PROBABILITY AND STATISTICS*
	On successful completion of the course the students will be able to:
CO1	Imbibing the knowledge of basic probability improves the quality of interpretation and decision making in real time problems of uncertainty.
CO2	Understanding the real time application of probability distributions.
CO3	Learning the concept of two dimensional random variables helps to understand and analyse the Statistical measures which describe an outcome of a random experiment.
CO4	Drawing inference & decision making through hypothesis testing.
CO5	Acquainting the knowledge of analysis of variance and control limits.
Course Name	*CHEMICAL ENGINEERING THERMODYNAMICS*
	On successful completion of the course the students will be able to:
CO1	Outline the terminology associated with engineering thermodynamics, apply the concepts of heat, work and energy conversion to calculate heat and work quantities for industrial processes and predict the properties of ideal and real mixtures based on thermodynamic principles.
CO2	Apply the basic concepts of first and second laws of thermodynamics for the design and analyze of the open and closed system in chemical process plants.
CO3	Predict the changes in the properties of real fluids undergoing changes in process plant equipment.
CO4	Use empirical correlations and experimental data to evaluate thermodynamic quantities that relate to the vapour-liquid or liquid-liquid equillibria of ideal and non-ideal chemical mixtures.
CO5	Determine equilibrium constants, standard enthalpy, Gibbs free energy and equilibrium compositions for single and multiple reaction systems.
Course Name	*HEAT TRANSFER*
	On successful completion of the course the students will be able to:
CO1	Distinguish different modes of heat transfer

CO2	Find the rate of heat transfer with and without change of phase
CO3	Evaluate film coefficients in convection under different situations (forced, natural convection, Boiling and Condensation Heat)
CO4	Decide the type of evaporator required for a specific purpose
CO5	Analyze the concepts of heat exchangers
Course Name	*MASS TRANSFER – I*
	On successful completion of the course the students will be able to:
CO1	Write rate equations for mass transfer operations
CO2	Apply the diffusion principles in mass transfer calculations
CO3	Apply the concepts of inter phase mass transfer in gas- liquid, liquid-liquid and solid – liquid mass transfer operations
CO4	Design Cooling towers, dryers and crystallizers
CO5	Acquire knowledge about crystal formation and industrial crystallizers.
Course Name	*PROCESS INSTRUMENTATION*
	On successful completion of the course the students will be able to:
CO1	Understand the working mechanism of important instruments used in process industry.
CO2	Understand the basic principle and operation of various temperature measuring Instruments.
CO3	Identify instruments used for measuring various ranges of pressure measurement.
C04	Select suitable instruments for measurement of viscosity, density and quantity meter
CO5	Acquire sound knowledge about applications of various instruments in the required fields
Course Name	*FUEL CELL TECHNOLOGY*
	On successful completion of the course the students will be able to:
CO1	Differentiate the available fuel cells
CO2	Apply Fuel Cell Thermodynamic Principles in electrochemical energy conversion
CO3	Apply mass transport concepts in electrochemical cells
CO4	Understand Electrolytes used on fuel cells and the membranes used in fuel cells
CO5	Find the Electro - catalysts for different Fuel Cells
Course Name	*INTRODUCTION TO COLLOIDAL SCIENCE AND INTERFACIAL ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Understand the basic nomenclature, concepts and tools of colloid and interface science and engineering.
CO2	Understand the basics of multi-phase nano-systems; mechanics and thermodynamics on small scales.

CO3	Establish the differences between the surface and bulk dominated regimes and behavior and exploitation of nano-behavior.
CO4	Utilize the concepts and tools translate into a variety of applications from processes to materials.
CO5	Understand the mechanism of advanced and functional interfaces in coatings in nanoadhesives
Course Name	*OIL AND NATURAL GAS ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Understand the properties and composition of cure oil and production of natural gas
CO2	Learn the properties processing of natural gas
CO3	Assess the environmental aspects of gas processing
CO4	Acquire knowledge about compressors
CO5	Acquire knowledge about emissions and environmental management systems
Course Name	*FLUIDIZATION ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Understand the properties of Fluidized bed.
CO2	Learn different type of Fluidization processes.
CO3	Acquire knowledge on design aspects of fluidization equipment.
CO4	Acquire knowledge on heat and mass transfer in Fluidized Beds and types of fluidization.
CO5	Acquire the knowledge of single and multi-stage continuous fluidization equipment.
Course Name	*ENVIRONMENTAL BIOTECHNOLOGY*
	On successful completion of the course the students will be able to:
CO1	Develop and improve in standard of living
CO2	Understand the dynamic process integrated themes related to biodiversity
CO3	Envision the surrounding environment its function with technology
CO4	Understand the structure and biochemical aspects of various microbes
CO5	Acquire knowledge about the renewable forms of energy and its features of biomass and its utilization
Course Name	*FINITE ELEMENT ANALYSIS*
	On successful completion of the course the students will be able to:
CO1	Identify mathematical model for solution of common engineering problems
CO2	Formulate one dimensional finite element equation for simple problems
CO3	Examine 2-D finite element continuum for structural applications
CO4	Formulate and solve vibration problems using finite element techniques

CO5	Solve 1-D and 2-D heat transfer and fluid flow problems using finite element approach
Course Name	***HEAT TRANSFER LABORATORY***
	On successful completion of the course the students will be able to:
CO1	Determine the thermal conductivity for various conductors and Stefan Boltzmann constants through experiments.
CO2	Use experimental data to evaluate heat transfer co-efficient and evaluate performance of different types of equipment including heat exchangers, condensers.
CO3	Use experimental data to evaluate heat transfer co-efficient and evaluate performance of different types of equipment including heat exchangers, condensers.
Course Name	***CHEMICAL ENGINEERING COMPUTATIONAL LABORATORY***
	On successful completion of the course the students will be able to:
CO1	Equipped with the software applications and the numerical solutions of chemical engineering problems.
CO2	Solve the various numerical problems using these tools and commercial packages.
CO3	Optimize the various factors using the computational techniques
Course Name	***EMPLOYABILITY SKILLS LAB***
	On successful completion of the course the students will be able to:
CO1	Comprehend the various strategies of listening and its significance.
CO2	Articulate their views clearly and concisely with self-confidence and persuasiveness.
CO3	Understand the prevailing practices of testing in the recruitment process by the corporate and the institutional selection processes.
CO4	Communicate the corporate and social requirements in an impressive written mode.
CO5	Enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.
Semester	**VI**
Course Name	***MASS TRANSFER – II***
	On successful completion of the course the students will be able to:
CO1	Apply mass transfer and separation principles in several unit operations like absorption, distillation
CO2	Determine the number of theoretical stages in a stage-wise mass transfer processes
CO3	Calculate height requirements of continuous separation columns.
CO4	Apply mass transfer and separation principles in several unit operations like liquid-liquid extraction, leaching and adsorption
CO5	Understand the principle of ion exchange.
Course Name	***CHEMICAL REACTION ENGINEERING-I***
	On successful completion of the course the students will be able to:
CO1	Apply the basic principles of reaction kinetics, understand the effect of temperature on the rate of reaction

CO2	Learn and analyze batch reactor data
CO3	Design of single and multiple ideal flow reactors for homogeneous reactions.
CO4	Learn about multiple reactions and analyze the thermal characteristics of reactors and its usage in design procedure.
CO5	Acquire basic knowledge on non-ideal flow reactors
Course Name	*PROCESS DYNAMICS AND CONTROL*
	On successful completion of the course the students will be able to:
CO1	Understand the prerequisites of control strategies.
CO2	Design of process control systems
CO3	Suggest the suitable controllers for different chemical process
CO4	Analyze stability and apply different tuning techniques
CO5	Design control systems using frequency response analysis
Course Name	*CHEMICAL PROCESS PLANT SAFETY*
	On successful completion of the course the students will be able to:
CO1	Impart knowledge on safety management process in chemical process industries.
CO2	Understand the effects of toxicants and safety policies and procedures.
CO3	Identify the sources and consequences of fire and explosion
CO4	Analyze the hazard and can identify the root cause of an accident.
CO5	Understand the concept of failure probabilities, and frequency of accident scenarios.
Course Name	*ENERGY CONSERVATION AND MANAGEMENT IN PROCESS INDUSTRIES*
	On successful completion of the course the students will be able to:
CO1	Analyze differentiate the types of energy and its conservation.
CO2	Assess various environmental issues and impact.
CO3	Understand the importance of energy conservation.
CO4	Analyze energy action planning methods.
CO5	Understand the concept of energy monitoring and targeting.
Course Name	*INDUSTRIAL MANAGEMENT*
	On successful completion of the course the students will be able to:
CO1	Understand the function of leadership and organizing culture, importance of quality control in process and planning operations
CO2	Understand the necessity of planning process and objectives, decision making processes under different conditions
CO3	Understand the nature and purpose of organization and importance of staffing selection recruitment.

CO4	Understand the function of leadership and organizing culture.
CO5	Understand importance of quality control in process and planning operations
Course Name	*PULP AND PAPER TECHNOLOGY*
	On successful completion of the course the students will be able to:
CO1	Understand the scenario of Indian pulp and paper industry
CO2	Acquire knowledge of pulping processes and required raw materials.
CO3	Learn different types of processes for paper manufacturing and testing of paper
CO4	Acquire knowledge on properties and testing of pulp and paper
CO5	Acquire knowledge of various paper machine
Course Name	*ELECTROCHEMICAL ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Understand the basic concepts involved in electrochemical processes
CO2	Learn different types of electrodes used for processes
CO3	Apply the concepts of potential theory for design of advanced electrodes
CO4	Applying the concept of transport properties
CO5	Learn different types of potential properties
Course Name	*DISASTER MITIGATION AND MANAGEMENT*
	On successful completion of the course the students will be able to:
CO1	Analyze and differentiate the types of disasters, causes and their impact on environment and society.
CO2	Assess vulnerability and various methods of risk reduction measures as well as mitigation.
CO3	Draw the hazard and vulnerability profile of India, scenarios in the Indian context.
CO4	Analyze Disaster damage assessment and mitigation.
CO5	Develop disaster management alternatives flow through case studies.
Course Name	*FOOD SCIENCE AND TECHNOLOGY*
	On successful completion of the course the students will be able to:
CO1	Understand the problems related to food and food industries by implementing properties related to food
CO2	Apply the knowledge in aspects of food microbiology, production and utilization of various food products and the processing
CO3	Apply the basic skills related to heat preservation, with processing and various methods followed in food processing industries.
CO4	Apply the basic skills related to cold preservation, with processing and various methods followed in food processing industries.
CO5	Understand the Production and Utilization of Food Products

Course Name	PROCESS CONTROL LABORATORY
	On successful completion of the course the students will be able to:
CO1	Understands the importance of dynamics of process in controller design
CO2	Able to design of controller and evaluation of its performance
CO3	Able to use MATLAB Simu-link software in dynamic study of processes, and design of controllers
Course Name	MASS TRANSFER LABORATORY
	On successful completion of the course the students will be able to:
CO1	Apply the basic principles of mass transfer operations
CO2	Perform experiments and to Determine diffusivity, mass transfer rate, drying rate, efficiency in leaching / extraction and mass transfer coefficient of a given system using fundamental principles
CO3	Choose a mass transfer operation for separation of a mixture into pure components
Course Name	CHEMICAL PROCESS EQUIPMENT DESIGN & DRAWING LAB – I
	On successful completion of the course the students will be able to:
CO1	Students understands design and drawing considerations of process equipment
CO2	Students will be able to perform required calculations for the process equipment design
CO3	Students will be able to design and draw process equipments
Semester	VII
Course Name	CHEMICAL REACTION ENGINEERING – II
	On successful completion of the course the students will be able to:
CO1	Evaluate the temperature and pressure effects in ideal reactors
CO2	Able to understand the nature of fluid – solid non catalytic reactions and selection of reactors.
CO3	Able to understand the nature of gas – liquid non catalytic reactions and design of reactors.
CO4	Acquire knowledge on the catalysis preparation process, and mechanism.
CO5	Acquire knowledge on the pore diffusion in catalyst, and operation of heterogeneous catalytic reactors
Course Name	CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS
	On successful completion of the course the students will be able to:
CO1	Calculate various costs involved in a process industry and Compute break even period for rate of return. Calculate the taxes by different methods.
CO2	Estimate profitability of a company, how to work with balance sheets, understand relationship between demand & supply.
CO3	Acquire the concept of management and also personnel management, labour management relations.
CO4	Acquire the concept of Annual cost method and replacement of existing facilities.

CO5	Acquire knowledge about Profitability & Optimum Design.
Course Name	**TRANSPORT PHENOMENA**
	On successful completion of the course the students will be able to:
CO1	Able to develop mathematical models of momentum, heat and mass transport to determine respective fluxes and velocity, temperature and concentration distribution.
CO2	Able to apply equations of change to determine the velocity, temperature and concentration profile of complex transport processes.
CO3	Able to understand the turbulence and boundary layer concept and analogy between transport processes
CO4	Able to apply in Transport in Turbulent and Boundary Layer Flow.
CO5	Able to understand Analogies between Transport Processes.
Course Name	**CHEMICAL ENGINEERING MODELING AND SIMULATION**
	On successful completion of the course the students will be able to:
CO1	Apply the fundamentals of modeling and their applications to transport/energy equations, chemical and phase equilibria kinetics
CO2	Formulate the mathematical models of stirred tank heaters, heat exchangers, evaporators, reactors and distillation column.
CO3	Analyze the simulation principles of steady state processes
CO4	Apply in heat transfer and mass transfer equipments.
CO5	Optimize analytical and numerical techniques for multivariable problem
Course Name	**MATHEMATICAL METHODS FOR CHEMICAL ENGINEERS**
	On successful completion of the course the students will be able to:
CO1	Understand the involvement of matrix and linear Algebric equations in chemical engineering.
CO2	Know the application of eigen values and eigen vectors in process control.
CO3	Understand the application of ordinary differential equations in chemical reaction engineering.
CO4	Students will have an ability to know the application of hyperbolic, elliptic and parabolic equations in mass transfer.
CO5	Understand the application of numerical solution of linear and nonlinear algebraic equations in fluid mechanics and separation processes.
Course Name	**BIOCHEMICAL ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Able to implement the knowledge of microorganisms and enzymes to study different biochemical reactions and rate equations.
CO2	Able to understand transport mechanisms including mass transfer and heat transfer and sterilization concepts to design and analyze bioreactors.
CO3	Acquire knowledge on various downstream processing for product recovery and purification and design of industrial bioreactors.
CO4	Acquire knowledge about bioreactors

CO5	Acquire knowledge about downstream processes.
Course Name	*MODERN SEPARATION TECHNIQUES*
	On successful completion of the course the students will be able to:
CO1	Explain different types of separation techniques based on size, surface properties, cross flow filtration and derive the equations for the same.
CO2	Develop design equations for membrane separation processes such as RO&UF.
CO3	Design the affinity and immune chromatographic columns.
CO4	Understand type of equipment employed for electrophoresis.
CO5	Design the ion exchange chromatography and industrial effluent treatment by modern techniques.
Course Name	*PROCESS AUTOMATION*
	On successful completion of the course the students will be able to:
CO1	Able to Learning the application of process control instruments.
CO2	Able to understand the basic concept of Process Automation and advance control techniques.
CO3	Able to apply the digital control and optimal control to real time problems
CO4	Able to apply digital control.
CO5	Able to apply optimal control.
Course Name	*SOLID WASTE MANAGEMENT*
	On successful completion of the course the students will be able to:
CO1	Understand the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management.
CO2	Plan waste minimization, design and storage to reduce waste.
CO3	Understand the collection, transport, processing of municipal waste.
CO4	Understand the thermal processing of waste.
CO5	Understand disposal of municipal solid waste.
Course Name	*PROGRAMMING USING MATLAB*
	On successful completion of the course the students will be able to:
CO1	Apply MATLAB basics in solving complex problems
CO2	Find the solution for Problems related to chemical engineering
CO3	Implement algorithms to find solutions using arrays, functions and statements
CO4	Implement concepts of MATLAB in various field of Chemical Engineering
CO5	Find the solutions for multidisciplinary problems.

Course Name	OPTIMIZATION OF CHEMICAL PROCESSES
	On successful completion of the course the students will be able to:
CO1	Design experiments and formulate models of chemical processes/ equipments.
CO2	Apply different search and linear programming methods for solutions of chemical process problems.
CO3	Apply the non- linear programming methods for application in R&D.
CO4	Optimize Unconstrained multivariable.
CO5	Understand linear programming and its applications.
Course Name	INDUSTRIAL WASTE WATER TREATMENT
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals of wastewater treatments.
CO2	Understand the common physical, chemical and biological unit operations encountered in treatment processes.
CO3	Analyse various characteristics of wastewater.
CO4	Able to understand importance of advanced waste water treatment processes.
CO5	Able to understand various effluent treatment plants and find solutions.
Course Name	CATALYST SCIENCE AND TECHNOLOGY
	On successful completion of the course the students will be able to:
CO1	Have an ability to know catalytic process and heterogeneous reaction and their kinetics.
CO2	Have an ability to know catalytic process and heterogeneous reaction and their kinetics.
CO3	Understand types of catalytic reactors and the transport.
CO4	Design of new catalytic reactors for industrial process.
CO5	Understand Modelling and simulation of catalytic reactor.
Course Name	FUNDAMENTALS OF NANOTECHNOLOGY
	On successful completion of the course the students will be able to:
CO1	Learn and understand the purpose of Nanotechnology.
CO2	Understand application of carbon nanotubes and process the involved, learn microfabrication.
CO3	Understanding different types of NEMS, MEMS and learn principles of microscopes
CO4	Understand material aspects of NEMS, MEMs and their applications
CO5	Understand the principle and applications of Microscopy.
Course Name	COMPUTATIONAL FLUID DYNAMICS
	On successful completion of the course the students will be able to:

CO1	Understand CFD techniques in developing fluid flow models
CO2	Apply finite volume model for solution of steady state diffusion and convection diffusion problems
CO3	Demonstrate the application of SIMPLER, SIMPLEC and PISO algorithms for solution of industry and R&D problems
CO4	Understand Navier stroke equations and behavior of flow
CO5	Understand the nature of Compressible viscous flow
Course Name	**PIPING ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Able to understand the nature of compressible and incompressible fluids and basis of piping design.
CO2	Able to Design and operation of pipeline for different fluid systems.
CO3	Learn the maintenance of pipe lines.
CO4	Learn the pipeline operations.
CO5	Learn the pipeline failure and maintenance.
Course Name	**CHEMICAL REACTION ENGINEERING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Able to find rate constant in different types of reactors
CO2	Able to carry out kinetic studies in different reactors and to calculate conversion, rate constant.
CO3	Able to analyze the performance of PFR, PBR, CSTR and RTD in reactors and kinetics studies.
Course Name	**CHEMICAL PROCESS EQUIPMENT DESIGN & DRAWING LAB – II**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge of basics of process equipment design and important parameters of equipment design and drawing.
CO2	Design and draw heat exchange equipment and mass transfer equipment (e. g. Double pipe heat exchanger).
CO3	Design and draw various parts of vessels (e.g. heads)
CO4	Gain knowledge about design of Evaporators
CO5	Design rotary driers
Course Name	**CHEMICAL ENGINEERING SIMULATION LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Use any chemical process simulation software.
CO2	Understand the importance of steady state processes from simulation principle.
CO3	Optimize the parameters in a chemical process using simulation software

CO4	Simulate a chemical engineering Transfer process.
CO5	Optimize and troubleshoot a multivariate problem.
Semester	**VIII**
Course Name	*TOTAL QUALITY MANAGEMENT*
	On successful completion of the course the students will be able to:
CO1	Understand definition of quality, analysis techniques for quality costs, role of senior management and its functions.
CO2	Understand the principles of TQM
CO3	Understand the importance of seven tools of quality.
CO4	Apply benchmarking tools.
CO5	Explain importance of quality systems and need of quality systems.
Course Name	*PROJECT WORK – VIVA VOCE*
	On successful completion of the course the students will be able to:
CO1	Analysis independently to design experiments
CO2	Simulate
CO3	Fabricate and Setup experiments
CO4	Demonstrate the application of the chemical engineering principles to particular process variables for optimization of experimental projects.
CO5	Prepare clear concise project reports with the help of graph, charts, and power point presentations
Course Name	*FERMENTATION ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Know the Microbial metabolites and Microbial growth Kinetics.
CO2	Know how to measure the process variables and the principles of instrumentation and control in fermentation.
CO3	Explain recovery and purification of fermentation products.
CO4	Understand treatment and disposal of waste effluent.
CO5	Understand the economical aspect of fermentation process.
Course Name	*PETROLEUM REFINERY ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Have knowledge on petroleum properties, resources and composition.
CO2	Familiarize on different exploration techniques.
CO3	Identify the petroleum products based on the properties and give specifications.
CO4	Differentiate separation processes required for refining of petroleum.

CO5	Understand different conversion processes and treatment methods of petroleum refining.
Course Name	**CHEMICAL PROCESS FLOW SHEETING**
	On successful completion of the course the students will be able to:
CO1	Know the basic concepts of flowsheeting on symbols and their presentation, the calculations involving constraints prevention.
CO2	Apply the sequential method for modular approach.
CO3	Gain the ability to solve complex problems using Equation modular approach.
CO4	Suitably apply P&ID methods for any process.
CO5	Understand various applications for Chemical Process plant Safety.
Course Name	**ENTREPRENEURSHIP DEVELOPMENT**
	On successful completion of the course the students will be able to:
CO1	Understand the principle of Entrepreneurship and enhance the creativity to develop new chemical product and processes.
CO2	Analyze source of finance and financial management of new enterprises and prepare business plans.
CO3	Apply the principles of operation management to improve production efficiency and reduce sickness
CO4	Acquire sound knowledge about applications of various instruments in the required fields.
CO5	Apply importance of Human resource development, Leadership, Procedures for getting subsidies & Marketing.
Course Name	**AIR POLLUTION CONTROL AND DESIGN OF EQUIPMENT**
	On successful completion of the course the students will be able to:
CO1	Understand sources and effects of air pollution.
CO2	Know the techniques of monitoring air pollution
CO3	Design and improvise cyclone separator and fabric filter
CO4	Design and improvise electrostatic precipitator and wet scrubber
CO5	Understand Air act 1981
Course Name	**DRUGS AND PHARMACEUTICAL TECHNOLOGY**
	On successful completion of the course the students will be able to:
CO1	Understand the Drug Metabolism and pharmaco–kinetics principles .
CO2	Apply knowledge of unit processes and analytical methods to develop new processes and product formulations.
CO3	Demonstrate statistical quality control procedure and quality assurance programmes in various stages of pharmaceutical process.
CO4	Understand the formulation and use of excipients in tablets, powders, capsules, microcapsules and coating techniques.
CO5	Apply knowledge to design and develop new drug.

Course Name	HETEROGENEOUS CATALYSIS
	On successful completion of the course the students will be able to:
CO1	Understand the properties and adsorption characteristic of catalyst
CO2	Prepare and characterize various catalysts for heterogeneous catalytic reactionS.
CO3	Model the different systems and interpret the data
CO4	Apply the knowledge and design reactors for heterogeneous catalytic reactions
CO5	Develop deactivation mechanism and kinetics of catalyst
Course Name	BIOREACTOR DESIGN
	On successful completion of the course the students will be able to:
CO1	Predict fermentation kinetics of growth, product formation, substrate utilization kinetics of bacteria
CO2	Design a bioreactor considering mass transfer between different phases
CO3	Design all accessories and internals like agitator, sterilizer, controllers etc
CO4	Analyze differences between reactor types and modes of operation, and exploit these differences for various design goals
CO5	Design of a bioreactor considering all its related problems
Course Name	SUPPLY CHAIN MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Apply basic terminology and supply chain operations in the context of today's business environment.
CO2	Describe the logistics/supply chain system in oral and written presentations.
CO3	Analyse areas for improvement in logistics and supply chain operations.
CO4	Implement effective inventory management policy, demand variability, forecasting of revenue management.
CO5	Incorporate coordination and technology in supply chain.
Course Name	CORROSION ENGINEERING
	On successful completion of the course the students will be able to:
CO1	Learn the principles of Corrosion and understand the environmental effects.
CO2	Differentiate possible types of corrosion in a particular situation.
CO3	Apply different corrosion testing methods for a system.
CO4	Adopt different corrosion prevention methods.
CO5	Design and apply modern protection coatings.
Course Name	MIXING TECHNOLOGY
	On successful completion of the course the students will be able to:

CO1	Identify required mixing process for a system.
CO2	Characterize flow patterns and velocities in mixing of different fluids.
CO3	Apply the effects of viscosity and mass transfer in a mixing process.
CO4	Elaborate on a suitable mixing process for heterogeneous systems.
CO5	Design equipment for a mixing process.
Course Name	*PROFESSIONAL ETHICS AND HUMAN VALUES*
	On successful completion of the course the students will be able to:
CO1	Implement awareness of professional ethics and human values.
CO2	Pursue career with professional ethics by adopting ethical theories
CO3	Work with more responsibility by understanding various social issues by adopting various industrial standards.
CO4	Adopt various safety procedures in the professional environment and safe guard IPR.
CO5	Judge role in various global issues and apply ethical principles to resolve situations

Program Name	B.E. (CIVIL ENGINEERING)
Semester	**III**
Course Name	*ENGINEERING MATHEMATICS-III*
	On successful completion of the course the students will be able to:
CO1	Knowing the methods to solve partial differential equations occurring in various physical
	and engineering problems.
CO2	Describing an oscillating function which appear in a variety of physical problems by
	Fourier series helps them to understand its basic nature deeply.
CO3	Acquiring the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining
	solution using Fourier series methods.
CO4	Understanding the effect of Fourier transform techniques and their applications.
CO5	Gaining the concept of analysis of linear discrete system using Z-transform approach.
Course Name	*MECHANICS OF SOLIDS*
	On successful completion of the course the students will be able to:
CO1	Understand the concepts of stress and strain, principal stresses and principal planes.
CO2	Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
CO3	Calculate the deflection of beams by different methods and selection of method for determining slope and deflection.
CO4	Apply basic equation of torsion in design of circular shafts and helical springs,.
CO5	Analyze the pin jointed plane and space trusses
Course Name	*MECHANICS OF FLUIDS*
	On successful completion of the course the students will be able to:
CO1	Gain knowledge on fluid properties
CO2	Know about Fluid statics and kinematics
CO3	Gain knowledge on Fluid dynamics
CO4	Understand and solve the problems related to flow through pipes
CO5	Gain knowledge about Dimensional analysis and preparation of models in
	hydraulic structures
Course Name	*CONSTRUCTION MATERIALS & STRUCTURAL GEOLOGY*
	On successful completion of the course the students will be able to:
CO.1	To know the properties of materials

CO.2	To understand the application of Timber and other building materials
CO.3	To know the conventional and modern construction
CO.4	To know the sub structure & frame work
CO.5	To know the super structure
Course Name	*ENGINEERING SURVEY*
	On successful completion of the course the students will be able to:
CO1	The use of various surveying instruments andmapping
CO2	Measuring Horizontal angle and vertical angle using differentinstruments
CO3	Methods of Leveling and setting Levels with differentinstruments
CO4	Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth
CO5	Concept and principle of modernsurveying
Course Name	*VALUE EDUCATION PROGRAM*
	On successful completion of the course the students will be able to:
CO1	Able to understand definition and classification of values.
CO2	Able to understand purusartha.
CO3	Able to understand sarvodaya idea.
CO4	Able to understand sustenance of life.
CO5	Able to understand views of hierarchy of values.
Course Name	*ENGINEERING SURVEYING LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Handle basic survey equipments like Theodolite, Total Station and GPS
CO2	Carry out survey work covering large area
CO3	Measure differences in elevation and distance accessible and inaccessible point
CO4	Carry out alignment surveys and compute area / quantities
CO5	To carryout Triangulation and Astronomical surveying including general field marking for various engineering projects and Location of siteetc.
Course Name	*BUILDING MATERIALS & CONSTRUCTIONPRACTICES LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Test on properties of aggregates
CO2	Test on properties of cement
CO3	Test on bricks

CO4	Construct brick wall with different bonds
Course Name	***BUILDING PLANNING & DRAWING***
	On successful completion of the course the students will be able to:
CO1	After undergoing the course, the students will have ability to draft on manual building drawings (Plan, elevation and sectio
	views) in accordance with development and control rules satisfying orientation and functional requirements for the drawings.
Semester	**IV**
Course Name	***NUMERICAL METHODS***
	On successful completion of the course the students will be able to:
CO.1	solve the eigenvector problems.
CO.2	solve problems by numerical differentiation and integration.
CO.3	solve the numerical differentiation and interpolation and the errors associated with them.
CO.4	solve the engineering problems associated with the ordinary and partial differential equations.
CO.5	apply numerical techniques to real-world problems.
Course Name	***STRENGTH OF MATERIALS***
	On successful completion of the course the students will be able to:
CO.1	analyze the flow characteristic of open channel
CO.2	design the most economical channel section in irrigation channels
CO.3	design spillways
CO.4	develop pilot studies on hydraulic turbines
CO.5	select and design pumps for various flow
Course Name	***GEOTECHNICAL ENGINEERING***
	On successful completion of the course the students will be able to:
CO.1	classify the various types of soil
CO.2	determine the physical and engineering properties of soil
CO.3	determine the stresses in soils with respected to given loading conditions
CO.4	quantify the shear behaviour of soil
CO.5	derive the stability of slopes
Course Name	***WATER SUPPLY ENGINEERING***
	On successful completion of the course the students will be able to:
CO.1	Know about water demand, its source & collection

CO.2	Understand the Standards applied for drinking water.
CO.3	Design the appropriate water treatment plant for municipal water supply.
CO.4	Understand & design the distribution system.
Course Name	**3D PRINTING AND DESIGN**
	On successful completion of the course the students will be able to:
CO.1	Develop CAD models for 3D printing
CO.2	Import and Export CAD data and generate .stl file
CO.3	Select a specific material for the given application
CO.4	Select a 3D printing process for an application
CO.5	Produce a product using or Additive Manufacturing (AM)
Course Name	**STRENGTH OF MATERIALS LABORATORY**
	On successful completion of the course the students will be able to:
CO.1	access the compressive strength of concrete cubes and bricks
CO.2	analyze the flexural behavior of beams
CO.3	evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens
CO.4	find stiffness of springs
CO.5	decide over the suitability of materials for the intended purpose
Course Name	**HYDRAULIC ENGINEERING LABORATORY**
	On successful completion of the course the students will be able to:
CO.1	To determine flow through pipes and open channels
CO.2	To determine major and minor losses in pipes
CO.3	To determine flow tests
CO.4	To determine the efficiency of various types of pumps
CO.5	To know about various turbines and their applications
SEMESTER	**V**
Course Name	**TRANSPORTATION ENGINEERING- I**
	On successful completion of the course the students will be able to:
CO.1	Gain knowledge on highway planning and alignment
CO.2	Design various geometry with respect to highways.
CO.3	Design flexible and rigid payments
CO.4	Evaluate various highway materials and appropriate construction practices

CO.5	Acquire knowledge in financial aspects in highway project execution
Course Name	*STRUCTURAL ANALYSIS - I*
	On successful completion of the course the students will be able to:
CO.1	Calculate the deflection of indeterminate beams
CO.2	Evaluate and draw influence line diagram for statically determinate and indeterminate
	structure.
CO.3	Calculate internal forces in arch structures.
CO.4	Apply slope deflection method to analyse statically indeterminate structures
CO.5	Apply moment distribution method to analyse statically indeterminate structures
Course Name	*DESIGN OF RCC STRUCTURES*
	On successful completion of the course the students will be able to:
CO.1	Use the IS codes for analysis and design of RC structures.
CO.2	analyse and design beams and slabs by limit state
CO.3	Design the beams for shear and torsion
CO.4	Design columns for axial, uniaxial and biaxial eccentric loadings.
CO5	Design of footing by limit state method.
Course Name	*FOUNDATION ENGINEERING*
	On successful completion of the course the students will be able to:
CO.1	Understand the site investigation, methods and sampling
CO.2	Get knowledge on bearing capacity and testing methods
CO.3	Design shallow footings
CO.4	Determine the load carrying capacity, settlement of pile foundation
CO.5	Determine the erth pressure on retaining walls and analysis for stability
Course Name	*CONCRETE TECHNOLOGY*
	On successful completion of the course the students will be able to:
CO.1	To know the properties of materials required for concrete
CO2	To know the use of different chemical and mineral admixtures used in concrete
CO.3	To know the design procedures for making concrete
CO.4	To know the tests on concrete - Fresh and hardened concrete
CO.4	
CO.5	To know the properties of different materials used for making special concrete

Course Name	ENVIRONMENTAL ENGINEERING LABORATORY
	On successful completion of the course the students will be able to:
CO.1	Determine the amount of various minerals present in water.
CO.2	Conduct test to determine chlorine in bleaching powder
CO.3	Conduct DO & BOD test.
CO.4	Conduct COD test.
CO.5	Conduct Bacteriological Analysis
Course Name	SOIL MECHANICS LABORATORY
	On successful completion of the course the students will be able to:
CO.1	To Gain knowledge about Grain size distribution of soil
CO.2	To know fundamentals of Atterberg limits .
CO.3	To Determine the Field density and permeability of soil.
CO.4	To Evaluate the shear strength of soil.
CO.5	To Determine co-efficient of consolidation
Course Name	Computer Aided Design – I
	On successful completion of the course the students will be able to:
CO.1	Draw the load bearing walls
CO.2	Draw the details of doors and windows
CO.3	Draw the different types of roofs trusses
CO.4	Draw the plan sectional elevation of a structure
CO.5	Draw the different views of a structure
Course Name	REMOTE SENSING
	On successful completion of the course the students will be able to:
CO1	understand the concepts and laws related to remote sensing
CO2	understand the interaction of electromagnetic radiation with atmosphere and earth material
CO3	acquire knowledge about satellite orbits and different types of satellites
CO4	understand the different types of remote sensors
CO5	gain knowledge about the concepts of interpretation of satellite imagery and civil engineering applications
Course Name	GEOGRAPHIC INFORMATION SYSTEM
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals of maps, their characteristics and GIS, its components

CO2	Appreciate various spatial data models and their advantages
CO3	Produce a error free GIS database for civil engineering applications
CO4	Apply various spatial analysis tools for deriving GIS based outcome
CO5	Present the spatial information along with quality assessment for applications
Course Name	***GEOINFORMATICS APPLICATIONS FOR CIVIL ENGINEERS***
	On successful completion of the course the students will be able to:
CO1	Understand the concepts of map making process.
CO2	Gain knowledge on spatial data and Geographic Information System
CO3	Impart the required skills for analyzing the spatial data useful modelling the real world problems
CO4	Impart the required skills for analyzing the spatial data useful modelling transportation networks and resource transport.
CO5	Gain knowledge on the applicability of Geoinfomatics technology on diverse Civil Engineering Problems
Course Name	***TOTAL STATION AND GPS SURVEYING***
	On successful completion of the course the students will be able to:
CO1	Learn the fundamentals of Total station.
CO2	Provides knowledge about electromagnetic waves and its usage in Total station and GPS.
CO3	Understand the measuring and working principle of electro optical and Microwave Total station and GPS
CO4	Learn the concepts of satellite in GPS
CO5	Gains knowledge about Total station and GPS data downloading and processing
SEMESTER	**VI**
Course Name	***Transportation Engineering – II***
	On successful completion of the course the students will be able to:
CO.1	Plan and do the geometric design of the railway track and its elements.
CO.2	Design turn outs and modern method of maintenance of railway track
CO.3	Plan and design of the Runway and Taxiway
CO.4	Design the elements of an airport and its layout, aids and traffic control.
CO.5	Understand different terminologies in harbour Engineering
Course Name	***Structural Analysis – II***
	On successful completion of the course the students will be able to:
CO.1	Analyse determinant and Indeterminate structure using Flexible method
CO.2	Analyse structures using matrix methods.

CO.3	Understand the basics of Finite Element Methods.
CO.4	Know about plastic analysis of intermediate beams and frames.
CO.5	Analyse space truss and suspension cables.
Course Name	*Design of Steel structures*
	On successful completion of the course the students will be able to:
CO.1	Design steel structure elements using limit state design concept.
CO.2	Design bolted and welded joints.
CO.3	Use IS codes and Design tension, compression members and beams.
CO.4	Design roof trusses.
CO.5	Design Gantry girders and other industrial structures.
Course Name	*CONSTITUTION OF INDIA*
	On successful completion of the course the students will be able to:
CO.1	Able to understand history and philosophy of Indian Constitution.
CO.2	Able to understand the premises informing the twin themes of liberty and freedom from a
	civil rights perspective.
CO.3	Able to understand powers and functions of Indian government.
CO.4	Able to understand emergency rule.
CO.5	Able to understand structure and functions of local administration.
Course Name	*COMPUTER AIDED DESIGN LABORATORY – II*
	On successful completion of the course the students will be able to:
CO.1	design and draft retaining walls with reinforcement details
CO.2	design the solid slab and RCC tee beam bridges.
CO.3	design and draft steel bridges
CO.4	design and draft connections
CO.5	design and draft different types of water tanks
Course Name	*CONCRETE AND HIGHWAY ENGINEERING LABORATORY*
	On successful completion of the course the students will be able to:
CO.1	Determine the workability of concrete
CO.2	Determine the properties of hardened concrete
CO.3	Find out the properties of bitumen
CO.4	Find out the properties of bitumen mixes

CO.5	know the techniques to characterize various pavement materials through relevant tests.
Course Name	**EXTENSIVE SURVEY CAMP**
	On successful completion of the course the students will be able to:
CO.1	Survey the given area using triangulation survey.
CO.2	Determine the latitude &longitude of a given point or position
CO.3	Study about the moment of sun using astronomical surveying.
CO.4	Able to plot the contour by using Total Station
Course Name	**AIR POLLUTION AND CONTROL ENGINEERING**
	On successful completion of the course the students will be able to:
CO.1	understand the chemistry of atmosphere, characterize the air pollutants ,know the effects of air pollution, identify the criteria air pollutants and know about NAAQS
CO.2	apply the knowledge of mathematics ,science and engineering fundamentals to understand the concept of meteorology, air pollution dispersion and Gaussian plume dispersion model
CO.3	select suitable method and design the particulate pollutant control equipment
CO.4	select appropriate method for control of gaseous pollutant by due consideration of sources of emission
CO.5	understand the source of indoor air pollution, effects and control methods as well as to identify the source of noise ,and select suitable method for measuring and control of noise pollution
Course Name	**Sanitary Engineering**
	On successful completion of the course the students will be able to:
CO.1	Learn about waste water sources and collection**.**
CO.2	The different types of Sewer systems.
CO.3	Know and identify waste water characterization
CO.4	Disposal the effluents in most efficient manner
CO.5	Design the unit processes for conventional and advanced waste water treatment
Course Name	**ENVIRONMENTA L AND SOCIAL IMPACT ASSESSMENT**
	On successful completion of the course the students will be able to:
CO.1	carry out scoping and screening of developmental projects for environmental and social assessments
CO.2	explain different methodologies for environmental impact prediction and assessment
CO.3	plan environmental impact assessments and environmental management plans
CO.4	asses socioeconomic investigation of the environment in a project
CO.5	knowledge to prepare environmental impact assessment reports

Course Name	INDUSTRIAL WASTE WATER MANAGEMENT
	On successful completion of the course the students will be able to:
CO.1	explain the source and types of industrial wastewater and their environmental impacts
	and choose the regulatory laws pertaining to environmental protection
CO.2	apply knowledge and skills to design industrial wastewater treatment schemes
CO.3	design facilities for the processing and reclamation of industrial wastewater
CO.4	Know the various treatment technologies.
CO.5	Know about hazardous waste management.
Course Name	MUNICIPAL SOLID WASTE MANAGEMENT
	On successful completion of the course the students will be able to:
CO.1	Understand the importance of solid waste management and functional elements of solid waste management.
CO.2	Know about the prevention of air pollution
C0.3	know the segregation of solid waste and the onsite storage methods
CO.4	Know about the different disposal methods.
CO.5	Know about the recycling and reuse of solid waste products.
Course Name	INTEGRATED WATER RESOURCES MANAGEMENT
	On successful completion of the course the students will be able to:
CO.1	Describe the context and principles of IWRM; Compare the conventional and integrated ways of water management.
CO.2	Select the best economic option among the alternatives; illustrate the pros and cons of PPP through case studies.
CO.3	Apply law and governance in the context of IWRM.
CO.4	Discuss the linkages between water-health; develop a HIA framework.
CO.5	Analyse how the virtual water concept pave way to alternate policy options.
Course Name	PARTICIPATORY WATER RESOURCES MANAGEMENT
	On successful completion of the course the students will be able to:
CO.1	Capture to fundamental concepts and terms which are to be applied and understood all through the study.
CO.2	Acquire a clear insight into the subject matter of participatory ideology with its rudiments under the light of both national and international illustrative cases.
CO.3	Comprehend the roles of different players as stakeholders with the ground reality of the underlying issues in farm community.
CO.4	Articulate as how reforms can help build up institutional and irrigation agencies with the support obtained from the existing farm network in irrigation Management

CO.5	Gain an overarching understanding of recommendation for improved irrigation management with a vision to transform the existing governance and policies with the novel approach of sustainability.
Course Name	*Hydrology And Water Resource Engineering*
	On successful completion of the course the students will be able to:
CO.1	Analyze the various phases of Hydrological cycle and its data interpretation
CO.2	Analyze the hydrograph for surface runoff systems.
CO.3	Assess the flood damages and to suggest remedial measures for flood control
CO.4	Plan, manage and evaluate any water resources project
CO.5	Apply the concepts of groundwater for water resources management
Course Name	*Ground water Engineering*
	On successful completion of the course the students will be able to:
CO.1	Analyze the basics of ground water engineering.
CO.2	Develop skills in analyzing steady flow and unsteady flow situation in groundwater studies.
CO.3	Gain knowledge about groundwater exploration and designing of wells.
CO.4	Evaluate artificial recharge methods and structures for groundwater management.
CO.5	Apply creative and innovative technique on conservation of water
Course Name	*WATER RESOURCES SYSTEMS ENGINEERING*
	On successful completion of the course the students will be able to:
CO.1	Define the economic aspects and analysis of water resources systems for comprehensive and integrated planning of a water resources project.
CO.2	Apply the concept of linear programming for optimisation of water resources problems.
CO.3	Explain the concept of dynamic programming and apply in water resource system.
CO.4	Develop the simulation model based on deterministic and stochastic simulation for reservoir operating policy
CO.5	Apply advance optimisation techniques like goal programming, heuristic algorithm in the field of water resources planning and management.
Course Name	*PERSONALITY DEVELOPMENT*
	On successful completion of the course the students will be able to:
CO1	To know the thoeries of personality
CO2	To know the importance and factors that determine attitude
CO3	To know about group and team dynamivs
CO4	To develop their communication skills
CO5	To know about time and stress management

Course Name	ELECTRICAL DRIVES AND CONTROLS
	On successful completion of the course the students will be able to:
CO.1	Understand the stable steady-state operation and transient dynamics of a motor-load system.
CO.2	Analyze the starting and braking methods of DC and AC drives.
CO.3	Understand the speed control methods of DC motors and induction motors.
CO.4	Idetify relevant drive system for a given application with given specifications.
CO5	Use inverters and AC voltage regulators
Course Name	ELECTRICAL AND ELECTRONIC MEASUREMENTS
	On successful completion of the course the students will be able to:
CO.1	Understand and analyse the working of various electrical meters
CO.2	Understand the basic concepts of the bridge circuits for measurement of resistance
CO.3	Understand the basic concepts of the bridge circuits for measurement of capacitance and inductance
CO.4	Enlighten the basic concepts of electronic meters
CO.5	Understand and analyse the calibration of industrial meters and apply the appropriate measuring techniques to real time applications
Course Name	PRINCIPLES OF MANAGEMENT
	On successful completion of the course the students will be able to:
CO.1	Understand of managerial functions like planning, organizing, staffing, leading & controlling
CO.2	Understand the basic knowledge on international aspect of management
CO.3	Analyze the various organizing techniques
CO.4	Understand the nature & purpose of coordination
CO.5	Impart the knowledge in controlling
Course Name	ENVIRONMENTAL INSTRUMENTATION
	On successful completion of the course the students will be able to:
CO.1	Comprehend the concept of Environment.
CO.2	Realize the concept of Water quality parameters
CO.3	Grasp the elements in water & air.
CO.4	Know the concept of Pollution measurements.
CO.5	Analyze various Measurement Techniques
Course Name	ENGINEERING ECONOMICS AND COST ANALYSIS
	On successful completion of the course the students will be able to:

CO.1	Get knowledge about basics of economics.
CO.2	Know about make or buy decisions.
CO.3	Become familiar with cost calculations.
CO.4	Know the concept of challenger and defender.
CO.5	Know about how to find the depreciation of an asset.
SEMESTER	**VII**
Course Name	**ESTIMATION AND QUANTITY SURVEYING**
	On successful completion of the course the students will be able to:
CO.1	Estimate the quantities of different items in buildings
CO2	Estimate the quantities of water supply and sanitary works, Roads and irrigation works
CO.3	Design the bar bending schedule
CO4	Analyse the rates of the quantities and estimate the material quantity
CO.5	Prepare a bill of quantities, make specifications and prepare tender documents.
Course Name	**Irrigation Engineering**
	On successful completion of the course the students will be able to:
CO.1	Know types and methods of irrigation system.
CO.2	Have more knowledge focussed on irrigation and water resources engineering.
CO.3	Apply multidisciplinary approaches to plan, design and execute relevant irrigation and water resources structures
CO4	Design various irrigation structures like canal regulators, cross drainage works, canal headwork's etc.,
CO5	Ability to evaluate Irrigation management system and development of irrigation projects
Course Name	**Disaster Mitigation & Management**
	On successful completion of the course the students will be able to:
CO1	Understand the concepts, definitions of hazards and disasters.
CO2	Outline the disaster risk reduction strategies.
CO3	Understand concepts of Inter-relationship between disasters and development.
CO4	Describe the preparedness in disaster management.
CO5	Know the case studies in disaster management.
Course Name	**IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING**
	On successful completion of the course the students will be able to:
CO.1	Understand the Design and drawing of RC sand filters and septic tank with reinforcement details

CO2	Understand the Design and drawing of RC Trickling filter and sedimentation tank reinforcement details
CO3	Understand the Design and drawing of RC Tank sluice and canal drop with reinforcement details
CO4	Understand the Design and drawing of RC siphon aqueduct, canal escape and intake tower with reinforcement details
CO5	Acquire hands on experience in design and analysis of Concrete structures in environmental and irrigation engineering practice.
Course Name	*MINI PROJECT*
	On successful completion of the course the students will be able to:
CO.1	On completion of the design project, students will have a better experience & Knowledge in various design problems related to Civil Engineering.
Course Name	*SUMMER INTERNSHIP/ SUMMER TRAINING (4 Weeks)*
	On successful completion of the course the students will be able to:
CO.1	The intricacies of implementation textbook knowledge into practice
CO.2	The concepts of developments and implementation of new techniques
Course Name	*PAVEMENT ENGINEERING*
	On successful completion of the course the students will be able to:
CO.1	Get knowledge about types of rigid and flexible pavements
CO2	Able to design rigid pavements.
CO.3	Able to design flexible pavements.
CO4	Determine the causes of distress in rigid and flexible pavements.
CO.5	Understand stailisation of pavements, testing and field control.
Course Name	*TRAFFIC ENGINEERING AND MANAGEMENT*
	On successful completion of the course the students will be able to:
CO1	Analyse traffic problems and plan for traffic systems various uses.
CO2	Design Channels, Intersections, signals and parking arrangements.
CO3	Develop Traffic management Systems
CO4	Use statistical concepts and applications in traffic engineering.
CO5	Identify traffic stream characteristics
Course Name	*TRANSPORT AND ENVRONMENT*
	On successful completion of the course the students will be able to:
CO.1	Understood the impact of Transportation projects on the environment
CO2	Get knowledge on methods of impact analysis and their applications.

CO3	Understand environmental Laws on Transportation Projects and the mitigative measures adopted in the planning stage.
CO4	Predict and assess the impact of transportation projects.
CO5	Identify and address the needs of minority and low-income populations in making transportation decisions
Course Name	**TRANSPORTATION PLANNING AND SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Understand the concepts and surveys adopted in Transportation planning
CO2	Knowledge on modelling of trip generation assigning and distribution techniques in transportation system.
CO3	Planning and evaluating transportation projects through various case studies.
CO4	Knowledge on planning of bus transportation system in urban areas.
CO5	Planning of various rail transportation and fare policies adopted.
Course Name	**URBAN PLANNING AND DEVELOPMENT**
	On successful completion of the course the students will be able to:
CO.1	Understand the basic concepts in urban planning and development.
CO2	Knowledge on principles of planning, surveys and analysis. in developing an urban area.
CO3	Knowledge on development of regional, master plan and norms for development of smart cities.
CO4	Planning of standards, implanting and financing of Urban projects.
CO5	Understand the norms, legal aspects and stakeholders role in planning an urban area.
Course Name	**GEO-ENVIRONMENTAL ENGINEERING**
	On successful completion of the course the students will be able to:
CO.1	understand basic knowledge of concepts and principles of Geo-environmental Engineering.
CO.2	in capable of selecting site for safe disposal of waste.
CO.3	aware of soil stabilization by utilizing solid waste.
CO4	assess the contamination in the soil and to select suitable remediation methods based on contamination.
CO5	prepare the suitable disposal system for particular waste.
Course Name	**GROUND IMPROVEMENT TECHNIQUES**
	On successful completion of the course the students will be able to:
CO.1	Able to gain knowledge on different ground improvement techniques and contemporary issues.
CO2	Able to identify, analyse and solve geotechnical engineering problems.
CO.3	Able to understand grouting techniques and stability analysis.

CO4	Able to have a knowledge on the reinforcement details and the use of Geotextiles for filtration, drainage and separation in road and other works.
CO5	Able to gain knowledge about the geotechnical problems in various types of soils
Course Name	*SOIL DYNAMICS AND MACHINE FOUNDATIONS*
	On successful completion of the course the students will be able to:
CO.1	Have the basic knowledge about the theory of vibration.
CO2	Understand the different types of waves and its behaviour.
CO.3	have enough knowledge about various laboratory and field tests to determine the dynamic soil properties and its interpretation.
CO.4	assess the contamination in the soil and to select suitable remediation methods based on contamination.
CO.5	assess the influence of vibrations and selection of remediation methods based on the nature of vibration, properties and behaviour of soil.
Course Name	*ROCK MECHANICS*
	On successful completion of the course the students will be able to:
CO.1	know geological factor on rock to solve field problems
CO.2	solve the field problems associated with rocks and have a knowledge of classification of rock mass
CO.3	have clear knowledge about Elasticity in rock mechanics
CO4	acquire the knowledge about Rock dynamics
CO5	know about the properties of rocks
Course Name	*ENERGY EFFICIENT ARCHITECTURE*
	On successful completion of the course the students will be able to:
CO.1	know alternative sources of energy and are exposed to passive design considerations
CO.2	understand the site design conditions for various climatic zones in creating sustainable built environment
CO3	have the knowledge on usage of solar energy in efficient way
CO4	gain information on various techniques of shading to reduce heat gain in tropical climate
CO5	know about the design of energy efficient buildings
Course Name	*SERVICES FOR HIGH- RISE BUILDINGS*
	On successful completion of the course the students will be able to:
CO.1	Understanding of various service systems for a high rise building as per the National Building Code.
CO.2	Knowing the advanced technologies used for water management and sewage treatment.
CO.3	The students are exposed to various heating, Ventilation, air conditioning systems and their applications.

CO.4	An understanding of fire safety, firefighting, fire prevention and installations in buildings.
CO.5	A detail understanding of design guidelines of vertical transportation system in current trends.
Course Name	**AFFORDABLE HOUSING**
	On successful completion of the course the students will be able to:
CO.1	understand issues relating to Housing policy and need for Affordable housing. Following cost effective techniques and yet design for diversity.
CO2	have a thorough knowledge on affordable buildings
CO3	Use PERT and CPM methods in building construction
CO4	Have knowledge on building construction details for cost reduction
CO5	Know about community participation and environmental aspects
Course Name	**URBAN HOUSING**
	On successful completion of the course the students will be able to:
CO.1	understand issues relating to Housing policy and its impact on housing development in Indian context.
CO2	learn about Evolution of settlement pattern
CO3	design for diversity, Costing etc for a cross section of income groups and design of disaster resistant structures
CO4	have knowledge on traditional patterns - Row Housing and Cluster Housing
CO5	know various stages and tasks in Project Development
Course Name	**Building Automation**
	On successful completion of the course the students will be able to:
CO.1	Analyze current philosophy, technology, terminology, and practices used in buildingautomation.
CO.2	Select hardware and software for HVAC system.
CO.3	Evaluate different fire standards, FAS Components, FAS loops, Architectures.
CO.4	Analyze Smart building and Security Systems,
CO.5	Evaluate CCTV, Intrusion and Guard Tour System
Course Name	**ENTREPRENEURSHIP AND E-BUSINESS**
	On successful completion of the course the students will be able to:
CO.1	The students will understand the necessity of management in the field of engineering and it realizes the importance of entrepreneurship in the modern world.
CO.2	The students will have an ability to define, characteristics and role of SSI in economic Development. Impact of privatization and globalization on SSIs and understand the meaning of project and project identification.

CO.3	The students are well trained to analyze the parameters of project like project appraisal, identification of business Opportunities, market feasibility study, technical feasibility study etc.
CO.4	The students will be able to understand the motivation techniques and the financial analysis in entrepreneurships.
CO.5	Students will understand the concept of management as a science, art and profession and appreciate the role of planning in management.
SEMESTER	**VIII**
Course Name	**CONSTRUCTION PLANNING & PROJECT MANAGEMENT**
	On successful completion of the course the students will be able to:
CO.1	Understand basic concepts of construction planing.
CO.2	Schedule the construction activities.
CO.3	Forecast and control the cost in a construction.
CO.4	Understand the quality control and safety during construction.
CO.5	Organize information in Centralized database Management systems.
Course Name	**PROJECT WORK**
	On successful completion of the course the students will be able to:
CO.1	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.
Course Name	**DESIGN OF PLATE AND SHELL STRUCTURES**
	On successful completion of the course the students will be able to:
CO1	Assess the strength of thin plates under different types of loads.
CO2	Analyze thin plates using Navier's method and Levy's method.
CO3	Analyze circular plates under axis - symmetric deflection.
CO4	Classify different types of shells and study their behavior.
CO5	Analyze space frame.
Course Name	**DESIGN OF PRESTRESSED CONCRETE STRUCTURES**
	On successful completion of the course the students will be able to:
CO1	Design a prestressed concrete beam accounting for losses.
CO2	Design for flexure and shear.
CO3	Design the anchorage zone for post tensioned members and deflection in beams.
CO4	Design composite members and continuous beams.
CO5	Design water tanks, pipes and poles.
Course Name	**BRIDGE ENGINEERING**
	On successful completion of the course the students will be able to:

CO1	Outline the basic design concept of bridges
CO2	Design of Reinforced concrete girder bridges
CO3	Design of steel bridges, girder and plates
CO4	Design of Prestressed concrete bridges
CO5	Know about bearings, joints and appurtenances in bridges
Course Name	*PREFABRICATED STRUCTURES*
	On successful completion of the course the students will be able to:
CO.1	Understand the principles of prefabrication
CO.2	Know about various prefabricated components.
CO.3	Know the design principles for prefabricated structures
Course Name	*STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING*
	On successful completion of the course the students will be able to:
CO.1	Apply the knowledge of science and engineering fundamentals to idealize and formulate the equations of motion for SDOF system.
CO.2	Develop the equations of motion for MDOF system and to evaluate the natural frequencies and mode shapes.
CO.3	Explain the elements of engineering seismology, characteristics of earthquake and seismic instrumentation.
CO.4	To identify the various causes and effects of earthquakes on structures due to past earthquakes.
CO.5	To analyze the structures subjected to dynamic loading and to design for seismic loading as per codal provisions.
Course Name	*MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES*
	On successful completion of the course the students will be able to:
CO.1	Know about the assessment procedure for evaluating a damaged structure.
CO.2	Know about the durability aspects of concrete
CO.3	Know about the different materials used for repair techniques.
CO.4	Know about the different repair methods to overcome low member strength.
CO.5	To know about different demolition techniques
Course Name	*INSTRUMENTATION IN CIVIL ENGINEERING*
	On successful completion of the course the students will be able to:

CO1	Discriminate the functions and response of instrumented structures and the role of effectors and actuators in smart structures.
CO2	Apply the concept of whetstone bridge in strain measurement and describe the strain measuring techniques using electrical strain gauges
CO3	Outline the applications of sensors in smart structures
CO4	Outline about actuator materials and techniques.
CO5	Apply the concepts of data acquisition and signal processing in smart structure to minimize the realistic engineering constraint
Course Name	*POWER PLANT STRUCTURES*
	On successful completion of the course the students will be able to:
CO1	Explain the principles, layout and functional aspects of a power plant structure.
CO2	Analyze and design the layout and components of hydroelectric power plant.
CO3	Explain, analyze and design the layout and components of Thermal power plant.
CO4	Explain the functioning of a nuclear power plant and design its components.
CO5	Develop an understanding of the various non-conventional sources of energy and design the layout and components.
Course Name	*INDUSTRIAL STRUCTURES*
	On successful completion of the course the students will be able to:
CO1	Identify the type of structures and choose appropriate building materials.
CO2	Identify the location for lightning and ventilation.
CO3	Identify the various types of steel roof trusses and various loads acting over it , analyze and design it.
CO4	Describe the design concept of crane girder, mill bends, bunkers and silos using structural steel.
CO5	Illustrate the principle of prefabricated structures.
Course Name	*TALL STRUCTURES*
	On successful completion of the course the students will be able to:
CO1	Know the general planning considerations of tall structures
CO2	Know the behavior of shear walls and high-rise building structures and their behavior under load.
CO3	know about common high rise building structures and their behaviour under load
CO4	know the approximate structural analysis and design of buildings

CO5	Design High-rise buildings

Program Name	B.E. (COMPUTER SCIENCE AND ENGINEERING)
Semester	III
Course Name	ENGINEERING MATHEMATICS-III
	On successful completion of the course the students will be able to:
CO1	Know the methods to solve partial differential equations occurring in various physical and engineering problems
CO2	Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply
CO3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.
CO4	Understand the effect of Fourier transform techniques and their applications
CO5	Gain the concept of analysis of linear discrete system using Z-transform approach
Course Name	DIGITAL ELECTRONICS
	On successful completion of the course the students will be able to:
CO1	Solve the Postulates of Boolean algebra using different techniques
CO2	Design the Combinational and sequential circuits
CO3	Apply the concept of synchronous and asynchronous circuit
CO4	Summarize the concept of memories and programmable logic devices.
CO5	Knowledge in VHDL for VLSI Design.
Course Name	DATABASE MANAGEMENT SYSTEM
	On successful completion of the course the students will be able to:
CO1	Gain and design extensive knowledge on various data models and ER diagram.
CO2	Recognize and develop sophisticated queries and authorization techniques to extract information from database
CO3	Analyze and eliminate all kind of dependency in a database schema via normalization techniques.
CO4	Apply concurrency control and recovery mechanism.
CO5	Understand the internal storage structures using different file and indexing techniques & advanced database concepts
Course Name	OBJECT ORIENTED PROGRAMMING IN C++
	On successful completion of the course the students will be able to:
CO1	Describe the important concepts of Object Oriented Programming.
CO2	Identify the relationship between the classes and link them using appropriate concepts.
CO3	Develop solutions for given problems using Polymorphism and Inheritance concepts to solve real world problems.

CO4	Devise generic classes capable of manipulating primitive and user defined data types.
CO5	Develop and implement File I/O operations and Exception handling mechanisms.
Course Name	**DATA STRUCTURES**
	On successful completion of the course the students will be able to:
CO1	Implement List ADT to solve real time problems.
CO2	Develop applications using Stack and Queues data structures.
CO3	Design and Implement applications on trees.
CO4	Implement graph data structure for solving problems.
CO5	Develop various Sorting, Searching and Hashing algorithms to small and large data sets.
Course Name	**COMPUTER ORGANIZATION**
	On successful completion of the course the students will be able to:
CO1	Understand basic operational concepts of computers, ALU and Instructions
CO2	Know the computer arithmetic and control unit operations.
CO3	Comprehend and analyze the Pipelined Execution.
CO4	Know the various Memory Systems and I/O Organization.
CO5	Understand Parallelism and Multiprocessor architectures
Course Name	**DIGITAL ELECTRONICS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Apply Digital ICs for various applications
CO2	Analyze the various combinational circuits using logic gates.
CO3	Implement various sequential circuits using logic gates
CO4	Write VHDL code for various combinational circuits
CO5	Write VHDL code for various sequential circuits
Course Name	**DATABASE MANAGEMENT SYSTEM LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Design and implement database schema for a given problem domain
CO2	Populate and query a database using SQL operations.
CO3	Prepare reports.
CO4	Design & develop an application using advanced databases.
Course Name	**OOPS AND DATA STRUCTURES LABORATORY**
	On successful completion of the course the students will be able to:

CO1	Implement object oriented programming concepts.
CO2	Implement various file concepts, exception handling in object oriented Programming
CO3	Implement programs for manipulating List, Stack and Queue ADT with its Applications
CO4	Ability to apply and implement Tree and Graph Data Structures for Real Time Applications.
CO5	Implement various Searching Sorting and Hashing Algorithms
Semester	**IV**
Course Name	*DISCRETE MATHEMATICS*
	On successful completion of the course the students will be able to:
CO1	understand and demonstrate the applications of basic concepts of an algorithm and counting principles in combinatorial mathematics
CO2	acquaint the graph theory concepts which serves as the base for the real time applications in network analysis.
CO3	expertise the knowledge of logics helps to verify the correctness of computer programs and to draw conclusions from scientific experiments.
CO4	internalize the abstract algebraic structures which provides the ability to deal the theory of sequential machines, formal languages and syntactic analysis.
CO5	Imbibe the concept of Lattices and Boolean algebra.
Course Name	*DESIGN AND ANALYSIS OF ALGORITHM*
	On successful completion of the course the students will be able to:
CO1	Design Algorithms for various Computing Problems.
CO2	Design and analyze algorithm using Divide and Conquer,Greedy Techniques
CO3	Solve and analyze problems using Dynamic programming and iterative improvement
CO4	Analyze back tracking and Branch and Bound algorithm
CO5	Identify any Problem as belonging to the Class of P and NP.
Course Name	*JAVA PROGRAMMING*
	On successful completion of the course the students will be able to:
CO1	Develop Java Programs using OOPs Principles
CO2	Create a real-world application by applying the user defined packages,interfaces.
CO3	Implement multithreading concepts in real time scenarios.
CO4	Design a GUI-based application using Applets &Swings.
CO5	Understand the usage of Utility & Generic Classes.
Course Name	*OPERATING SYSTEM*
	On successful completion of the course the students will be able to:

CO1	Gain extensive knowledge and apply the concepts of process management
CO2	Evaluate various scheduling algorithms and methods of dead lock handling
CO3	Compare various memory management and paging techniques.
CO4	Illustrate disk management functionalities and file systems.
CO5	Be familiar with I/O systems access methods and protection mechanism.
Course Name	**COMPUTER NETWORKS**
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals of data communication and networking
CO2	Explore various flow and error control protocols in data link layer.
CO3	Understand and evaluate the performance of various routing algorithms.
CO4	Analyze flow control and congestion control algorithm for QoS at end to end level.
CO5	Explore the features and operations of various application layer protocols.
Course Name	**SOFTWARE ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Compare and analyze the various life cycle models of software process.
CO2	Describe the process of requirement engineering and Feasibility Studies.
CO3	Prepare Software Requirement document and build requirement model then design the methods for software architecture.
CO4	Formulate various implementation and testing strategies in a system.
CO5	Familiarize various measurements for a software system and Software maintenance.
Course Name	**JAVA PROGRAMMING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Write a program that use the fundamental program constructs, including packages & Interfaces.
CO2	Create &access database connection and handling exceptions.
CO3	Design a GUI-based event handling application using Applets &Swings.
CO4	Understand the I/O functionality to read & write in the files.
Course Name	**OPERATING SYSTEM LABORATARY**
	On successful completion of the course the students will be able to:
CO1	Implement basic services and functionalities of operating system using system call.
CO2	Implement various CPU scheduling algorithm and inter process communication and Semaphores.
CO3	Simulate Producer Consumer problem for process synchronization

CO4	Implement memory management and file allocation techniques algorithms.
CO5	Illustrate disk scheduling algorithms.
Course Name	**COMPUTER NETWORKS LABORATARY**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge on the basic concepts of open source network simulator.
CO2	Analyze and implement various routing algorithms.
CO3	Simulate networks and analyze traffic using various tools.
CO4	Analyze the performance of protocols in different layers
Semester	**V**
Course Name	**PROBABILITY AND QUEUING THEORY**
	On successful completion of the course the students will be able to:
CO1	Imbibe the knowledge of basic probability improves the quality of interpretation and decision making in real time problems of uncertainity.
CO2	Learn the concept of two dimensional random variables which helps to understand and analyse the statistical measures which describesan outcome of a random experiment.
CO3	Understand and characterize the random variable phenomenon which evolve with respect to time in a probabilistic approach.
CO4	Construct and solve queuing models that are suitable for practical problems encountered in daily life.
Course Name	*MICROPROCESSORS AND MICROCONTROLLERS*
	On successful completion of the course the students will be able to:
CO1	Recognize the basicMicroprocessorarchitecture and its concepts.
CO2	Outline the concepts of peripheral interfacing mechanisms
CO3	Design various assembly language programming using microprocessors and microcontroller.
CO4	Extend the real world interfacing with microcontroller
CO5	Extrapolate the architectural features of 801XX with 8086 processor
Course Name	*MODELLING AND DESIGN*
	On successful completion of the course the students will be able to:
CO1	Apply fundamental Object Oriented (OO) modeling and design in solving complex problems and Analyze problem scenario and identify classes/ Objects, their properties and associations.
CO2	Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation

CO3	Propose the appropriate strategies to incorporate standard quality parameters in the design of a system.
CO4	Construct models to show the importance of system Modeling and Design in solving complex problems.
Course Name	**OBJECT ORIENTED ANALYSIS AND DESIGN**
	On successful completion of the course the students will be able to:
CO1	Apply Object Oriented Methodologies and Unified Modeling Approach to develop a system model.
CO2	Analyze, identify object relationship, attributes and methods to build a class.
CO3	Use the UML analysis and design diagrams.
CO4	Create UML for requirements, designs and component interfaces
CO5	Design classes, user interface and to have wide knowledge on object storage and interoperability to develop an effective model.204:210
Course Name	**THEORY OF COMPUTATION**
	On successful completion of the course the students will be able to:
CO1	Construct automata, regular expression for any pattern.
CO2	Design grammars and Automata (recognizers) for different language classes.
CO3	Write Context free grammar for any construct
CO4	Design Turing machines for any language and propose computation solutions using Turing Machines
CO5	Derive whether a problem is decidable or not
Course Name	**C# AND .NET PROGRAMMING**
	On successful completion of the course the students will be able to:
CO1	Understand anatomy of C# Programming.
CO2	Develop Console application using object oriented concepts, advanced features in C#.
CO3	Develop Window form application with Database connectivity.
CO4	Develop Window form application with Database connectivity.
CO5	Build Applications using ADO.NETAND ASP.NET.
Course Name	**MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Generate the code for arithmetic operations in assembly language
CO2	Generalize the developed code using 8086 processors and 8051 controllers.
CO3	Reorganize the Interfacing peripherals with microprocessor and microcontroller
CO4	Interpolate the peripherals for real world applications.

CO5	Propose the various ALU for analysis of microprocessor and microcontroller
Course Name	*EMPLOYABILITY SKILL LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Comprehend the various strategies of listening and its significance.
CO2	Articulate their views clearly and concisely with self-confidence and persuasiveness.
CO3	Understand the prevailing practices of testing in the recruitment process by the corporate the institutional selection processes.
CO4	Communicate the corporate and social requirements in an impressive written mode.
CO5	Communicate the corporate and social requirements in an impressive written mode and pursuing higher studies as well.
Course Name	*COMPUTER GRAPHICS AND MULTIMEDIA SYSTEM*
	On successful completion of the course the students will be able to:
CO1	Create Interactive Computer Graphics using OpenGL.
CO2	Develop Two Dimensional Transformations and Clipping Algorithms.
CO3	Design and Apply Three-Dimensional Graphics and Visible Surface Detection Methods.
CO4	Explore different Multimedia Data Structures and Databases.
CO5	Apply Compression Techniques and Multimedia Applications in Real Time Problems.
Course Name	*NETWORK PROTOCOLS*
	On successful completion of the course the students will be able to:
CO1	Understand the basics of OSI and TCP/IP protocols.
CO2	Analyze the various layers of network protocols.
CO3	Acquire knowledge on network security and telephony protocols.
CO4	Apply different network environment protocols.
Course Name	*ADVANCED JAVA PROGRAMMING*
	On successful completion of the course the students will be able to:
CO1	Understand the advanced concepts of Java programming such as Servlets, Session management and JDBC in servlets.
CO2	Design and develop java beans Application and implementation of EJB in Java
CO3	Apply Key Management and Authentication Techniques to provide Secure Communication
CO4	Understand the importance of Firewalls and Intrusion Detection System.
CO5	Discover and identify abnormalities within the Network caused by Worms, Viruses and Program threats.
Course Name	*OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY*

		On successful completion of the course the students will be able to:
	CO1	Prepare a project plan by analyzing project scope and objectives by using OO concepts.
	CO2	Design & develop UML diagrams.
	CO3	Get knowledge on Argo UML tool for developing UML diagrams.
	CO4	Compare test cases, test plan for an application project
Semester		**VI**
Course Name		*MOBILE APPLICATION DEVELOPMENT*
		On successful completion of the course the students will be able to:
	CO1	Familiarize with Mobile apps development aspects.
	CO2	Design and implement the user interfaces for mobile applications
	CO3	Develop useful mobile applications using Google Android and Eclipse simulator.
	CO4	Develop mobile applications using graphics and animation
	CO5	Perform testing, signing, packaging and distribution of mobile apps
Course Name		*COMPILER DESIGN*
		On successful completion of the course the students will be able to:
	CO1	Recognize tokens from language specification
	CO2	Parse the generated tokens using top down and bottom up parsers.
	CO3	Design semantic rules into a parser that performs attribution while parsing.
	CO4	Represent the intermediate code for the source languages.
	CO5	Apply the various optimization techniques
Course Name		*WEB PROGRAMMING*
		On successful completion of the course the students will be able to:
	CO1	Acquire knowledge about functionalities of World Wide Web.
	CO2	Explore markup languages features and create interactive web pages using them.
	CO3	Learn and design Client side validation using scripting languages.
	CO4	Design web page and connect to the databases.
	CO5	Create, describe, publish and consume the Web Services.
Course Name		*SOFTWARE PROJECT MANAGEMENT*
		On successful completion of the course the students will be able to:
	CO1	Assess and evaluate the role of XML.
	CO2	Understand architecting web services.

CO3	Deploy and publish web services.
CO4	Understand XML Security framework and XML Documents
Course Name	*DATA WAREHOUSING AND DATA MINING*
	On successful completion of the course the students will be able to:
CO1	Have an extensive knowledge on concepts of data warehousing and differentiate OLTP and OLAP.
CO2	Discover and measure interesting patterns from different kinds of databases.
CO3	Apply the technique of association finding to solve real life problems.
CO4	Compare and contrast the various classifiers.
CO5	Able to explore recent trends in data mining and its applications.
Course Name	*MOBILE APPLICATION DEVELOPMENT*
	On successful completion of the course the students will be able to:
CO1	Familiarize with Mobile apps development aspects.
CO2	Design and implement the user interfaces for mobile applications
CO3	Develop useful mobile applications using Google Android and Eclipse simulator.
CO4	Develop mobile applications using graphics and animation
CO5	Perform testing, signing, packaging and distribution of mobile apps
Course Name	*ARTIFICIAL INTELLIGENCE*
	On successful completion of the course the students will be able to:
CO1	Understand various problem solving approaches for AI problems.
CO2	Apply different search strategies and heuristics in problem solving.
CO3	Utilize various Knowledge Representation Techniques in solving complex real-life problems.
CO4	Understand the concepts of Planning and Learning Techniques.
CO5	Build new applications for real-world scenarios.
Course Name	*MULTICORE ARCHITECTURE*
	On successful completion of the course the students will be able to:
CO1	Discuss the issues related to multiprocessing and suggest solutions
CO2	Understand the salient features of different multicore architectures and how they exploit parallelism
CO3	Critically analyze the different types of inter connection networks
CO4	Understand the architecture of GPUs, warehouse-scale computers and embedded processors

Course Name	PARALLEL AND DISTRIBUTED COMPUTING
	On successful completion of the course the students will be able to:
CO1	Apply parallel programming algorithms for real world problems.
CO2	Acquire knowledge on different scheduling, decomposition techniques and its mapping.
CO3	Develop applications by incorporating distributed computing architectures.
CO4	Build remote procedure calls and manage resources
CO5	Implement and deploy the application using distributed file systems
Course Name	NETWORK DESIGN AND MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Apply the networking principles to design a network
CO2	Formulate possible approaches for managing OSI network model.
CO3	Use on SNMP for managing the network & RMON for monitoring the behavior of the Network
CO4	Explore the possibilities of improving the speed of the network and managing them
CO5	Identify the various components of network and formulate the scheme for the managing them
Course Name	SOFTWARE PROJECT MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Understand Project Management and the roles of the Project Manager
CO2	Evaluate a project and provide accurate cost estimates and to plan various activities
CO3	Develop knowledge in Risk Evaluation and Agile methodologies
CO4	Apply best practices to develop skills in Monitoring and Controlling of Software Projects
CO5	Identify suitable Project management tools and techniques
Course Name	ADVANCED JAVA SCRIPTING LANGUAGE
	On successful completion of the course the students will be able to:
CO1	Understand about javascript objects.
CO2	Design Database access with AJAX & JSON.
CO3	Build real world applications using Angular JS.
CO4	Develop a dynamic website using advanced features of Node JS.
CO5	Develop a dynamic website using advanced features of React JS.
Course Name	MOBILE APPLICATION DEVELOPMENT LABORATORY

	On successful completion of the course the students will be able to:
CO1	Design and Implement various mobile applications using emulators.
CO2	Deploy applications to hand-held devices
CO3	Develop an application using basic graphical primitives and databases.
CO4	Construct an application using multi threading and RSS feed and Make use of location identification using GPS in an application.
Course Name	*DATA MINING LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Gain the knowledge in various ground support system for aircraft operations.
CO2	Understood the operation of Air conditioning and pressurization systems in ground level conditions.
CO3	Identify the aircraft component safety and reliability of aircraft systems service and its environmental condition.
CO4	Ability to carry out the ground servicing of critical aircraft systems during the aircraft maintenance manual.
CO5	Knowledge in specifications standards of aircraft hardware systems.
Course Name	*WEB PROGRAMMING LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Design Web pages using HTML/DHTML and style sheets
CO2	Create dynamic web pages using server side scripting.
CO3	Design and Implement database applications.
CO4	Develop the simple GUI interfaces to interact with users and real time applications.
Semester	**VII**
Course Name	*CRYPTOGRAPHY AND SECURITY IN COMPUTING*
	On successful completion of the course the students will be able to:
CO1	Apply Cryptographic Algorithms for Secure Data Transmission.
CO2	Acquire knowledge about the concept of stress concentration and able to plot S-N curves for various component fractures.
CO3	Apply Key Management and Authentication Techniques to provide Secure Communication.
CO4	Understand the importance of Firewalls and Intrusion Detection System.
CO5	Discover and identify abnormalities within the Network caused by Worms, Viruses and Program threats.
Course Name	*MACHINE LEARNING TECHNIQUICS*
	On successful completion of the course the students will be able to:

CO1	Distinguish between, supervised, unsupervised and semi-supervised learning
CO2	Apply the suitable machine learning strategy to real-world applications.
CO3	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem
CO4	Modify existing machine learning algorithms to improve classification efficiency
CO5	Design systems that uses the appropriate graph models of machine learning
Course Name	**MOBILE COMPUTING**
	On successful completion of the course the students will be able to:
CO1	Understand the working principles of wireless and mobile communication networks.
CO2	Apply data communicating methods and networking protocols for mobile and wireless network environments.
CO3	Design of various soft computing based networks and controllers
CO4	Apply genetic programming to real world problems.
CO5	Discuss and integrate various soft computing techniques.
Course Name	**CLOUD COMPUTING**
	On successful completion of the course the students will be able to:
CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
CO2	Choose the appropriate technologies, algorithms and approaches for the related issues in cloud.
CO3	Identify the architecture, infrastructure and delivery models of cloud computing
CO4	Understand and apply Map and Reduce Programming.
CO5	Understand the core issues of cloud computing such as security, privacy and interoperability.
Course Name	**CLOUD COMPUTING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Develop and deploy cloud application using popular cloud platforms,
CO2	Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud.
CO3	Explain and identify the techniques of hadoop cluster in cloud.
CO4	Compare, contrast, and evaluate the key trade-offs between multiple approaches to map reduce in cloud system design.
Course Name	**INTERNET OF THINGS**
	On successful completion of the course the students will be able to:
CO1	Compare and analyze different design issues and domains of IoT.

CO2	Identify different design methodologies and end point devices of IoT.
CO3	Prepare different cloud based and embedded solution for IoT.
CO4	Formulate different case studies related to IoT framework
CO5	Solve data analytical and real-time application problems on IoT.
Course Name	*BUILDING ENTERPRISE APPLICATION*
	On successful completion of the course the students will be able to:
CO1	Understand a given business scenario and document the use case diagrams for the given Scenario
CO2	Identify the non functional requirements for the given scenario and document it in the given template
CO3	Create a logical architecture for the given business scenario documented in use case diagrams
CO4	Create a data architecture for the given logical architecture
CO5	Create test cases (subset) as per the given template
Course Name	*BUSINESS INTELLIGENCE AND ITS APPLICATIONS*
	On successful completion of the course the students will be able to:
CO1	Explain the fundamentals of business intelligence.
CO2	Link data mining with business intelligence.
CO3	Apply various modeling techniques.
CO4	Explain the data analysis and knowledge delivery stages.
CO5	Apply business intelligence methods to various situations.
Course Name	*AGILE SOFTWARE DEVELOPMENT*
	On successful completion of the course the students will be able to:
CO1	Understand Agile development using Test Driven Development
CO2	Understand the Agile Scrum framework.
CO3	Perform testing activities within an Agile project
CO4	Apply design principles and refactoring to achieve Agility
CO5	Deploy automated build tools, version control and continuous integration
Course Name	*INFORMATION STORAGE MANAGEMENT*
	On successful completion of the course the students will be able to:
CO1	Ability to identify the key requirements of data center.
CO2	Analyze the different storage systems architecture.
CO3	Analyze different storage networking technologies.

CO4	Ability to identify key challenges in managing information and also describe the different role in providing disaster recovery and business continuity capabilities.
CO5	Ability to identify and analyzes the common threats in different domains.
Course Name	*CYBER SECURITY AND LAW*
	On successful completion of the course the students will be able to:
CO1	Analyze the role of forensics in preventing various forms of fraud.
CO2	Examine digital evidences such as the data acquisition, identification analysis.
CO3	Analyze and validate forensic data.
CO4	Defend a computer against a variety of security attacks using scanning and penetration testing tools.
CO5	Protect personal data, Secure computer networks and know safe internet usage.
Course Name	*PERVASIVE COMPUTING*
	On successful completion of the course the students will be able to:
CO1	Outline the basic significances and performance requirements of pervasive computing.
CO2	Understand the basic pervasive computing elements and autonomic behavior of sensors.
CO3	Examine and analyze various pervasive approaches and possible solutions.
CO4	Design and develop diversified smart applications using pervasive computing techniques.
Semester	**VIII**
Course Name	*BIG DATA ANALYTICS*
CO1	Understand the fundamentals of big data, its storage and processing concepts.
CO2	Apply analytics for various big data based problems.
CO3	Identify the Problem appropriate to data streams.
CO4	Develop applications using NoSQLDB.
CO5	Explore on big data applications using big data framework.
Course Name	*SOCIAL NETWORK ANALYSIS*
CO1	Develop semantic web related applications.
CO2	Represent knowledge using ontology.
CO3	Predict human behavior in social web and related communities.
CO4	Visualize social networks
Course Name	*SOFTWARE DEFINED NETWORKS*
CO1	Compare and contrast between traditional switch architecture and software defined networks.

CO2	Understand the functionality of Openflow protocol and SDN controllers.
CO3	Illustrate use of SDN in Data Centers and other environments.
CO4	Use software programs to perform varying and complex networking tasks.
CO5	Expand the knowledge learned and apply it to solve real world problems.
Course Name	*GREEN COMPUTING*
CO1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
CO2	Enhance the skill management in Green business process
CO3	Practice Green Information system in the modern Society
CO4	Utilize and adopt green compliance in different environmental scenarios
CO5	Apply the green computing strategies and develop various business application.
Course Name	*WIRELESS AD HOC AND SENSOR NETWORKS*
CO1	Explain the concepts, architecture and applications of Ad Hoc and WSN.
CO2	Analyze the MAC protocol design concepts in Ad Hoc networks.
CO3	Design Ad Hoc routing protocols with respect to some protocol design issues
CO4	Identify different MAC protocols and evaluate the QOS related performance measurement of Sensor Networks.
CO5	Recognize various routing protocols and its issues in WSN
Course Name	*AUGMENTED AND VIRTUAL REALITY*
CO1	Identify the Fundamentals of Virtual Reality
CO2	Analyse and Implement the software is used in Virtual Reality
CO3	Recognize the VR frames work used in real-time .
CO4	Recognize various applications in Digital Entertainment
CO5	Analyse the working fundamentals of Augmented Reality in various Sectors
Course Name	*GREEN COMPUTING*
CO1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
CO2	Enhance the skill management in Green business process
CO3	Practice Green framework in the modern Society
CO4	Utilize and adopt green compliance in different environmental scenarios.
CO5	Apply the green computing strategies and develop various business application.
Course Name	*BLOCKCHAIN TECHNOLOGIES*

CO1	Understand the technology components of Blockchain and how it works behind the scenes
CO2	Identify different approaches to developing decentralized applications.
CO3	Understand Bitcoin and its limitations by comparing with other alternative coins.
CO4	Devise solution using the Ethereum model.
CO5	Understand and use Hyperledger and its development framework
Course Name	*SERVICE ORIENTED ARCHITECTURE*
CO1	Understand XML technologies
CO2	Understand service orientation, benefits of SOA
CO3	Understand web services and WS standards
CO4	Use web services extensions to develop solutions
CO5	Understand and apply service modeling, service oriented analysis and design for application development
Course Name	*DIGITAL FORENSICS*
CO1	Recognize attacks on systems
CO2	Design a counter attack incident response and incident response methodology.
CO3	Illustrate the methods for data recovery, evidence collection and data seizure.
CO4	Understand network and email attacks and forensic investigation with tools
CO5	Use forensic tools and collect evidences of a computer crime.
Course Name	*Deep Learning Techniques*
CO1	Understand the fundamentals of deep learning and activation functions
CO2	Apply backpropagation network model for real world problems.
CO3	Design model using CNN and RNN.
CO4	Develop applications using Tensorflow
CO5	Explore deep learning model for different applications
Course Name	*VISUALIZATION TECHNIQUES*
CO1	Understand the fundamentals of visualization techniques
CO2	Apply computer graphics and visualization to explore data
CO3	Project data in different dimensions
CO4	Apply textual method of visualization in real world applications.
CO5	Apply animatic non photo realistic computer graphics for any applications
Course Name	*SOFTWARE QUALITY ASSURANCE*

CO1	Learn to document, control and manage software quality with the aid of tools and standards
CO2	Distinguish between various software quality models.
CO3	Measure and assess software quality through process and product metrics
CO4	Distinguish between the software quality standards.

Program Name	B.E (Electronics and Communication Engineering)
Semester	I
Course Name	**Technical English**
	On successful completion of the course the students will be able to:
CO1	Read technical texts and write area- specific texts effortlessly.
CO2	Listen and comprehend lectures and talks in their area of specialization successfully.
CO3	Speak appropriately and effectively in varied formal and informal contexts.
CO4	Understand the basic grammatical structures and its applications.
CO5	Write reports and winning job applications.
Course Name	**Engineering Mathematics-I**
	On successful completion of the course the students will be able to:
CO1	Develop the knowledge of basic linear algebraic concepts.
CO2	Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects.
CO3	Acquire the basic knowledge of ordinary differential calculus.
CO4	Compute maxima and minima of a function.
CO5	Apply Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields.
Course Name	**Engineering Physics**
	On successful completion of the course the students will be able to:
CO1	To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.
CO2	To understand basic concepts of high frequency sound waves and its applications.
CO3	To understand basic concepts of quantum mechanical behavior of wave and particle along with applications.
CO4	To understand the concepts of production of laser and its behavior with diffraction principle of interference.
CO5	To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication.
Course Name	**Engineering Chemistry**
	On successful completion of the course the students will be able to:

CO1	Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
CO2	Construct an electrochemical cell and Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.
CO3	Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes.
CO4	Differentiate the polymers used in day to day life based on its source, properties and applications.
CO5	Analyse the three types of fuels based on calorific value for selected application.
Course Name	**Problem Solving And Python Programming**
	On successful completion of the course the students will be able to:
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs.
CO3	Structure simple Python programs for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries.
Course Name	**Engineering Physics Laboratory**
	On successful completion of the course the students will be able to:
CO1	Understanding the moduli of elasticity by determining Young's modulus and Rigidity modulus of a beam and cylinder respectively.
CO2	Understanding the phenomenon of diffraction, dispersion and interference of light using optical component
CO3	Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid
CO4	Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity.
Course Name	**Problem Solving and Python Programming Laboratory**
	On successful completion of the course the students will be able to:
CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Develop Python programs step-wise by defining functions and calling them.
CO4	Use Python lists, tuples, dictionaries for representing compound data.
CO5	Read and write data from/to files in Python.

Course Name	Basic Civil and Mechanical Engineering
	On successful completion of the course the students will be able to:
CO1	The usage of surveying and properties of construction materials.
CO2	The stress strain of various building and material such as substructure, road transport and bridge.
CO3	The concept of manufacturing methods encountered in engineering practice such as foundry, welding and forging processes.
CO4	The working of internal combustion engines and its types.
CO5	The concept of energy conservation in practical, power plant refrigeration air condition and its types.
Course Name	Basic Mechanical Electrical and Instrumentation Engineering
	On successful completion of the course the students will be able to:
CO1	Learn the concept of manufacturing methods encountered in engineering practice such as foundry and welding processes
CO2	Know the working of internal combustion engines and the concept of sources of energy, working principle of refrigeration and air conditioning
CO3	Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.
CO4	Acquire a good understanding of DC and AC circuits
CO5	Understand the principles of measurement systems and transducers.
Course Name	Basic Electrical Electronics and Instrumentation Engineering
	On successful completion of the course the students will be able to:
CO1	Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws.
CO2	Acquire a good understanding of DC and AC circuits.
CO3	Demonstrate the characteristics of semiconductor devices.
CO4	Design the various logic gates for switching applications.
CO5	Understand the principles of measurement systems and transducers.
Course Name	Biology For Engineers
	On successful completion of the course the students will be able to:
CO1	To familiarize the basic organization of organisms and subsequent building to a living being
CO2	To provide knowledge about biological problems that require engineering expertise to solve them
CO3	To provide knowledge about biological problems that require engineering expertise to solve them

CO4	To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
CO5	To know about the nervous system, immune system and cell signaling
Semester	**II**
Course Name	**Communicative English**
	On successful completion of the course the students will be able to:
CO1	Comprehend conversations and talks delivered in English.
CO2	Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English
CO3	Read short stories, magazines, novels and other printed texts of a general kind.
CO4	Write short paragraphs, essays, letters and develop hints in English.
Course Name	**Engineering Mathematics-II**
	On successful completion of the course the students will be able to:
CO1	Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields.
CO2	Learn the basic concepts of analytic functions and transformations of complex functions
CO3	Master the integration in complex domain
CO4	Understand the use of improper integrals' applications in the core subject
Course Name	**Environmental Science and Engineering**
	On successful completion of the course the students will be able to:
CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
CO2	Public awareness of environmental is at infant stage
CO3	Ignorance and incomplete knowledge has led to misconceptions
CO4	Development and improvement in std. of living has led to serious environmental disasters
Course Name	**Engineering Graphics**
	On successful completion of the course the students will be able to:
CO1	Recognize the conventions and apply dimensioning concepts while drafting simple objects.
CO2	Draw the orthographic projection of points, line, and plane surfaces

CO3	Draw the orthographic projection of simple solids.
CO4	Draw the section of solid drawings and development of surfaces of the given objects
CO5	Apply the concepts of isometric and perspective
Course Name	**Electric Circuits And Electron Devices**
	On successful completion of the course the students will be able to:
CO1	Analyze the two port networks using different techniques
CO2	Compute transient response in RLC circuits
CO3	Describe the concept of intrinsic and extrinsic semiconductors and its characteristics
CO4	Explain the concept of transistor configurations and their applications
CO5	Recognize the various forms of semiconductors devices and their characteristics.
Course Name	**Engineering Chemistry Laboratory**
	On successful completion of the course the students will be able to:
CO1	Carry out the volumetric experiments and improve the analytical skills.
CO2	Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering.
CO3	Understand the principle and handling of electrochemical instruments and Spectrophotometer.
CO4	Apply their knowledge for protection of different metals from corrosion by using different inhibitors
Course Name	**Engineering Practice Laboratory**
	On successful completion of the course the students will be able to:
CO1	Prepare simple Lap, Butt and T- joints using arc welding equipments.
CO2	Prepare the rectangular trays and funnels by conducting sheet metal operation.
CO3	Prepare the pipe connections and identify the various components used in plumbing
CO4	Prepare simple wooden joints using wood working tools.
CO5	Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions
Course Name	**Circuits and Devices Laboratory**
	On successful completion of the course the students will be able to:
CO1	Demonstrate the different Laws for Network circuits
CO2	Analyze various Theorems for Network circuits

CO3	Determine the frequency response of resonance circuits
CO4	Compute the characteristics of various semiconductor devices
Semester	**III**
Course Name	**Engineering Mathematics-III**
	On successful completion of the course the students will be able to:
CO1	Know the methods to solve partial differential equations occurring in various physical and engineering problems.
CO2	Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.
CO3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.
CO4	Understand the effect of Fourier transform techniques and their applications.
CO5	Gain the concept of analysis of linear discrete system using z-transform approach
Course Name	**Signals and Systems**
	On successful completion of the course the students will be able to:
CO1	Categorize the properties and representation of discrete and continuous time signals.
CO2	Analyze the continuous time signal using Fourier and Laplace transform.
CO3	Determine total response, impulse response and frequency response of LTI-CT systems
CO4	Analyze the discrete time signals using Discrete Time Fourier Transforms and Z transform
CO5	Determine total response, impulse response and frequency response of LTI-DT systems
Course Name	**Fundamentals of Data Structures in C**
	On successful completion of the course the students will be able to:
CO1	Summarize the basic concepts of C
CO2	Develop programs for real time application using functions, structures, union
CO3	Gain knowledge on operations of linear data structures
CO4	Develop applications using nonlinear data structures
CO5	Apply appropriate sorting, searching technique for given problem.
Course Name	**Analog Electronics - I**

	On successful completion of the course the students will be able to:
CO1	Recognize various biasing technique and compensation technique for transistors
CO2	Design small signal and large signal amplifiers using BJT for various application
CO3	Design small signal amplifiers using FET and MOSFET
CO4	Design high and low frequency amplifiers and to calculate Bandwidth
CO5	Design Rectifiers and power supplies for various applications
Course Name	**Digital Electronics**
	On successful completion of the course the students will be able to:
CO1	Solve and implement various Boolean expression with minimized logic gates
CO2	Implement the various combinational circuits for real time applications
CO3	Design and analyze various sequential circuits like counters, registers, etc
CO4	Demonstrate the concept of memories and programmable logic devices.
CO5	Implement synchronous and asynchronous sequential circuits
Course Name	**Electromagnetic Fields**
	On successful completion of the course the students will be able to:
CO1	Evaluate the field potentials due to static charges
CO2	Explain the concepts of static magnetic fields
CO3	Demonstrate how materials affect electric and magnetic fields
CO4	Demonstrate the concepts of time varying magnetic field
CO5	Generalize the equation for Electromagnetic waves and its significance
Course Name	**Fundamentals of Data Structures in C Laboratory**
	On successful completion of the course the students will be able to:
CO1	Implement basic and advanced programs in C
CO2	Implement functions and recursive functions in C
CO3	Apply the different Linear Data Structures for Implementing Solutions to Practical Problems.
CO4	Apply and implement Graph Data Structures for Real Time Applications.
CO5	Implement various Searching, Sorting and hashing Algorithms.
Course Name	**Analog Electronics –I Laboratory**
	On successful completion of the course the students will be able to:

CO1	Design power supply circuits for various application
CO2	Calculate the gain of the amplifier
CO3	Measure the Bandwidth of Darlington amplifiers
CO4	Measure the CMRR value for differential amplifiers
CO5	Calculate the gain of the power amplifier
Course Name	**Digital Electronics Laboratory**
	On successful completion of the course the students will be able to:
CO1	Apply Digital ICs for various applications.
CO2	Apply the Magnitude comparator using MSI device
CO3	Apply the operation of Parity generator and checker using MSI device
CO4	Implement the various combinational circuits using MSI device.
CO5	Implement and analyze various sequential circuits using MSI device
Semester	**IV**
Course Name	**Probability and Random Processes**
	On successful completion of the course the students will be able to:
CO1	Imbibe the knowledge of basic probability
CO2	Aquaint the ability of fitting the real time problems into probability distribution modals and interpret.
CO3	Learn the concept of two dimensional random variables helps to understand and analyse the statistical measures which describe an outcome of a random experiment.
CO4	Understand and characterizing the random variable phenomenon which evolve with respect to time in a probabilistic approach.
CO5	Gain the concept of the linear system with random inputs.
Course Name	**Electrical Engineering and Instrumentation**
	On successful completion of the course the students will be able to:
CO1	Acquire a good understanding of basics of electrical machines.
CO2	Understanding the functions of transformer.
CO3	Emphasis knowledge in basic concepts of AC machines.
CO4	Be able to analyze the operation of DC and AC bridges and its measurements.
CO5	Be able to analyze operation of digital instrumentation system with their applications
Course Name	**Linear Integrated Circuits**

	On successful completion of the course the students will be able to:
CO1	Explain the principle of operational amplifier and its characteristics
CO2	Demonstrate the various applications of operational amplifier
CO3	Generalize the theory of phased lock loop and its characteristics
CO4	Examine the concept of A-D and D-A converters using operational amplifier
CO5	Summarize how operational amplifier can be modeled as voltage regulator and Special function IC
Course Name	**Analog Electronics -II**
	On successful completion of the course the students will be able to:
CO1	Design the various types of feedback amplifiers for single and multi stage modes
CO2	Identify the various types of tuned amplifiers
CO3	Interpret the operation of oscillators for different real time applications
CO4	Demonstrate the concept of clampers, multi-vibrators and wave shaping circuits
CO5	Manipulate the features of ramp generators, sine wave converters and time base generators
Course Name	**Control Systems Engineering**
	On successful completion of the course the students will be able to:
CO1	Identify the various control system components and their representations.
CO2	Analyze the various time domain parameters.
CO3	Analysis the various frequency response plots and its system.
CO4	Apply the concepts of various system stability criterions.
CO5	Design various transfer functions of digital control system using state variable models.
Course Name	**Electrical Engineering Laboratory**
	On successful completion of the course the students will be able to:
CO1	Calculation of EMF equation for the self-excited generators.
CO2	Ability to analyze the various parameters of the motor and transformer.
CO3	Analyze and study the displacement and pressure transducers.
CO4	Ability to make measurements and interpret data on various bridges.
CO5	Compare and contrast calibrations of single phase energy meter and current
Course Name	**Linear Integrated Circuit Laboratory**

		On successful completion of the course the students will be able to:
	CO1	Determine the Characteristics of op-amp
	CO2	Modify the op-amp circuits for various applications
	CO3	Extrapolate wave shaping circuits using op-amp
	CO4	Describe the power supplies and its regulation
	CO5	Design op-amp circuits for various applications by using Multisim tool
Course Name	**Analog Electronics-II Laboratory**	
		On successful completion of the course the students will be able to:
	CO1	Measure the frequency response of Negative feedback amplifiers using discrete BJT
	CO2	Design an oscillator circuits using discrete BJT
	CO3	Construct the Wave Shaping Circuits using discrete BJT
	CO4	Demonstrate the multi-vibrators using discrete BJT
	CO5	Design Negative feedback amplifiers, Multi-vibrators, Boot strap ramp generator and Miller Integrator Ramp generator using Multisim tool
Course Name	**Industrial Electronics**	
		On successful completion of the course the students will be able to:
	CO1	Explain the behavior of SCR and TRIAC circuits
	CO2	Design the voltage regulators using SCR and various speed control methods
	CO3	Identify the thermal losses and Manipulate the Industrial Heating under RF
	CO4	Recognize the various Industrial Timing Circuits
	CO5	Develop the PLC programming for industrial applications
Course Name	**Consumer Electronics**	
		On successful completion of the course the students will be able to:
	CO1	Explain the concepts of audio system and processing
	CO2	Describe the operation of Television system and DTH
	CO3	Demonstrate the functions Telecommunication systems
	CO4	Show the various commercial electronic applications
	CO5	Show the various domestic electronic applications
Course Name	**Green Electronics**	
		On successful completion of the course the students will be able to:

CO1	Recognize the importance of various environmental regulations in different major countries around the world and the need for compliance with these regulations.
CO2	Describe the process, design techniques, manufacturing of green electronics systems and assessment of the environmental hazards and suggest ways to reduce them.
CO3	Apply the principles and practices of green electronics in selected consumer products.
CO4	Analyze the reliability of green electronic systems
CO5	Describe the significance of green electronics to nanotechnology domain
Course Name	**Optoelectronic Devices**
	On successful completion of the course the students will be able to:
CO1	Explain the Polarization, Interference and diffraction of light
CO2	Demonstrate the operation of LASER and various display devices
CO3	Describe the various optical detection devices like photo detector, thermal detector, photo diodes etc..,
CO4	Extrapolate the application of optoelectronic devices as different optical modulator
CO5	Explain the opto-electronics integrated circuits and guided wave devices
Course Name	**PCB Design**
	On successful completion of the course the students will be able to:
CO1	Explain the concepts of connectivity, components and manufacturing of PCB
CO2	Manipulate various drawing and design rules in Layout planning and design of PCB
CO3	Extrapolate the design rules for Analog and Digital circuits
CO4	Describe the concept of various image transfer techniques
CO5	Identify the defects in Plating and Etching process
Course Name	**Solid state devices**
	On successful completion of the course the students will be able to:
CO1	Describe the crystal structures of elements used for fabrication of semiconductor devices.
CO2	Explain the concept of fermi levels, movement of charge carriers, Diffusion current and Drift current.
CO3	Describe the characteristics, operations of various MOSFET
CO4	Identify the various opto-electronics devices

CO5	Demonstrate the operation of different high power devices like tunnel diodes, IMPATT, TRAPATT etc
Semester	**V**
Course Name	**Digital Signal Processing**
	On successful completion of the course the students will be able to:
CO1	Calculate the FFT of a discrete time signal.
CO2	Demonstrate various FIR filter techniques.
CO3	Demonstrate various IIR filter techniques.
CO4	Summarize finite word length effects in signal processing.
CO5	Explain the fundamentals of Digital signal processor.
Course Name	**Microprocessors and Microcontrollers**
	On successful completion of the course the students will be able to:
CO1	Recognize the basic microprocessor architecture and its concepts.
CO2	Outline the concepts of peripheral interfacing mechanisms.
CO3	Design various assembly language programming using microprocessors and microcontroller.
CO4	Extend the real world interfacing with microcontroller
CO5	Extrapolate the architecture of PIC microcontroller and its addressing modes .
Course Name	**Communication Theory**
	On successful completion of the course the students will be able to:
CO1	Understand the modulation and its significance
CO2	Analyze the different modulation systems
CO3	Understand the working principle of AM and FM transmitters and receivers.
CO4	Understand the frequency characteristics of noise.
CO5	Calculate and analyze noise performance in various receivers.
Course Name	**Computer Communication and Networks**
	On successful completion of the course the students will be able to:
CO1	Implement the concept of various parameters in application layer
CO2	Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
CO3	Configure the various network layers and IP standards IPV4, IPV6

CO4	Implement various multiple access protocols point to point protocols and 802.11 standards
CO5	Understand concepts in network security layers like cryptography, firewall, intrusion detection system and elements of QoS
Course Name	**Transmission Lines and Waveguides**
	On successful completion of the course the students will be able to:
CO1	Discuss the propagation of signals through transmission lines
CO2	Analyze signal propagation at radio frequencies
CO3	Explain propagation of RF signals in guided systems
CO4	Elaborate the concept of waveguide mechanism.
CO5	Utilize cavity resonators
Course Name	**Digital Signal Processing Laboratory**
	On successful completion of the course the students will be able to:
CO1	Implement the signal processing techniques in time domain using MATLAB
CO2	Compute the signals in frequency domain using MATLAB.
CO3	Produce Simulink model for signal generation.
CO4	Manipulate the Audio signals using MATLAB.
CO5	Analyze the signal processing techniques using TMS320C5X DSP Processor.
Course Name	**Microprocessors and Microcontrollers Laboratory**
	On successful completion of the course the students will be able to:
CO1	Generate the code for arithmetic operations in assembly language
CO2	Generalize the developed code using 8085, 8086 processors and 8051 controllers
CO3	Identify the bugs in the assembly code using 8085, 8086 processors and 8051 controllers
CO4	Reorganize the Interfacing peripherals with microprocessor and microcontroller
CO5	Propose the new design for real world applications.
Course Name	**Computer Networks Laboratory**
	On successful completion of the course the students will be able to:
CO1	Implement Error Detecting Codes, IP subnet, LAN protocols
CO2	Understand CSMA/CD Protocol, Token ring and Token Bus protocols

CO3	Understand various protocols in transport layer like stop and wait go-back-N, TCP etc
CO4	Implement various routing algorithms like Distance vector and link state routing algorithm
CO5	Simulate various algorithm in NS2 software
Semester	**VI**
Course Name	**Digital Communication**
	On successful completion of the course the students will be able to:
CO1	Demonstrate of sampling and waveform coding related to digital hierarchy.
CO2	Implement the band limited signaling in the various digital transmissions.
CO3	Analyze the BER for the different digital modulations.
CO4	Apply the concept of error control coding to detect and correct the error in digital data transmission.
CO5	Understand the concept of spread spectrum modulation to obtain secure communication.
Course Name	**VLSI Design**
	On successful completion of the course the students will be able to:
CO1	Discuss the different design hierarchy of the CMOS circuits.
CO2	Determine the various characteristics of the MOS transistor.
CO3	Design the inverter and logic gates using the CMOS technology.
CO4	Perform the testing and fault modeling in any design.
CO5	Write Programs based on the VHDL structure
Course Name	**Cellular and Mobile Communication**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in multiple access techniques and cellular concepts
CO2	Demonstrate the mobile propagating mechanism
CO3	Acquire knowledge in modulation techniques and mobile antennas
CO4	Recall the different speech coding techniques in vocoders
CO5	Identify the various Cellular Standards by their architecture
Course Name	**Principles of management**
	On successful completion of the course the students will be able to:
CO1	Categorize the development and types of business of organization.
CO2	Demonstration of the various strategies for the planning and decision making.

CO3	Illustrate the various functional area of organization.
CO4	Integration of the innovative and creative objectives for job enrichment.
CO5	Propose to control various issues in the global environment
Course Name	**VLSI Design Laboratory**
	On successful completion of the course the students will be able to:
CO1	Analyze the PLL characteristics and its applications.
CO2	Understand the difference between the modulation and demodulation techniques.
CO3	Implement various detection process of analog and digital communication.
Course Name	**Analog and Digital Communication Systems Laboratory**
	On successful completion of the course the students will be able to:
CO1	Design and simulate various sequential and combinational logic circuits with VHDL programs.
CO2	Design and implement the different adders and multipliers using FPGA kit.
CO3	Design CMOS circuits for the DC and transient analysis.
Course Name	**Digital Image Processing**
	On successful completion of the course the students will be able to:
CO1	Compute the mathematical transforms for images.
CO2	Analyze Image by designing spatial and frequency domain filters.
CO3	Describe the concepts of image segmentation and pattern recognition and to develop an object recognition system.
CO4	List the various image segmentation and representation process
CO5	Explain the Image compression process
Course Name	**Robotics Engineering**
	On successful completion of the course the students will be able to:
CO1	Write programs for programmable Logic devices
CO2	Implement and realization of SM charts
CO3	Implement and realize digital design in FPGA
CO4	Write program using RISC
CO5	Write Programs in VHDL
Course Name	**Information Theory Coding**
	On successful completion of the course the students will be able to:
CO1	Acquire Knowledge in Information entropy, channel capacity

CO2	Apply various source coding techniques
CO3	Implement various compression techniques in relevant application
CO4	Acquire Knowledge in Error control codes
CO5	Apply various decoding techniques in Block codes and Convolutional codes
Course Name	**Soft Computing and Applications**
	On successful completion of the course the students will be able to:
CO1	Describe the concept of Conventional and Computational AI
CO2	Discuss the Genetic Algorithms and Application
CO3	Describe the Neural Network concepts
CO4	Discuss the Fuzzy Logic Concepts
Course Name	**Speech Processing**
	On successful completion of the course the students will be able to:
CO1	Model speech signal digitally
CO2	Measure and analyze the parameters of speech.
CO3	Perform the various analytical methods in frequency domain.
CO4	Explain the predictive technique for speech compression.
CO5	Perform the homomorphic analysis on speech.
Semester	**VII**
Course Name	**Adhoc and Wireless Sensor Networks**
	On successful completion of the course the students will be able to:
CO1	Outline the basics of Ad hoc networks and Routing protocols.
CO2	Illustrate various Sensor network architectures
CO3	Summarize appropriate physical and MAC layer protocols
CO4	Identify the sensor network security and attacks
CO5	Experiment with sensor network programming and tools
Course Name	**Optical Communication**
	On successful completion of the course the students will be able to:
CO1	Predict the different characteristics of the optical links.
CO2	Detect signal loss while designing the transceivers.
CO3	Summarize the optical sources and detectors with their effects.

CO4	Justify the suitable receivers and couplers in the transceiver design.
CO5	Design digital transmission systems with optical fibers.
Course Name	**Antenna and Microwave Engineering**
	On successful completion of the course the students will be able to:
CO1	Apply the basic principles and evaluate antenna parameters and link power budgets
CO2	Design and assess the performance of various antennas
CO3	Design a microwave system given the application specifications
CO4	Gain knowledge in various passive and active microwave devices
CO5	Perform the various microwave designs .
Course Name	**Embedded Systems**
	On successful completion of the course the students will be able to:
CO1	Identify the basic concepts and architecture of the embedded systems.
CO2	Summarize the various concepts of the RTOS and OS.
CO3	Write program for embedded system
CO4	Gain knowledge on various communication protocols.
CO5	Perform the design in various concepts for real time application models.
Course Name	**Optical and Microwave Laboratory**
	On successful completion of the course the students will be able to:
CO1	Analyze S parameter and VSWR measurements of microwave components
CO2	Identify the Radiation pattern of Horn and reflector antenna
CO3	Outline basic of light propagation and mode characteristics through optical Fiber
CO4	Estimate the operations of optical networks
CO5	Demonstrate the microwave work bench with various components
Course Name	**Electronic System Design Laboratory**
	On successful completion of the course the students will be able to:
CO1	Recall the concept of regulator, SCR and timer circuit designs.
CO2	Analyze various transducers interfacing with microprocessor.
CO3	Devise modulation schemes using MATLAB
CO4	Extrapolate DTMF generation & detection using MATLAB
CO5	Demonstrate PCB Layout design using CAD

Course Name	Advanced Digital Signal Processing
	On successful completion of the course the students will be able to:
CO1	Analyze the signal parameters in time and frequency domain
CO2	Compute statistical parameter of the signal
CO3	Design and develop Adaptive filters
CO4	Implement Sub-band coding for various Applications
CO5	Compute spectral estimation
Course Name	RF System Design
	On successful completion of the course the students will be able to:
CO1	Describe the various passive and active components for radio frequency circuit
CO2	Analyze RF filters based on smith chart.
CO3	Analyze the biasing methods for RF amplifiers.
CO4	Compare the various RF amplifiers and their performance.
CO5	Design oscillators and mixers for various applications.
Course Name	Multimedia Compression Techniques
	On successful completion of the course the students will be able to:
CO1	Understand the various requirements of the multimedia compression techniques.
CO2	Implement text compression using the LZW algorithms and coding techniques.
CO3	Acquire knowledge in the various audio compression techniques and its applications.
CO4	Design and analyze of images compression using wavelet-based compression.
Course Name	Nano Technology
	On successful completion of the course the students will be able to:
CO1	Extrapolate the basics for understanding blooming Nano technologies.
CO2	Describe the Nano materials for designing new applications.
CO3	Utilize of the nano particles and nano shells in various industrial applications.
CO4	Design various applications with the knowledge in Nano interfaces.
CO5	Design system with the updation of global issues.
Course Name	Neural Networks and its Applications

		On successful completion of the course the students will be able to:
	CO1	Recall the Principles of Neural Networks
	CO2	Understand the unsupervised learning networks
	CO3	Analysis the principles of associative memories and SOM
	CO4	Design Fuzzy rules and Measures.
	CO5	Explain the thoughts of Fuzzy Logic applications
Course Name		**Optical Networks**
		On successful completion of the course the students will be able to:
	CO1	Apply the concepts of the optical networks and components.
	CO2	Analyze the single and multihop networks.
	CO3	Recite the optical switching and their effects.
	CO4	Identify the operation of various optical networks.
	CO5	Apply the concepts of routing and Multicasting.
Course Name		**Cognitive Radio**
		On successful completion of the course the students will be able to:
	CO1	Describe the basics of the software defined radios.
	CO2	Analysis the principles of SDR Architecture
	CO3	Design the wireless networks based on the cognitive radios.
	CO4	Understanding of cognitive techniques
	CO5	Explain the concepts behind the wireless networks and next generation network.
Course Name		**Wireless Networks**
		On successful completion of the course the students will be able to:
	CO1	Recognize the fundamentals of WLAN technology.
	CO2	Outline various functions of the mobile network layer.
	CO3	Summarize the functions of the Transport layer and its various protocols.
	CO4	Point out the Various wide area network concepts.
	CO5	Extrapolate Features and Challenges of 4G networks.
Course Name		**Telecommunication Switching Networks**
		On successful completion of the course the students will be able to:
	CO1	Implement the different multiplexing technique

CO2	understand the concept of switching
CO3	synchronize, control and managing the Network
CO4	Identify the different methods for subscriber access
CO5	Analyze and route the traffic in the peak hours
Course Name	**Advanced Microcontrollers**
	On successful completion of the course the students will be able to:
CO1	Distinguish between RISC AND CISC processor architecture.
CO2	Outline the RL-78 Microcontroller architecture.
CO3	Illustrate the MSP 430 Microcontroller architecture.
CO4	Recognize various peripheral interface in MSP 430.
CO5	Categorize the different communication interface in real time environment.
Course Name	**Detection and Estimation Theory**
	On successful completion of the course the students will be able to:
CO1	Interpolate the meaning and method of hypothesis testing
CO2	Develop the principles of signal detection in relevant situations
CO3	Design the various algorithms to estimate random parameters of signals
CO4	Demonstrate the minimum variance unbiased methods and its application to various problems
CO5	Assess the different methods used for the estimation of non-random param
Course Name	**CMOS Analog IC Design**
	On successful completion of the course the students will be able to:
CO1	Extrapolate the concepts of Analog MOS devices and current mirror circuits.
CO2	Summarize the different configuration of Amplifiers and feedback circuits.
CO3	Point out the characteristics of frequency response of the amplifier and its noise.
CO4	Recognize the performance of the stability and frequency compensation techniques of OpAmp Circuits.
CO5	Outline and Construct switched capacitor circuits and PLLs.
Course Name	**Disaster Mitigation and Management**
	On successful completion of the course the students will be able to:
CO1	Create Awareness about disaster
CO2	Summarize the technology for disaster risk reduction

CO3	Outline the inter relationships between disasters and development.
CO4	Illustrate the disaster risk management in india
CO5	Analyse the case studies and field works in disaster management.
Semester	**VIII**
Course Name	**Electromagnetic Interference and Compatibility**
	On successful completion of the course the students will be able to:
CO1	Ability to understand the concepts in EMI/EMC.
CO2	Ability to understand the EMI coupling principles
CO3	Implementation of EMI control techniques such as grounding, shielding, filtering.
CO4	Implementation of EMC in equipment design of PCB.
CO5	Analyzing the various parameters with the knowledge of the measurements and standards.
Course Name	**ARM System Architecture and applications**
	On successful completion of the course the students will be able to:
CO1	Describe the ARM architecture
CO2	Explain the architecture for high level language
CO3	Build the architecture for system development
CO4	Explain the memory of ARM
CO5	Implement ARM in Embedded applications
Course Name	**Radar and Navigational Aids**
	On successful completion of the course the students will be able to:
CO1	Discuss the fundamentals of RADAR
CO2	Describe the types of RADAR
CO3	Explain the transceiver of RADAR
CO4	Demonstrate the different methods of direction finding
CO5	Demonstrate the various methods navigation in RADAR
Course Name	**Parallel and Distributed Processing**
	On successful completion of the course the students will be able to:
CO1	Articulate the principles and standard practices underlying the design of distributed and parallel systems.
CO2	Explain the core issues of distributed and parallel systems.

CO3	Appreciate the difficulties in implementing basic communication in parallel and distributed systems.
CO4	Have knowledge on the substantial difficulty in designing parallel and distributed algorithms in comparison to centralized algorithms.
CO5	Appreciate the issues in distributed operating system, resource management and fault tolerance
Course Name	**Compressive sensing**
	On successful completion of the course the students will be able to:
CO1	Utilize knowledge about compression in a Data Acquisition System.
CO2	Classify signal representation and properties.
CO3	Relate the various algorithms in compression.
CO4	Point out compressive sensing in Wireless Sensor Network.
CO5	Formulate the various applications in compressive sensing.
Course Name	**MEMS and NEMS**
	On successful completion of the course the students will be able to:
CO1	Learn fundamental knowledge about micro & nano electro mechanical systems.
CO2	Understand the theoretical knowledge in micro machining and fabrication techniques
CO3	Learn the basic knowledge about micro sensors.
CO4	Build knowledge on micro actuators.
CO5	Acquire knowledge about Nanoscale systems/structures, synthesis and characterization procedures for Nano materials
Course Name	**ASIC Design**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in various physical design in ASIC.
CO2	Understand the concept of ASIC Logic Cells and ASIC I/O Cells.
CO3	Design Programmable ASIC Architecture.
CO4	Use the simulation techniques at various levels in ASIC design flow.
CO5	Design ASIC and FPGA based floor planning and placement of cells for optimized area and speed.
Course Name	**SATELLITE COMMUNICATION**
	On successful completion of the course the students will be able to:
CO1	Analyze different orbital elements.
CO2	Control the space craft subsystems and design link budget analysis.

CO3	Apply multiple access technique for Satellite Communication.
CO4	Describe the various types of Earth Segments.
CO5	Understand different applications of Satellite.
Course Name	**Microwave Integrated Circuits Design**
	On successful completion of the course the students will be able to:
CO1	Realize the couplers and microstrip lines
CO2	Realize the filters using microstrip lines
CO3	Analyze the various amplifiers parameters like power gain, stability issues for MICs
CO4	Examine the oscillation and stability conditions of different Microwave oscillators
CO5	Identify various Microwave mixers for desired applications
Course Name	**LOW POWER VLSI DESIGN**
	On successful completion of the course the students will be able to:
CO1	Analyze the power dissipation in various CMOS circuits
CO2	Outline the mechanisms of power dissipation in CMOS integrated circuits;
CO3	Design the various low power circuits
CO4	Estimate power analysis of low power combinational circuits and sequential circuits
CO5	Summarize the synthesis and software design of circuit-level and system-level power optimization techniques.
Course Name	**Advanced Wireless Communication**
	On successful completion of the course the students will be able to:
CO1	Design the wireless communication channels.
CO2	Implement new techniques and demonstrate their feasibility using mathematical validations and simulation tools.
CO3	Demonstrate the space time block codes
CO4	demonstrate the space time trellis codes
CO5	Select the optimal access for layered space time codes
Course Name	**DSP PROCESSOR ARCHITECTURE AND PROGRAMMING**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in the fundamentals of the DSP'S.
CO2	Understand the concept of TMS320C3X Processor
CO3	Demonstrate their ability to program the ADSP Processors

CO4	Explain the architecture for TMS320C54X
CO5	Discuss, compare and select the suitable Advanced Processors for real-time signal processing applications

Program Name	B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)
Semester	I
Course Name	TECHNICAL ENGLISH - I
	On successful completion of the course the students will be able to:
CO1	The ability to comprehend facets of grammar, wide range of vocabulary so as to be equipped to present opinions and ideas in a convincing manner.
CO2	The ability to be proactively read, listen, speak and present facts in a persuasive manner in both oral and written medium.
CO3	The ability to interact, translate and delegate information.
CO4	The ability to carry out extempore discussions, document and elucidate ideas.
Course Name	ENGINEERING MATHEMATICS-I
	On successful completion of the course the students will be able to:
CO1	Developing the knowledge of basic linear algebraic concepts.
CO2	Determining the solutions of ordinary differential equations by various methods which have an application in their core subjects.
CO3	Acquiring the basic knowledge of ordinary and partial differential calculus.
CO4	Knowing the methods to solve partial differential equations occurring in various physical and engineering problems.
Course Name	ENGINEERING PHYSICS
	On successful completion of the course the students will be able to:
CO1	To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.
CO2	To understand basic concepts of high frequency sound waves and its applications and also quantum mechanical behaviour of wave and particle along with applications.
CO3	To understand the concepts of production of laser and its behaviour with diffraction principle of interference and polarization phenomenon and thereby its applications in fiber optic communication.
Course Name	ENGINEERING CHEMISTRY
	On successful completion of the course the students will be able to:
CO1	Understanding the concepts of electrochemistry and Energy storage devices
CO2	Understanding the chemistry of Corrosion
CO3	Applying the basic concepts of thermodynamics for engineering stream
CO4	Understanding the basic concepts of phase equilibrium
CO5	Developing the knowledge of chemistry behind water technology
Course Name	ELECTRON DEVICES
	On successful completion of the course the students will be able to:

CO1	Emphasis knowledge on construction, characteristics of various devices.
CO2	Gain adequate knowledge for modeling practical circuits using in the field of P-N junction diode, transistors, Field Effect transistor.
CO3	Understanding the circuit design of
CO4	Different oscillator circuits.
Course Name	*FUNDAMENTALS OF COMPUTING & C PROGRAMMING*
	On successful completion of the course the students will be able to:
CO1	Able to acquire knowledge in Computer, Internet basics and problem solving methods.
CO2	Able to understand and implement the programs in C using arrays, functions and structures.
CO3	Able to design and develop applications using pointer concepts and file handling
Course Name	*INTRODUCTION TO BIOMEDICAL ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	The ability to understand the role of Biomedical Engineers
CO2	The ability to know the fundamentals of diagnostic devices
CO3	The ability to know the principles of radiological equipments
CO4	The ability to know the fundamentals of therapeutic equipments
CO5	The ability to know about various type of analyzers
Course Name	*BASIC ELECTRICAL AND ELECTRONICS ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Recognise the different combinations of circuit elements and solving the circuit by applying basic circuital laws.
CO2	Acquire a good understanding of basics of electrical machines
CO3	Emphasis knowledge on construction, characteristics of various devices.
CO4	Emphasis knowledge on fundamental concept of decimal number system and represent number system in powers of base
Course Name	*BASICS OF CIVIL AND MECHANICAL ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	An ability to know the various types of bridges and dams and to have knowledge on
CO2	basics of interior design and landscape.
CO3	An ability to learn the manufacturing processes like foundry, welding and forging.
Course Name	*ENGINEERING PHYSICS LAB*
	On successful completion of the course the students will be able to:
CO1	Understanding the moduli of elasticity by determining Young's modulus and
CO2	Rigidity modulus of a beam and cylinder respectively

CO3	Understanding the phenomenon of diffraction, dispersion and interference of light using optical components
CO4	Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid
Course Name	**ENGINEERING PRACTICES LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Prepare simple Lap, Butt and T- joints using arc welding equipments.
CO2	Prepare the pipe connections and identify the various components used in plumbing.
CO3	Prepare simple wooden joints using wood working tools.
CO4	Demonstrate basic electrical, electronic and computer components based on their
Course Name	**COMPUTER PRACTICES LAB**
	On successful completion of the course the students will be able to:
CO1	efficiently apply MS-Word and MS-Excel for creating document & spreadsheets for various applications
CO2	design presentation using MS-PowerPoint with animation effects.
CO3	Write and compile programs using C-Language.
CO4	Develop programs in C for any computing problems
Course Name	**UNIX AND SHELL PROGRAMMING LAB**
	On successful completion of the course the students will be able to:
CO1	Work confidently in Unix/Linux environment
CO2	Write shell scripts to automate various tasks
CO3	use the basics of linux administration Commands
CO4	Write shell scripts that use selection and loops.
Course Name	**CAD & MODELING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Ability to use the software packers for drafting and modeling.
CO2	Ability to create 2D and 3D models of engineering components
CO3	Students will be able to create simple sheet metal parts and generate unfolded views.
Course Name	**ELECTRON DEVICES LAB**
	On successful completion of the course the students will be able to:
CO1	Select the suitable range of meters for the given circuit and set the appropriate values of circuit elements and energy sources as per the requirement.
CO2	The student should be able to learn the characteristics of basic electronic devices.
CO3	Ability to understand the practical application of various electronic circuits.

CO4	Ability to understand the practical application of amplifiers and oscillators.
Semester	**II**
Course Name	*TECHNICAL ENGLISH - II*
	On successful completion of the course the students will be able to:
CO1	The ability to strengthen technical writing and speaking
CO2	The ability to be proactively read, listen, speak and present facts in a persuasive manner in both oral and written medium
CO3	The ability to interact, translate and delegate information,
CO4	The ability to face various levels of competitive examinations to upgrade educational and career options
Course Name	*ENGINEERING MATHEMATICS-II*
	On successful completion of the course the students will be able to:
CO1	Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields.
CO2	Learn the basic concepts of analytic functions and transformations of complex functions.
CO3	Master the integration in complex domain.
CO4	Understand the use of improper integrals' applications in the core subject.
Course Name	*APPLIED PHYSICS*
	On successful completion of the course the students will be able to:
CO1	Analyzing and identifying the crystal structure and lattice parameters in solid materials.
CO2	Understanding the physical properties and concept of classical and quantum theories for electron behaviour in conducting materials
CO3	Determining the carrier concentration and electrical conductivity of intrinsic and extrinsic semiconductors.
CO4	Understanding the various polarization mechanisms in dielectrics and the techniques to manufacture nano materials for engineering applications.
CO5	Acquiring the knowledge about nuclear physics in energy production and the phenomenon of thermal conductivity through different media of materials.
Course Name	*OBJECT ORIENTED PROGRAMMING*
	On successful completion of the course the students will be able to:
CO1	Acquire the deep knowledge on Object Oriented Programming concepts.
CO2	Develop solutions for given problems using class object concepts.
CO3	Make use of Polymorphism and Inheritance concepts to solve real world problems.
CO4	Understand the usage of virtual functions and templates in various applications.
CO5	Develop and implement File I/O Operations and Exception handling mechanisms.
Course Name	*ELECTRIC CIRCUITS AND ELECTRON DEVICES*

	On successful completion of the course the students will be able to:
CO1	Analyze the two port networks using different techniques
CO2	Compute transient response in RLC circuits
CO3	Describe the concept of intrinsic and extrinsic semiconductors and its characteristics
CO4	Explain the concept of transistor configurations and their applications
CO5	Recognize the various forms of semiconductors devices and their characteristics
Course Name	***ESSENTIALS OF INFORMATION TECHNOLOGY***
	On successful completion of the course the students will be able to:
CO1	Able to design and deploy web-sites
CO2	Able to design and deploy simple web-applications
CO3	Able to create simple database applications
CO4	Able to develop information system
CO5	Able to describe the basics of networking and mobile communications
Course Name	***BIOLOGY FOR ENGINEERS***
	On successful completion of the course the students will be able to:
CO1	Be familiar with the basic organization of organisms and subsequent building to a living being
CO2	Be Understand the concepts of biochemistry and molecular aspects of life
CO3	Be Understand the machinery of the cell functions that is ultimately responsible for various daily activities
CO4	Have knowledge about biological problems that require engineering expertise to solve them.
Course Name	***ENGINEERING CHEMISTRY LAB***
	On successful completion of the course the students will be able to:
CO1	Carry out the volumetric experiments and improve the analytical skills.
CO2	Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering
CO3	Understand the principle and handling of electrochemical instruments and Spectrophotometer.
CO4	Apply their knowledge for protection of different metals from corrosion by using different inhibitors
Course Name	***OBJECT ORIENTED PROGRAMMING LAB***
	On successful completion of the course the students will be able to:
CO1	Implement class, object, constructors concepts by using object oriented programming language
CO2	Designs, develop programs using inheritance and polymorphism
CO3	Implement various file concepts, exception handling in object oriented programming.
CO4	Construct generic classes using templates.

Course Name	ELECTRIC CIRCUITS LAB
	On successful completion of the course the students will be able to:
CO1	Selecting the suitable range of meters and rheostats for the given circuit and set the appropriate values of circuit elements and energy sources as per the requirement.
CO2	Applying basic circuital laws to confirm the practical values of the current through and voltage across different elements of the circuit with that of the theoretical values.
CO3	Applying theorems to simplify the electric circuits.
CO4	Illustrating the transient response and frequency response of RLC circuits
Course Name	CIRCUIT AND DEVICES LAB
	On successful completion of the course the students will be able to:
CO1	Demonstrate the different Laws for Network circuits
CO2	Analyze various Theorems for Network circuits
CO3	Determine the frequency response of resonance circuits
CO4	Compute the characteristics of various semiconductor devices
Course Name	FUNDAMENTALS OF MAT LAB
	On successful completion of the course the students will be able to:
CO1	Learn the MATLAB environment and its programming fundamentals
CO2	write Programs using commands and functions
CO3	Handle polynomials, and use 2D Graphic commands
CO4	Familiarize the Simulink environment.
CO5	Study Mat lab toolboxes.
Course Name	BASIC WORKSHOP PRACTICES LAB
	On successful completion of the course the students will be able to:
CO1	Students will be able to prepare the pipe connections and identify the various components used in plumbing.
CO2	An ability to prepare simple wooden joints using wood working tools.
CO3	An ability to prepare simple lap, butt and tee joints using arc welding equipment's.
CO4	Able to demonstrate the preparation of simple components using lathe and drilling machine.
CO5	Able to demonstrate the forging operations and preparation of sand mould.
Semester	III
Course Name	318MAT01/ENGINEERING MATHEMATICS III
	On successful completion of the course the students will be able to:
CO1	Gaining the concept of analysis of linear discrete system using Z-transform approach.

CO2	Applying Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields
CO3	Describing an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply. Acquiring the knowledge to construct partial differential equations for various physical and engineering real time problems and obtaining solution using Fourier series methods.
CO4	Gaining the concept of analysis of linear discrete system using Z-transform approach.
CO5	Understanding the effect of Fourier transform techniques and their applications.
Course Name	**318EET02/ELECTROMAGNETIC THEORY**
	On successful completion of the course the students will be able to:
CO1	Learnt mathematical operations of three dimensional vectors related to electromagnetic fields
CO2	Gained the acquaintance in applications of Poisson's and Laplace's equations
CO3	Acquired the knowledge in applications of Biot-Savart's Law and Ampere's Circuital law.
CO4	Gained the indulgent of the Maxwell's equations and its applications.
CO5	Attained the knowledge in principles of propagation of plane waves.
Course Name	**318EET03/NETWORK ANALYSIS AND SYNTHESIS**
	On successful completion of the course the students will be able to:
CO1	Gained the knowledge of network topology.
CO2	Learnt about apply Fourier transforms to analyze electrical networks.
CO3	Learnt network functions and two-port parameters.
CO4	Learnt about apply to synthesis techniques.
CO5	Able to design k and m filters and exposure to synthesis techniques.
Course Name	**318EET04/LINEAR INTEGRATED CIRCUITS AND APPLICATIONS**
	On successful completion of the course the students will be able to:
CO1	Obtained the knowledge of ICs and their applications
CO2	Ability to fabricate and design the circuits using ICs.
CO3	Able to analyze and describe the characteristics of Op amps.
CO4	Learnt about Analyze Timers, PLL circuits and regulator Circuits
C05	Able to analyze different application ICs.
Course Name	**318EET05/MEASUREMENTS AND INSTRUMENTATION**
	On successful completion of the course the students will be able to:
CO1	Be able to analyze the performance characteristics and calibration of an instrumentation system
CO2	Understand the operation of various types of Potentiometers and bridges.
CO3	Select and apply analog and digital techniques to measure voltage, current, energy, power etc.

CO4	Elaborate knowledge about storage and display devices.
CO5	Exposure to various transducers and data acquisition systems.
Course Name	*318EET06/FUNDAMENTALS OF DATA STRUCTURES IN 'C'*
CO1	Summarize the basic concepts of C
CO2	Develop programs for realtime application using functions, structures, union
CO3	Gain knowledge on operations of linear data structures
CO4	Develop applications using nonlinear data structures
CO5	Apply appropriate sorting, searching technique for given problem.
Course Name	**318EEE07/BIO MEDICAL INSTRUMENTATION**
	On successful completion of the course the students will be able to:
CO1	Understood the physiological parameters of various systems of human body.
CO2	Recognized and learnt about the transducers used for the measurement of physiological parameters.
CO3	Acquired knowledge of different types of lead systems to record the waveforms.
CO4	Able to demonstrate various equipments
CO5	Able to demonstrate the usage of assisting and therapeutic equipment
Course Name	*318EEE08/ELECTRONIC INSTRUMENTATION*
	On successful completion of the course the students will be able to:
CO1	Learnt the concepts of moving coil and moving iron meters, various types of bridges and transducers
CO2	Obtained knowledge of Function generators and Storage oscilloscopes
CO3	Gained the knowledge of digital data acquisition system
CO4	Understood about virtual instrumentation
CO5	Understood about Lab view software
Course Name	*318EEE09/ELECTRICAL AND ELECTRONIC INSTRUMENTATION*
	On successful completion of the course the students will be able to:
CO1	Learnt the concepts of moving coil and moving iron meters.
CO2	Gained knowledge of different bridge circuits.
CO3	Obtained knowledge of Function generators and Storage oscilloscopes.
CO4	Understood about various analyzers.
CO5	Understood about various recording devices
Course Name	*318EEP07/LINEAR INTEGRATED CIRCUITS LAB*
	On successful completion of the course the students will be able to:

CO1	Learnt about the characteristics of op-amp
CO2	Gained the knowledge to analyze basic applications using op-amps.
CO3	Acquired knowledge to design power supply and multi-vibrator circuits.
CO4	Learnt to design filter circuits using op-amps and learnt about VCO.
CO5	Obtained knowledge to design and construct waveform generators
Course Name	318EEP08/MEASUREMENTS AND INSTRUMENTATION LAB
	On successful completion of the course the students will be able to:
CO1	Learnt about the basics of simulation software.
CO2	Gained the knowledge to simulate and to analyze the characteristics of amplifier circuits.
CO3	Acquired knowledge to simulate filter circuits.
CO4	Learnt about Characteristic of pressure transducers and LDR
CO5	Obtained knowledge to simulate and test the various oscillators.
Course Name	318EEP09/FUNDAMENTALS OF DATA STRUCTURES IN C LABAROTORY
	On successful completion of the course the students will be able to:
CO1	Implement basic and advanced programs in C
CO2	Implement functions and recursive functions in C
CO3	Apply the different Linear Data Structures for Implementing Solutions to Practical Problems.
CO4	Apply and implement Graph Data Structures for Real Time Applications
CO5	Implement various Searching, Sorting and hashing Algorithms.
Semester	IV
Course Name	418NMT01/NUMERICAL METHODS
	On successful completion of the course the students will be able to:
CO1	Apply numerical methods such as direct iterative and interpolation to solve algebraic or transcendental equations and system of equations.
CO2	Appreciate numerical solutions for differential and integral calculus as a handy tool to solve problems.
CO3	Implement numerical algorithms to find solutions for initial value problems for ordinary differential equations.
CO4	Demonstrate algorithms using finite differences to obtain solutions to boundary value problems
Course Name	418EET02/CONTROL SYSTEMS
	On successful completion of the course the students will be able to:
CO1	Ability to Understand the basic concepts of open-loop and closed–loop of systems
CO2	Ability to understand the basic concept of systems and to derive their transfer function models.
CO3	Analyzing the time-domain and frequency response of systems and steady state error analysis

CO4	Ability to analyze the concept of stability of control systems and design compensator.
CO5	Ability to come out with solution for different control problem.
Course Name	*418EET03/DIGITAL ELECTRONIC CIRCUITS*
	On successful completion of the course the students will be able to:
CO1	Gained the knowledge of fundamental concept of various number systems
CO2	Ability to Implement simple combinational logic circuits using logic gates, multiplexers and decoders.
CO3	Able to design of various synchronous sequential circuits.
CO4	Able to design of various asynchronous sequential circuits
CO5	Understood about semiconductor memories, PLDs and digital logic families.
Course Name	*418EET04/POWER GENERATION SYSTEMS*
	On successful completion of the course the students will be able to:
CO1	Understanding the working of steam and gas power plant thermal power station (TPS) using single line diagram and state the functions of the major equipment and auxiliaries of a Steam power plant.
CO2	Understanding the working of hydro energy conversion process with block diagrams and identify the appropriate site for it.
CO3	Understanding the working of Nuclear and Diesel power station
CO4	Understanding the various components of Wind Energy Conversion system
CO5	Understanding the performance analysis of Solar cell
Course Name	*418EET05/ELECTRICAL MACHINES –I*
	On successful completion of the course the students will be able to:
CO1	Learning the basic concepts of rotating machines and electromechanical energy conversion systems.
CO2	Learning the working principles, performance, as well as to identify, formulate and solve machine related problems on DC Generators.
CO3	Learning the working principles, performance, as well as to identify, formulate and solve machine related problems on DC Motors.
CO4	Gained knowledge in testing and speed control on DC machines.
CO5	Understood the functions of transformer and autotransformer.
Course Name	*418EOE06/OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES*
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals of object-oriented programming concepts, particularly in C++.
CO2	Design applications using inheritance and polymorphism
CO3	Apply object oriented programming concepts to implement Linear Data Structures.
CO4	Implement Non-linear Data Structures using C++.
CO5	Design applications using sorting and searching techniques.

Course Name	418ITT04/DATA STRUCTURES AND ALGORITHMS
	On successful completion of the course the students will be able to:
CO1	Identify an appropriate data structures for a given problem.
CO2	Implement the different Hashing, searching and sorting techniques.
CO3	Enhance the capability in complexity analysis.
CO4	Enhance the capability in implementation analysis.
CO5	Apply various algorithm design techniques for a given problem.
Course Name	418CIT05/JAVA PROGRAMMING
	On successful completion of the course the students will be able to:
CO1	Create a real-world application by applying the user defined packages, interfaces.
CO2	Implement multithreading concepts in real time scenarios.
CO3	Design a GUI-based application using Applets &Swings.
CO4	Enhance the capability in implementation analysis.
CO5	Understand the usage of Utility & Generic Classes.
Course Name	418ITE07/C# & .NET PROGRAMMING
	On successful completion of the course the students will be able to:
CO1	Understand anatomy of C# Programming.
CO2	Develop Console application using object oriented concepts, advanced features in C#.
CO3	Develop Applications using Interfaces and Events.
CO4	Develop Window form application with Database connectivity.
CO5	Build Applications using ADO.NETAND ASP.NET.
Course Name	418MCT01/INDIAN CONSTITUTION
	On successful completion of the course the students will be able to:
CO1	Understand the functions of the Indian government
CO2	Understand and abide the rules of the Indian constitution
CO3	Understand and appreciate different culture among the people
CO4	Analysis the structure of state and center
CO5	Learning the various constitution functions
Course Name	418EEP07/CONTROL SYSTEMS LABORATORY
	On successful completion of the course the students will be able to:
CO1	Analyzing the Transfer function of separately excited DC generators.
CO2	Analyzing and Transfer function of self-excited DC generators.

CO3	Able to analyzing speed of DC motor.
CO4	Understanding the various position control systems.
CO5	Learning the various controllers and networks.
Course Name	*418EEP08/ELECTRICAL MACHINES LABORATORY – 1*
	On successful completion of the course the students will be able to:
CO1	Analyzing the characteristics of DC generators.
CO2	Analyzing and test of different DC motors.
CO3	Able to analyze speed and efficiency of DC machines.
CO4	Understood the various tests on transformers.
CO5	Learnt the various connections of transformers
Course Name	*418EOP09/DATA STRUCTURES AND OOPS LAB*
	On successful completion of the course the students will be able to:
CO1	Develop programs using oops concept.
CO2	Design and implement C++ programs for manipulating stacks, queues, linked lists.
CO3	Apply the different data structures for implementing solutions to practical problems
CO4	Demonstrate the Infix. Prefix and Postfix notations using C++ programs.
CO5	Implement sorting techniques using C++ programs.
Course Name	*418CIP10/JAVA PROGRAMMING LAB*
	On successful completion of the course the students will be able to:
CO1	Write a programs that use the fundamental program constructs, including packages & interfaces
CO2	Create &access database connection and handling exceptions.
CO3	Design a GUI-based event handling application using Applets &Swings.
CO4	Design a GUI-based event handling application using Swings.
CO5	Understand the I/O functionality to read & write in the files.
Course Name	*418ITE18/C# & .NET PROGRAMMING LAB*
	On successful completion of the course the students will be able to:
CO1	Develop application using the features of C#.
CO2	Develop GUI application using interfaces, delegates and events.
CO3	Develop GUI application using events
CO4	Build window form application with database connectivity.
CO5	Solve the real world problems using C#.
Semester	**V**

Course Name	518EET01/MICROPROCESSORS AND MICROCONTROLLERS
	On successful completion of the course the students will be able to:
CO1	Ability to understand the architecture of any advanced Processor to be in pace with technological challenges.
CO2	Apply the acquired Programming skills and relate to any Processor/microcontroller in a multidisciplinary.
CO3	Extrapolate the architecture of PIC microcontroller
CO4	Able to utilize the IT tools like TASM, MASM and Proteus to develop electronic prototyping and thereby establishing real time control.
CO5	Ability to develop/design microcontroller based system paving way for automation and continuous Development.
Course Name	518EET02/ELECTRICAL MACHINES – II
	On successful completion of the course the students will be able to:
CO1	Constructional details, principles of operation, performance of Alternators
CO2	Ability to calculate torque, starting methods of AC motor
CO3	Employ different starting and speed control methods to three phase induction motors.
CO4	Correlate the different starting and speed control methods to three phase induction motors
CO5	Emphasis knowledge in basic concepts and principles of special machines.
Course Name	518EET03/ADVANCED CONTROL THEORY
	On successful completion of the course the students will be able to:
CO1	Identify state variables and poles to find the stability of non-linear system.
CO2	Ability to formulate differential equation, Z-transform, Z-transfer function And evaluate the Sample data control systems.
CO3	Identify the analysis of discrete time systems using conventional techniques.
CO4	Demonstrate the stability analysis of non linear systems
CO5	Analyze optimal control theory and design.
Course Name	518EET04/PROTECTION AND SWITCHGEAR
	On successful completion of the course the students will be able to:
CO1	Knowledgeable in the field of power system protection and switchgear.
CO2	Ability to demonstrate and design the relevant protection systems for the elements in power systems.
CO3	Emphasis knowledge in the field of over voltages.
CO4	Identify the causes of over voltages, methods of protection against over voltages and insulation coordination.
CO5	Implement the theory of circuit breakers in power system network.
Course Name	518EET05/TRANSMISSION AND DISTRIBUTION
	On successful completion of the course the students will be able to:

CO1	Understood the difference between the higher capacity AC and DC Lines .
CO2	Ability to compare the different types of conductors and characteristics
CO3	Identify the transmission line systems for various ranges.
CO4	Examine the various types of substations.
CO5	Gained the knowledge of the cables, the insulators and study of distribution system.
Course Name	*518EOE06/COMMUNICATION THEORY*
	On successful completion of the course the students will be able to:
CO1	Understand the modulation and its significance
CO2	Analyze the different modulation systems
CO3	Understand the working principle of AM and FM transmitters and receivers.
CO4	Understand the frequency characteristics of noise
CO5	Calculate and analyze noise performance in various receivers.
Course Name	*518MEO07/MECHATRONICS AND ROBOTICS*
	On successful completion of the course the students will be able to:
CO1	The students will be able to analyze mechatronics systems and different sensors used for displacement, position, velocity, motion, force, fluid pressure, temperature, etc
CO2	The students acquire knowledge in system models of mechanical, electrical, fluid, thermal systems and continuous and discrete process controllers
CO3	The students will be familiar with the basic structure of programmable logic controllers and in designing mechatronics systems
CO4	The students will be able to acquire the knowledge of different types and classification of robots, end effectors and robot kinematics.
CO5	The students will be able to gain the knowledge on robot programming languages.
Course Name	*518ITO08/COMPUTER ORGANIZATION*
	On successful completion of the course the students will be able to:
CO1	Understand Basic operational concepts and design of ALU of Digital Computer.
CO2	Design and analyze the performance of pipelined control unit.
CO3	Understand memory hierarchy and I/O Organization.
CO4	Know the various Memory Systems and I/O Organization.
CO5	Perceive knowledge on Instruction Level Parallelism and Parallel Processing.
Course Name	*518ECO09DIGITAL SIGNAL PROCESSING*
	On successful completion of the course the students will be able to:
CO1	Calculate the FFT of a discrete time signal.
CO2	Demonstrate various FIR filter techniques.
CO3	Demonstrate various IIR filter techniques.

CO4	Summarize finite word length effects in signal processing.
CO5	Explain the fundamentals of Digital signal processor.
Course Name	518EEP07/ELECTRICAL MACHINES LABORATORY – II
	On successful completion of the course the students will be able to:
CO1	Ability to interpret and connect circuits of synchronous generators and motors.
CO2	Develops a knowledge and ability to analyze and specify motors for use in varying applications.
CO3	Gaining practical experience in starting, speed control and testing of three-phase induction motors.
CO4	Examine the practical experience in speed control of three-Phase induction motors.
CO5	Interpret the performance of single phase induction motor.
Course Name	518EEP08/MICROPROCESSORS AND MICROCONTROLLERS LABORATORY
	On successful completion of the course the students will be able to:
CO1	Develop the code for simple arithmetic circuits in assembly language.
CO2	Implement the developed code using 8085 processors and 8051 controllers.
CO3	Reorganize the Interfacing peripherals with microprocessor and microcontroller
CO4	Propose the new design for real world applications.
CO5	Interface the peripherals with microprocessor and micro controller.
Course Name	518EEP09/DIGITAL ELECTRONICS LABORATORY
	On successful completion of the course the students will be able to:
CO1	Verification of digital logic circuits using digital IC's
CO2	Simplification of Boolean function and implementing those circuits practically.
CO3	Implementation of different combinational logic circuits using logic gates.
CO4	Analyze the design and functioning of synchronous sequential circuits.
CO5	Implementation of synchronous and asynchronous sequential logic circuits using digital IC's
Semester	VI
Course Name	618EET01/ELECTRICAL MACHINE DESIGN
	On successful completion of the course the students will be able to:
CO1	Gain knowledge in the design procedures of various electrical machines.
CO2	Apply the concept of specific electric and magnetic loadings for the armature design of rotating machine.
CO3	Gain knowledge in design of various parameters of DC motors and transformers.
CO4	Design single and three phase transformers.
CO5	Gain knowledge in design of various parameters of AC machines.
Course Name	618EET02/POWER ELECTRONICS

	On successful completion of the course the students will be able to:
CO1	Gain knowledge on principles of operation on power semiconductor devices.
CO2	Understand the function of single phase and three phase converters.
CO3	Recognize the operation of inverters and cycloconverters.
CO4	Correlate the different modes of operation of inverters.
CO5	Apply Power Electronics in utility-related applications.
Course Name	*618EET03/POWER SYSTEM ANALYSIS AND STABILITY*
	On successful completion of the course the students will be able to:
CO1	Develop the knowledge about power System under steady state operating condition.
CO2	To apply efficient numerical methods to solve the power flow problem.
CO3	Understand the analysis of power systems under abnormal (or) fault conditions.
CO4	Categorize the unsymmetrical fault and estimate symmetrical components.
CO5	Analyze the transient behavior of power system when it is subjected to a fault.
Course Name	*618EET04/HIGH VOLTAGE ENGINEERING*
	On successful completion of the course the students will be able to:
CO1	Gain knowledge in the fundamental concept of electric breakdown in liquids, solids and gases.
CO2	Extrapolate the production of various types of high voltages.
CO3	Familiar in non-destructive test techniques in high voltage engineering.
CO4	Extrapolate the measurement of various types of high voltages and high currents
CO5	Outline the Indian and international standards for high voltage equipment testing.
Course Name	*618EET05/RENEWABLE ENERGY SOURCES*
	On successful completion of the course the students will be able to:
CO1	Create awareness about the scenario of energy consumption and energy availability in India and world.
CO2	Evaluate the necessity and potential advantages of renewable energy resources like solar thermal and PV system over fossil fuels.
CO3	Examine the process of power generation using bio gas, wind energy and biomass.
CO4	Analyze the functioning of Geo thermal, ocean and small hydro plants and grid integration.
CO5	Create an linking all real time possible ways to generate the power by hybrid mode and optimal.
Course Name	*618EEE01/DISTRIBUTED GENERATION AND MICRO GRID*
	On successful completion of the course the students will be able to:
CO1	Comprehension on the various schemes of conventional and nonconventional power generation
CO2	Analyze the energy sources of distributed generation
CO3	Synthesis impacts of grid interconnection

CO4	Comprehension about the fundamental concept of Microgrid.
CO5	Evaluate the protection issues and control schemes
Course Name	**618EEE02/VLSI DESIGN**
	On successful completion of the course the students will be able to:
CO1	Implicit the fundamentals of MOS transistor and fabrication techniques.
CO2	Ability to apprehend the characteristics of MOS and CMOS circuits
CO3	Capable to design the NMOS, CMOS and BiCMOS based logic circuits.
CO4	Emphasis knowledge in the PLDs and CPLDs and design using FPGA.
CO5	Expose to HDL language and ability to design simple devices.
Course Name	**618EEE03/HIGH VOLTAGE DIRECT CURRENT TRANSMISSION**
	On successful completion of the course the students will be able to:
CO1	Cognitive of basic concepts of HVDC systems.
CO2	Comprehension of Power factor improvements of the system.
CO3	Emphasis knowledge in the converter control systems.
CO4	Analyze the reactive power control in HVDC.
CO5	Evaluate the concept of Power flow analysis in AC/DC Systems.
Course Name	**618EEE04/ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**
	On successful completion of the course the students will be able to:
CO1	Familiar with the idea of intelligent agents and search methods.
CO2	Do reasoning and decision making in uncertain world.
CO3	Illustrate language processing and learning.
CO4	Illustrate the concepts of Data Science
CO5	Analyze the concepts of Data Science.
Course Name	**618EEP07/POWER ELECTRONICS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Interpret to describe about modern power semiconductors and their control.
CO2	Examine and experimentally quantify steady state and transient characteristics of power converters.
CO3	Demonstrate and build complete converters, choppers and inverters
CO4	Identify the variable output voltage using AC voltage controller.
CO5	Analyze the variable output voltage using Single-phase cycloconverter.
Course Name	**618EEP09/EMPLOYABILITY SKILLS LABORATORY**

	On successful completion of the course the students will be able to:
CO1	Comprehend the various strategies of listening and its significance.
CO2	Articulate their views clearly and concisely with self-confidence and persuasiveness.
CO3	Understand the prevailing practices of testing in the recruitment process by the corporate and the institutional selection processes
CO4	Communicate the corporate and social requirements in an impressive written mode.
CO5	Enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.
Course Name	*618EEP08/ELECTRONIC SYSTEM DESIGN LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Design power supply units.
CO2	Design driver circuit for different ICs.
CO3	Design and fabricate opto-coupler and timer IC based circuits.
CO4	Design domestic Kits for different applications.
CO5	Analyze the performance of domestic kits.
Semester	**VII**
Course Name	*718EET01/POWER SYSTEM OPERATION AND CONTROL*
	On successful completion of the course the students will be able to:
CO1	Outline the planning and control of power system.
CO2	Develop the mathematical model of single area and two area load frequency control for static and dynamic analysis.
CO3	Determine the economic dispatch of the generating units with loss and without loss case.
CO4	Identify the relation of voltage and reactive power in power system and analyzed the various method to improve the voltage profile by modeling of exciter
CO5	Use SCADA and EMS for monitor and controlling the power system
Course Name	*718EET02/ELECTRIC DRIVES AND CONTROL*
	On successful completion of the course the students will be able to:
CO1	Understand the stable steady-state operation and transient dynamics of a motor-load system.
CO2	Analyse the steady state behaviour of converter fed DC drive.
CO3	Explain the speed control of induction motor drives.
CO4	Demonstrate the Inverter fed Synchronous motor drive, Brushless DC motor drive.
CO5	Justify the relevant drive system for a given application with given specifications.
Course Name	**718EEE03/SPECIAL ELECTRICAL MACHINES**
	On successful completion of the course the students will be able to:

CO1	Classify and explain the working of PMSM.
CO2	Apply control techniques to permanent magnet brushless DC motors.
CO3	Analyse the performance of switched reluctance motor
CO4	Analyze the performance of synchronous reluctance motor.
CO5	Categorise the stepping motors and analyse their performance.
Course Name	**718EET04/POWER QUALITY MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Ability to distinguish between the various categories of power quality problems.
CO2	Be able to apply appropriate techniques for power quality mitigations.
CO3	Emphasis knowledge by knowing power quality monitoring method and equipment.
CO4	To Study the Effects of harmonics on various equipment's.
CO5	Develop ability to analyze the measured data.
Course Name	**718EEE05/FLEXIBLE AC TRANSMISSION SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Ability to acquire knowledge on facts devices.
CO2	Ability to understand, analyze and develop analytical model of FACTS controller for power system application
CO3	Ability to understand the concepts about load compensation techniques.
CO4	Ability to analyze the performance of steady state and transients of facts controllers
CO5	Ability to study about advanced FACTS controllers.
Course Name	**718EEE07/SMART GRID**
	On successful completion of the course the students will be able to:
CO1	Learners will develop more understanding on the concepts of Smart Grid and its present Developments
CO2	Learners will study about different Smart Grid technologies.
CO3	Learners will acquire knowledge about different smart meters and advanced metering Infrastructure.
CO4	Learners will have knowledge on power quality management in Smart Grids
CO5	Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.
Course Name	718EEE09/AIRCRAFT ELECTRICAL SYSTEMS
	On successful completion of the course the students will be able to:
CO1	Distinguish the conventional and modern control systems.
CO2	Classify the aircraft systems

CO3	Categorize different types of aircraft instruments.
CO4	Learners will have knowledge on aircraft design fundementals
CO5	Able to compare with features of performance classification
Course Name	**718EEE06/EMBEDDED SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Understand the concept of embedded systems.
CO2	Analyzing of embedded networking to interface with the communication protocols.
CO3	Analyzing the design process for embedded systems.
CO4	Create models for various applications using embedded concept.
CO5	Design using embedded systems for real time applications.
Course Name	**718EET08/MODERN POWER CONVERTERS**
	On successful completion of the course the students will be able to:
CO1	Understood the operation of Switched mode dc power supplies
CO2	Learnt about the AC-DC converters
CO3	Learnt about the of DC-AC converters
CO4	Gained knowledge about AC-AC converters with and without dc link
CO5	Understood the operation of soft-switching power converters
Course Name	**718EEE10/POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Knowledge about the stand alone and grid connected renewable energy systems.
CO2	Equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
CO3	Design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.
CO4	Analyse and comprehend the various operating modes of wind electrical generators and solar energy systems.
CO5	Develop maximum power point tracking algorithms.
Course Name	**718EEE12/ADAPTIVE CONTROL**
	On successful completion of the course the students will be able to:
CO1	Various types of adaptive schemes
CO2	About self tuning regulators.
CO3	Design of minimum variance and moving.
CO4	Design of MRAS using Lyapunov Theory.
CO5	Understand Gain scheduling

Course Name	**718EEP09/MINI PROJECT**
	On successful completion of the course the students will be able to:
CO1	Identification of real time problems
CO2	Awareness of design methodologies & its implementation.
CO3	Implementing advanced simulation software techniques.
CO4	Able to produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.
CO5	Compare and analyze the result obtained with various conditions.
Course Name	*718EEP08/POWER SYSTEM SIMULATION LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Acquire experience in the usage of standard packages for the following analysis / simulation / control functions.
CO2	Ability to develop computer programs to perform load flow analysis on the power system.
CO3	Compute and model the transmission lines and analyze the generation control on power system using simulation tools.
CO4	Understand concepts of stability problems
CO5	Solve the transient stability problem in single machine infinite bus system.
Course Name	*718EEP07/ELECTRIC DRIVES AND CONTROL LABORATORY*
	On successful completion of the course the students will be able to:
CO1	Demonstrate the software tools used for simulation of drives.
CO2	Design and apply the speed control for converter/chopper fed DC motor.
CO3	Design and apply the speed control for stepper motor.
CO4	Demonstrate the software tools used for simulation of drives.
CO5	Design and apply the speed control for converter/chopper fed DC motor.
Semester	**VIII**
Course Name	*818EET01/ELECTRIC POWER UTILIZATION AND ENERGY AUDITING*
	On successful completion of the course the students will be able to:
CO1	Impart knowledge on Generation of electrical power by conventional, non–conventional methods.
CO2	Understand the principle and design of illumination systems and methods of heating and welding.
CO3	Attain the knowledge about Electric traction systems and their performance.
CO4	Acquired knowledge in Electrolytic process, Electroplating and storage of electricity.
CO5	Determine the needs of energy conservation and implement conservation techniques.
Course Name	**818EEE02/DISASTER MANAGEMENT**
	On successful completion of the course the students will be able to:

CO1	Aware of various natural and man- made disasters.
CO2	Prepared for facing disasters.
CO3	Aware of modern technology and tools in risk reduction.
CO4	Able to plan in emergency situations.
CO5	Aware of Tsunami and Recovery operations in Tamilnadu
Course Name	**818EEE03/ELECTRIC VEHICLE TECHNOLOGY**
	On successful completion of the course the students will be able to:
CO1	Categorize the electric vehicles and battery charging.
CO2	Recognize the applications of electric vehicle motors.
CO3	Acquired the knowledge of electronic devices in EV and sensor-less control methods
CO4	Categorize the hybrid vehicles.
CO5	Attained the knowledge in principles Fuel Cells and its characteristics for Electric Vehicles
Course Name	**818EEE04/TOTAL QUALITY MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Describe the dimensional barrier regarding Quality.
CO2	Summarize the Total quality principles
CO3	Demonstrate the tools utilization for quality improvement.
CO4	Analyze the various types of techniques are used to measure quality
CO5	Apply the various quality systems in implementation of Total quality management
Course Name	**818EEE05/INDUSTRIAL AUTOMATION**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge on basics of Industrial Automation
CO2	Students will be able to Develop Ladder programmes for PLC
CO3	Will be able to recommend right choice of automation systems for a given application.
CO4	Gain knowledge in design of various automation sensors.
CO5	Students will be able to apply DCS in power plants
Course Name	**818EEE06/POWER SYSTEM DYNAMICS**
	On successful completion of the course the students will be able to:
CO1	Learners will be able to understand the power system stability and security problems.
CO2	Learners will be able to understand on basics of dynamic modelling in synchronous Machine.
CO3	Learners will be able to understand the needs and modeling of controllers
CO4	Learners will understand the significance about small signal stability analysis

CO5	Learners will attain knowledge about stability of dynamic systems.
Course Name	**818EEE07/PROFESSIONAL ETHICS AND HUMAN VALUES**
	On successful completion of the course the students will be able to:
CO1	Create an awareness on Human Values
CO2	Analyse the Senses of 'Engineering Ethics
CO3	Instill Moral and Social Values and Loyalty
CO4	Appreciate the rights of Others
CO5	Analyze the various global issues
Course Name	**818EEE08/INSULATION AND TESTING ENGINEEING**
	On successful completion of the course the students will be able to:
CO1	Learning about the various insulating materials and its properties
CO2	Learning about the various insulating materials and its properties
CO3	Analyzing the design of High Voltage Equipment.
CO4	Learning the various testing of insulating materials and insulation coordination
CO5	Learning Dynamic properties of dielectric materials
Course Name	**818EEE09/WIRELESS POWER TRANSFER TECHNOLOGIES**
	On successful completion of the course the students will be able to:
CO1	Understand the characteristics of power transfer through coupled inductors and the significance of leakage inductance
CO2	Analyze and design appropriate compensation circuits and efficient power converters for WPT applications
CO3	Understand technical requirements for applications involving solid-state loads and battery loads using WPT technologies
CO4	Appreciate the factors affecting adoption of WPT in consumer applications including lightings, charging of smart phones and electric vehicles.
CO5	Predicting the future demand of WPT.
Course Name	***818EEP04/PROJECT***
	On successful completion of the course the students will be able to:
CO1	Analysis independently to design experiments.
CO2	Simulate the experiements.
CO3	Fabricate and setup experiements.
CO4	Demonstrate the application of the electrical engineering principles to particular process variables for optimization of experiemental projects.
CO5	Preapare clear concise project reports with the help of graph, charts, and power point presentations.

Program Name	DEPARTMENT OF INFORMATION TECHNOLOGY
Semester	**I**
Course Name	*TECHNICAL ENGLISH*
	On successful completion of the course the students will be able to:
CO1	Read technical texts and write area- specific texts effortlessly
CO2	Listen and comprehend lectures and talks in their area of specialization successfully
CO3	Speak appropriately and effectively in varied formal and informal contexts
CO4	Understand the basic grammatical structures and its applications
CO5	Write reports and winning job applications
Course Name	*ENGINEERING MATHEMATICS-I*
	On successful completion of the course the students will be able to:
CO1	Develop the knowledge of basic linear algebraic concepts
CO2	Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects
CO3	Acquire the basic knowledge of ordinary differential calculus
CO4	Compute maxima and minima of a function
CO5	Apply Laplace transform techniques to solve ordinary differential equations which have an application in many engineering fields
Course Name	*ENGINEERING PHYSICS*
	On successful completion of the course the students will be able to:
CO1	To understand properties of solids with different types of moduli and to gain knowledge about absorption coefficients of solids and different surfaces.
CO2	To understand basic concepts of high frequency sound waves and its applications
CO3	To understand basic concepts of quantum mechanical behavior of wave and particle along with applications
CO4	To understand the concepts of production of laser and its behavior with diffraction principle of interference
CO5	To apply the concept of polarization phenomenon and thereby its applications in fiber optic communication
Course Name	*ENGINEERING CHEMISTRY*
	On successful completion of the course the students will be able to:
CO1	Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications
CO2	Construct an electrochemical cell and Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications
CO3	Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes
CO4	Differentiate the polymers used in day to day life based on its source, properties and applications

CO5	Analyse the three types of fuels based on calorific value for selected application
Course Name	***ENGINEERING GRAPHICS***
	On successful completion of the course the students will be able to:
CO1	Recognize the conventions and apply dimensioning concepts while drafting simple objects
CO2	Draw the orthographic projection of points, line, and plane surfaces
CO3	Draw the orthographic projection of simple solids
CO4	Draw the section of solid drawings and development of surfaces of the given objects
CO5	Apply the concepts of isometric and perspective projection in engineering practice.
Course Name	***BASIC CIVIL AND MECHANICAL ENGINEERING***
	On successful completion of the course the students will be able to:
CO1	The usage of surveying and properties of construction materials.
CO2	The stress strain of various building and material such as substructure, road transport and bridge.
CO3	The concept of manufacturing methods encountered in engineering practice such as foundry, welding and forging processes.
CO4	The working of internal combustion engines and its types.
CO5	The concept of energy conservation in practical, power plant refrigeration air condition and its types.
Course Name	***ENGINEERING CHEMISTRY LABORATORY***
CO1	Carry out the volumetric experiments and improve the analytical skills
CO2	Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering
CO3	Understand the principle and handling of electrochemical instruments and Spectrophotometer
CO4	Apply their knowledge for protection of different metals from corrosion by using different inhibitors
Course Name	***ENGINEERING PRACTICE LABORATORY***
	On successful completion of the course the students will be able to:
CO1	Prepare simple Lap, Butt and T- joints using arc welding equipments
CO2	Prepare the rectangular trays and funnels by conducting sheet metal operation
CO3	Prepare the pipe connections and identify the various components used in plumbing.
CO4	Prepare simple wooden joints using wood working tools
CO5	Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions
Semester	**II**
Course Name	***COMMUNICATIVE ENGLISH***

		On successful completion of the course the students will be able to:
	CO1	Comprehend conversations and talks delivered in English.
	CO2	Participate effectively in formal and informal conversations; introduce themselves and their friends and express opinions in English
	CO3	Read short stories, magazines, novels and other printed texts of a general kind.
	CO4	Write short paragraphs, essays, letters and develop hints in English
Course Name		***ENGINEERING MATHEMATICS-II***
		On successful completion of the course the students will be able to:
	CO1	Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals and also extending the concept to vector fields
	CO2	Learn the basic concepts of analytic functions and transformations of complex functions
	CO3	Master the integration in complex domain.
	CO4	Understand the use of improper integrals' applications in the core subject
	CO5	Evaluate the integrals using complex integration
Course Name		***ENVIRONMENTAL SCIENCE AND ENGINEERING***
		On successful completion of the course the students will be able to:
	CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course
	CO2	Public awareness of environmental is at infant stage
	CO3	Ignorance and incomplete knowledge has led to misconceptions
	CO4	Development and improvement in std. of living has led to serious environmental disasters
Course Name		***ENGINEERING MECHANICS***
		On successful completion of the course the students will be able to:
	CO1	Explain the differential principle applies to solve engineering problems dealing with force, displacement, velocity and acceleration
	CO2	Find solution for problems related to equilibrium of particles.
	CO3	Solve the Moment of inertia for different 2-D plane figures
	CO4	Analyze the forces in any structures
	CO5	Solve rigid body subjected to frictional forces
Course Name		***PROBLEM SOLVING AND PYTHON PROGRAMMING***
		On successful completion of the course the students will be able to:
	CO1	Develop algorithmic solutions to simple computational problems
	CO2	Read, write, execute by hand simple Python programs.

CO3	Structure simple Python programs for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries and read and write data from/to files in Python Programs
Course Name	**CHEMISTRY FOR TECHNOLOGISTS**
	On successful completion of the course the students will be able to:
CO1	Apply gas laws in various real life situations.
CO2	Able to explain the characteristic properties and behaviour of solutions
CO3	Apply the basic concepts of thermodynamics for engineering stream.
CO4	Familiar in reaction pathways
CO5	Able to understand the chemistry behind dyes and drugs
Course Name	**ENGINEERING PHYSICS LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Understanding the moduli of elasticity by determining Young's modulus and Rigidity modulus of a beam and cylinder respectively
CO2	Understanding the phenomenon of diffraction, dispersion and interference of light using optical component
CO3	Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid and measuring the parameters of ultrasound propagating through a liquid
CO4	Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity
Course Name	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**
	On successful completion of the course the students will be able to:
CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Develop Python programs step-wise by defining functions and calling them.
CO4	Use Python lists, tuples, dictionaries for representing compound data.
CO5	Read and write data from/to files in Python.
Semester	**III**
Course Name	**Engineering Mathematics-III**
	On successful completion of the course the students will be able to:
CO1	Know the methods to solve partial differential equations occurring in various physical and engineering problems.
CO2	Describe an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.

CO3	Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.
CO4	Understand the effect of Fourier transform techniques and their applications.
CO5	Gain the concept of analysis of linear discrete system using Z-transform approach.
Course Name	*Digital Electronics*
	On successful completion of the course the students will be able to:
CO1	Solve the Postulates of Boolean algebra using different techniques
CO2	Design the Combinational and sequential circuits
CO3	Apply the concept of synchronous and asynchronous circuit
CO4	Summarize the concept of memories and programmable logic devices.
CO5	Knowledge in VHDL for VLSI Design.
Course Name	*Communication Engineering*
	On successful completion of the course the students will be able to:
CO1	Analyze the different modulation and demodulation schemes
CO2	Apply the basic concepts of different Digital communication Techniques.
CO3	Channelize the design concepts and performance of sampling and pulse modulation techniques.
CO4	Interpret the knowledge about spread spectrum and multiple access techniques
CO5	Gain knowledge on Satellite and Optical communication.
Course Name	*Object Oriented Programming in C++*
	On successful completion of the course the students will be able to:
CO1	Describe the important concepts of Object Oriented Programming.
CO2	Identify the relationship between the classes and link them using appropriate concepts.
CO3	Develop solutions for given problems using Polymorphism and Inheritance concepts to solve real world problems.
CO4	Devise generic classes capable of manipulating primitive and user defined data types.
CO5	Develop and implement File I/O operations and Exception handling mechanisms.
Course Name	*Data Structures*
	On successful completion of the course the students will be able to:
CO1	Implement List ADT to solve real time problems.
CO2	Develop applications using Stack and Queues data structures.
CO3	Design and Implement applications on trees.

CO4	Implement graph data structure for solving problems.
CO5	Develop various Sorting, Searching and Hashing algorithms to small and large data sets.
Course Name	**Computer Organization**
	On successful completion of the course the students will be able to:
CO1	Understand basic operational concepts of computers, ALU and Instructions.
CO2	Know the computer arithmetic and control unit operations.
CO3	Comprehend and analyze the Pipelined Execution.
CO4	Know the various Memory Systems and I/O Organization.
CO5	Understand Parallelism and Multiprocessor architectures.
Course Name	**Digital Electronics Laboratory**
	On successful completion of the course the students will be able to:
CO1	Apply Digital ICs for various applications.
CO2	Analyze the various combinational circuits using logic gates.
CO3	Implement various sequential circuits using logic gates
CO4	Write VHDL code for various combinational circuits
CO5	Write VHDL code for various sequential circuits
Course Name	**Object Oriented Programming Laboratory**
	On successful completion of the course the students will be able to:
CO1	Implement class, object, and constructor concepts by using object oriented programming language.
CO2	Develop programs using inheritance and polymorphism.
CO3	Develop and implement overloading concepts & various functions.
CO4	Construct generic classes using templates & STL.
CO5	Implement various file concepts, exception handling by using object oriented concepts.
Course Name	**Data Structures Laboratory**
	On successful completion of the course the students will be able to:
CO1	Implement programs for manipulating List, Stack and Queue ADT with its Applications.
CO2	Perform various Tree Operations
CO3	Apply and implement Graph Data Structures for Real Time Applications.
CO4	Implement various Searching and Sorting Algorithms.

CO5	Implement Hashing Algorithms
Semester	**IV**
Course Name	*Discrete Mathematics*
	On successful completion of the course the students will be able to:
CO1	Understand and demonstrate the applications of basic concepts of an algorithm and counting principles in combinatorial mathematics.
CO2	Acquaint the graph theory concepts which serves as the base for the real time application in network analysis.
CO3	Expertise the knowledge of logics helps to verify the correctness of computer programs and to draw conclusions from scientific experiments
CO4	Internalize the abstract algebraic structures which provides the ability to deal the theory of sequential machines, formal languages and syntactic analysis.
CO5	Imbibe the concept of Lattices and Boolean algebra
Course Name	*Design and Analysis of Algorithms*
	On successful completion of the course the students will be able to:
CO1	Design Algorithms for various Computing Problems.
CO2	Design and analyze algorithm using Divide and Conquer, Greedy Techniques
CO3	Solve and analyze problems using Dynamic programming and iterative improvement
CO4	Analyze back tracking and Branch and Bound algorithm
CO5	Identify any Problem as belonging to the Class of P and NP.
Course Name	*Java Programming*
	On successful completion of the course the students will be able to:
CO1	Develop Java Programs using OOPs Principles
CO2	Create a real-world application by applying the user defined packages, interfaces.
CO3	Implement multithreading concepts in real time scenarios.
CO4	Design a GUI-based application using Applets &Swings.
CO5	Understand the usage of Utility & Generic Classes
Course Name	*Operating System*
	On successful completion of the course the students will be able to:
CO1	Gain extensive knowledge and apply the concepts of process management
CO2	Evaluate various scheduling algorithms and methods of dead lock handling
CO3	Compare various memory management and paging techniques.
CO4	Illustrate disk management functionalities and file systems.

CO5	Be familiar with I/O systems access methods and protection mechanism.
Course Name	***Database Management System***
	On successful completion of the course the students will be able to:
CO1	Gain and design extensive knowledge on various data models and ER diagram.
CO2	Recognize and develop sophisticated queries and authorization techniques to extract nformation from database
CO3	Analyze and eliminate all kind of dependency in a database schema via normalization techniques
CO4	Apply concurrency control and recovery mechanism.
CO5	Understand the internal storage structures using different file and indexing techniques advanced database concepts
Course Name	***Software Engineering***
	On successful completion of the course the students will be able to:
CO1	Compare and analyze the various life cycle models of software process
CO2	Describe the process of requirement engineering and Feasibility Studies.
CO3	Prepare Software Requirement document and build requirement model then design the methods for software architecture.
CO4	Formulate various implementation and testing strategies in a system.
CO5	Familiarize various measurements for a software system and Software maintenance.
Course Name	***Java Programming laboratory***
	On successful completion of the course the students will be able to:
CO1	Write a programs that use the fundamental program constructs, including packages & Interfaces
CO2	Create &access database connection and handling exceptions.
CO3	Design a GUI-based event handling application using Applets &Swings.
CO4	Understand the I/O functionality to read & write in the files.
CO5	Understand the concept of collection classes
Course Name	***Operating System laboratory***
	On successful completion of the course the students will be able to:
CO1	Implement basic services and functionalities of operating system using system call.
CO2	Implement various CPU scheduling algorithm and inter process communication and Semaphores.
CO3	Simulate Producer Consumer problem for process synchronization
CO4	Implement memory management and file allocation techniques algorithms.
CO5	Illustrate disk scheduling algorithms

Course Name	Database Management System laboratory
	On successful completion of the course the students will be able to:
CO1	Design and implement database schema for a given problem domain.
CO2	Populate and query a database using SQL operations.
CO3	Prepare reports.
CO4	Design & develop an application using advanced databases.
CO5	Develop any application using VB/VC++
Semester	**V**
Course Name	Probability and Statistics
	On successful completion of the course the students will be able to:
CO1	Imbibing the knowledge of basic probability improves the quality of interpretation and decision making in real time problems of uncertainty.
CO2	Understanding the real time application of probability distributions.
CO3	Learning the concept of two dimensional random variables helps to understand and analyze the Statistical measures which describe an outcome of a random experiment.
CO4	Drawing inference & decision making through hypothesis testing.
CO5	Acquainting the knowledge of analysis of variance and control limits.
Course Name	Micro Processor and Microcontroller
	On successful completion of the course the students will be able to:
CO1	Recognize the basic Microprocessor architecture and its concepts.
CO2	Outline the concepts of peripheral interfacing mechanisms.
CO3	Design various assembly language programming using microprocessors and microcontroller.
CO4	Extend the real world interfacing with microcontroller
CO5	Extrapolate the architectural with features of 801XX 8086 processor.
Course Name	Computer Networks
	On successful completion of the course the students will be able to:
CO1	Understand the basic layers and its functions in computer networks.
CO2	Explore various flow and error control protocols in data link layer.
CO3	Understand and evaluate the performance of various routing algorithms.
CO4	Analyze flow control and congestion control algorithm for QoS at end to end level.
CO5	Explore the features and working of various application layer protocols

Course Name	Computational Intelligence
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals and various characteristics of artificial intelligence.
CO2	Use appropriate search algorithms for any AI problem.
CO3	Represent a problem using first order and predicate logic.
CO4	Solve uncertainty problems and acquire decision making capability based on reasoning.
CO5	Apply intelligent techniques for problem solving
Course Name	Microprocessor and Microcontroller Laboratory
	On successful completion of the course the students will be able to:
CO1	Generate the code for arithmetic operations in assembly language
CO2	Generalize the developed code using 8086 processors and 8051 controllers.
CO3	Reorganize the Interfacing peripherals with microprocessor and microcontroller
CO4	Interpolate the peripherals for real world applications.
CO5	Propose the various ALU for analysis of microprocessor and microcontroller
Course Name	Computer Networks Laboratory
	On successful completion of the course the students will be able to:
CO1	Gain knowledge on the basic network commands and concepts of open source network simulator
CO2	Implement data link protocols
CO3	Analyze and implement various routing algorithms
CO4	Simulate networks and analyze traffic using various tools.
CO5	Analyze the performance of protocols in different layers
Course Name	Employability Skills Laboratory
	On successful completion of the course the students will be able to:
CO1	Comprehend the various strategies of listening and its significance.
CO2	Articulate their views clearly and concisely with self-confidence and persuasiveness.
CO3	Understand the prevailing practices of testing in the recruitment process by the corporates and the institutional selection processes.
CO4	Communicate the corporate and social requirements in an impressive written mode
CO5	Enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.
Course Name	C# & .Net Programming

		On successful completion of the course the students will be able to:
	CO1	Understand anatomy of C# Programming.
	CO2	Develop Console application using object oriented concepts, advanced features in C#.
	CO3	Develop Applications using Interfaces and Events.
	CO4	Develop Window form application with Database connectivity.
	CO5	Build Applications using ADO.NETAND ASP.NET.
Course Name		Theory of Computation
		On successful completion of the course the students will be able to:
	CO1	Construct automata, regular expression for any pattern.
	CO2	Design grammars and Automata (recognizers) for different language classes.
	CO3	Write Context free grammar for any construct
	CO4	Design Turing machines for any language and propose computation solutions using Turing machines
	CO5	Derive whether a problem is decidable or not.
Course Name		Advanced Java Programming
		On successful completion of the course the students will be able to:
	CO1	Understand the advanced concepts of Java programming such as Servlets, Session management and JDBC in servlets.
	CO2	Design and develop Java Beans Application
	CO3	Design and Implement EJB in Java
	CO4	Develop and Implement the RMI and ORB protocol
	CO5	Understand and deploy the application using JSP and Java mail API.
Course Name		Real Time Systems
		On successful completion of the course the students will be able to:
	CO1	Understand the basics of Real time systems and modelling.
	CO2	Use programming languages and tools to develop real time systems.
	CO3	Use database in real time applications.
	CO4	Deploy various methodologies to design real time applications.
	CO5	Gain knowledge on Fault tolerance, Reliability and synchronization of RTS
Course Name		Computer Graphics and Multimedia Systems
		On successful completion of the course the students will be able to:
	CO1	Create Interactive Computer Graphics using OpenGL.

CO2	Apply Two Dimensional Transformations and Clipping Algorithms.
CO3	Apply Three Dimensional Graphics and Visible Surface Detection Methods.
CO4	Explore different Multimedia Data Structures and Databases.
CO5	Apply Compression Techniques and Multimedia Applications in Real Time Problems.
Semester	**VI**
Course Name	*Scripting Language*
	On successful completion of the course the students will be able to:
CO1	Apply Perl scripts in application development and data analysis
CO2	Create and run simple web applications using PHP
CO3	Develop Web based application using PHP and MySQL
CO4	Design and implement short and efficient Python scripts for longer constructs.
CO5	Illustrate Ruby scripts in application development
Course Name	*Compiler Engineering*
	On successful completion of the course the students will be able to:
CO1	Understand the construction of deterministic and nondeterministic automata.
CO2	Understand the concept of lexical analysis and various phases of a compiler
CO3	Parse the generated tokens using top down and bottom up parsers.
CO4	Represent the intermediate code for the source languages
CO5	Design and analyze code generation schemes and various optimization techniques.
Course Name	*Data Warehousing and Data Mining*
	On successful completion of the course the students will be able to:
CO1	Have an extensive knowledge on concepts of data warehousing Modeling and Implementation
CO2	Discover and measure interesting patterns from different kinds of databases.
CO3	Apply association rule mining techniques for data analysis.
CO4	Compare and contrast the various classifiers.
CO5	Explore different clustering techniques and data mining applications.
Course Name	*Object Oriented Modeling and Design*
	On successful completion of the course the students will be able to:
CO1	Apply fundamental Object Oriented (OO) modeling and design in solving complex problems and Analyze problem scenario and identify classes/ Objects, their properties and associations.

CO2	Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation
CO3	Propose the appropriate strategies to incorporate standard quality parameters in the design of a system
CO4	Construct models to show the importance of system Modeling in solving complex problems.
CO5	Construct models to show the importance of Design in solving complex problems.
Course Name	**Scripting Languages Laboratory**
	On successful completion of the course the students will be able to:
CO1	Create dynamic web pages and implement database connectivity with Perl and CGI.
CO2	Develop OOP concepts, file handling functions and database connections with PHP.
CO3	Implement functions, collections and database integrations in Python.
CO4	Implement basic operations in Ruby.
Course Name	**Compiler Engineering Laboratory**
	On successful completion of the course the students will be able to:
CO1	Construction of NFA and DFA from a given regular expression
CO2	Construct a token recognizer using LEX and YACC.
CO3	Demonstrate parsing and construct a syntax tree for control statements.
CO4	Generate intermediate code for the intermediate language
CO5	Translate the source to target code and optimize it.
Course Name	**Object Oriented Modeling and Design Laboratory**
	On successful completion of the course the students will be able to:
CO1	Use the UML analysis and design diagrams
CO2	Apply appropriate design patterns
CO3	Design and implement applications using OO concepts
CO4	Validating the code and design
Course Name	**Multi core Architecture**
	On successful completion of the course the students will be able to:
CO1	Identify the limitations of ILP and the need for multicore architectures
CO2	Discuss the issues related to multiprocessing and suggest solutions
CO3	Point out the salient features of different multicore architectures and how they exploit parallelism
CO4	Critically analyze the different types of inter connection networks

CO5	Discuss the architecture of GPUs, warehouse-scale computers and embedded processors
Course Name	**Soft Computing**
	On successful completion of the course the students will be able to:
CO1	Identify and describe soft computing techniques and their roles in building intelligent machines.
CO2	Recognize the feasibility of applying a soft computing methodology for a problem.
CO3	Compare different neural network approaches.
CO4	Design neural networks for pattern classification and regression problems.
CO5	Apply genetic algorithms to optimization problems.
Course Name	**Social Network Analysis**
	On successful completion of the course the students will be able to:
CO1	Develop semantic web related applications.
CO2	Model and represent knowledge for social semantic Web.
CO3	Represent knowledge using ontology.
CO4	Understood the mining communities in web social networks.
CO5	Develop Visualization for social networks.
Course Name	**Mobile Communication**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge on the mobile telecommunication systems.
CO2	Apply MAC protocols for mobile and wireless environments.
CO3	Deploy various protocols that support mobility at network layer and transport layer.
CO4	Use proactive, reactive and hybrid protocols to design Ad hoc networks
CO5	Develop wireless applications using script and mark-up languages.
Course Name	**Embedded Systems**
	On successful completion of the course the students will be able to:
CO1	Differentiate the general computing system and the embedded system also recognize the classification of embedded systems.
CO2	Summarize the concepts of memory inputs and output managements
CO3	Transform the concepts of process and operating systems.
CO4	Design real time embedded systems using the embedded software
CO5	Understand the design and techniques of embedded system development.
Semester	**VII**

Course Name	Cryptography and Security in Computing
	On successful completion of the course the students will be able to:
CO1	Convery Plain text to Cipher tect using classical and symmetric encryption techniques.
CO2	Apply number theory concepts and algorithms of public key cryptosystems to perform encryption and decryption.
CO3	Apply key management and authentication techniques to provide secure Communication.
CO4	Understand the importance of firewalls and intrusion Detection System.
CO5	Discover and identify abnormalities within the network caused byworms, viruses and program threats.
Course Name	Fundamentals of Machine Learning
	On successful completion of the course the students will be able to:
CO1	Gain Knowledge on basic concepts and types of machine learning
CO2	Implement supervised learning algorithms for an application of their choice.
CO3	Implement typical clustering algorithms and apply Dimensionality reduction techniques
CO4	Formulate and solve problems with uncertain information using Bayesian and HMM approaches
CO5	Explain the basic concepts of reinforcement learning algorithms and Ensembles Methods
Course Name	Mobile Application Development
	On successful completion of the course the students will be able to:
CO1	Familiarize with Mobile apps development aspects.
CO2	Design and implement the user interfaces for mobile applications
CO3	Develop useful mobile applications using Google Android and Eclipse simulator.
CO4	Develop mobile applications using graphics and animation
CO5	Perform testing, signing, packaging and distribution of mobile apps
Course Name	Web Programming
	On successful completion of the course the students will be able to:
CO1	Design Web page with HTML elements and CSS .
CO2	Write Client side script using java script.
CO3	Structure the data using XML.
CO4	Develop and deploy web application using JSP and Servlets.
CO5	Create, describe and access simple Web Services.
Course Name	Mobile Application Development Laboratory
	On successful completion of the course the students will be able to:

CO1	Design and Implement various mobile applications using emulators.
CO2	Deploy applications to hand-held devices
CO3	Develop an application using basic graphical primitives and databases.
CO4	Construct an application using multi threading and RSS feed
CO5	Make use of location identification using GPS in an application.
Course Name	*Web Programming Laboratory*
	On successful completion of the course the students will be able to:
CO1	Design Web pages using HTML/DHTML and style sheets
CO2	Built dynamic web pages using Java script.
CO3	Design and Implement database applications.
CO4	Develop simple GUI interfaces to interact with users in real time applications.
Course Name	*Mini Project*
	On successful completion of the course the students will be able to:
CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Design engineering solutions to complex problems utilizing a system approach.
CO3	Analyze engineering problem specification and recommend an optimum set of technical solutions
CO4	Implement innovative ideas in solving contemporary issues.
CO5	Acquire industry relevant skills by working in team and efficiently communicating the deliverables.
Course Name	*Internet of Things*
	On successful completion of the course the students will be able to:
CO1	Compare and analyze different design issues and domains of IoT.
CO2	Identify different design methodologies and end point devices of IoT.
CO3	Prepare different cloud based and embedded solution for IoT.
CO4	Formulate different case studies related to IoT framework.
CO5	Solve data analytical and real-time application problems on IoT.
Course Name	*Building Enterprise Application*
	On successful completion of the course the students will be able to:
CO1	Understand the fundamental of Enterprise applications and key determinants to measure the success.
CO2	Demonstrate an understanding of different modelling techniques used to design Enterprise applications.

CO3	Develop knowledge in designing Enterprise Applications.
CO4	Construct Enterprise applications by understanding the design.
CO5	Test and roll out the enterprise applications in real environment
Course Name	**Business Intelligence and Its Applications**
	On successful completion of the course the students will be able to:
CO1	Understand the fundamental of Enterprise applications and key determinants to measure the success.
CO2	Demonstrate an understanding of different modelling techniques used to design Enterprise applications.
CO3	Develop knowledge in designing Enterprise Applications.
CO4	Construct Enterprise applications by understanding the design.
CO5	Test and roll out the enterprise applications in real environment
Course Name	**Information Storage Management**
	On successful completion of the course the students will be able to:
CO1	Ability to identify the key requirements of data center.
CO2	Analyze the different storage systems architecture.
CO3	Analyze different storage networking technologies.
CO4	Ability to identify key challenges in managing information and also describe the different role in providing disaster recovery and business continuity capabilities.
CO5	Ability to identify and analyzes the common threats in different domains.
Course Name	**Agile Software Development**
	On successful completion of the course the students will be able to:
CO1	Realize the importance of interacting with business stakeholders in determining the requirements for a software system
CO2	Perform iterative software development processes: how to plan them, how to execute them.
CO3	Point out the impact of social aspects on software development success.
CO4	Develop techniques and tools for improving team collaboration and software quality.
CO5	Perform Software process improvement as an ongoing task for development teams.
Course Name	**Cyber Security and Law**
	On successful completion of the course the students will be able to:
CO1	Discriminate and analyze problems involved in cybercrime
CO2	Synthesis cybercrime issues on wireless and mobile devices
CO3	Use and apply modern cyber forensics tools

CO4	Analyze the computer forensic problems for a feasible solution
CO5	Apply cyber law for a given type of cyber issues
Course Name	**AD HOC and Sensor Networks**
	On successful completion of the course the students will be able to:
CO1	Explain the concepts, architecture and applications of Ad Hoc and WSN.
CO2	Describe the MAC protocol issues of Ad Hoc networks.
CO3	Design Ad Hoc routing protocols with respect to some protocol design issues.
CO4	Identify different MAC protocols and evaluate the QOS related performance measurement of Sensor Networks.
CO5	Recognize various routing protocols and its issues in WSN.
Course Name	**Cloud Computing**
	On successful completion of the course the students will be able to:
CO1	Analyze the architecture of Cloud computing stack
CO2	Differentiate between full and para virtualization
CO3	Identify the architecture, storage, infrastructure and delivery models of cloud computing
CO4	Design and apply Map Reduce Programming model.
CO5	Understand the necessity and approaches for cloud security.
Course Name	**Advanced Java Scripting Language**
	On successful completion of the course the students will be able to:
CO1	Understand about javascript objects.
CO2	Design Database access with AJAX & JSON.
CO3	Build real world applications using Angular JS.
CO4	Develop a dynamic website using advanced features of Node JS.
CO5	Develop a dynamic website using advanced features of React JS.
Course Name	**Software Testing**
	On successful completion of the course the students will be able to:
CO1	Design test cases suitable for a software development for different domains.
CO2	Identify suitable tests to be carried out.
CO3	Prepare test planning based on the document.
CO4	Document test plans and test cases designed.
CO5	Use automatic testing tools and Develop and validate a test plan.

Semester	VIII
Course Name	**Big Data Analytics**
	On successful completion of the course the students will be able to:
CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Design engineering solutions to complex problems utilizing a system approach.
CO3	Analyze engineering problem specification and recommend an optimum set of technical solutions.
CO4	Implement innovative ideas in solving contemporary issues.
CO5	Acquire industry relevant skills by working in team and efficiently communicating the deliverables.
Course Name	**Software Defined Networks**
	On successful completion of the course the students will be able to:
CO1	Compare and contrast between traditional switch architecture and software defined network.
CO2	Describe the functionality of Open flow protocol and SDN controllers
CO3	Illustrate use of software defined network in data centre.
CO4	Design and develop various applications of SDN.
CO5	Demonstrate the SDN open source framework and software.
Course Name	**Information Security**
	On successful completion of the course the students will be able to:
CO1	Demonstrate various security models in Information Security.
CO2	Formulate information security governance, and related legal and regulatory issues
CO3	Analyse risks in a given activity and write the impact of risk.
CO4	Become aware of various standards in the Information Security System
CO5	Construct network security designs using available secure solutions.
Course Name	**Swarm Intelligence**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge of modelling swarms/social/Biological agents in complex landscapes.
CO2	Apply swarm intelligence algorithms to solve real optimization problems
CO3	Solve some applications using advanced computing algorithms like Bat, Fish
CO4	Understand and apply local and hybrid algorithms to solve complex problems
CO5	Illustrate various multi objective optimization.
Course Name	**Green Computing**

	On successful completion of the course the students will be able to:
CO1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment
CO2	Enhance the skill in energy saving practices in their use of hardware
CO3	Acquire knowledge on grid framework
CO4	Evaluate technology tools that can reduce paper waste and carbon footprint by the Stakeholders
CO5	Develop and analyse few case studies
Course Name	**Computer Forensics**
	On successful completion of the course the students will be able to:
CO1	Understand the basics of computer forensics
CO2	Apply a number of different computer forensic tools to a given scenario
CO3	Analyse and validate forensics data
CO4	Identify the vulnerabilities in a given network infrastructure
CO5	Implement real-world hacking techniques to test system security
Course Name	**Software Project Management**
	On successful completion of the course the students will be able to:
CO1	Understand Project Management principles and the roles of the Project Manager while developing software
CO2	Evaluate a project and provide accurate cost estimates and to plan various activities
CO3	Identify and Evaluate risks involved in various Project
CO4	Apply best practices to develop skills in Monitoring and Controlling of Software Projects
CO5	Learn staff selecting process and issues related to people management
Course Name	**Service Oriented Architecture**
	On successful completion of the course the students will be able to:
CO1	Explain the basic concepts of service oriented architecture and web services.
CO2	Explain service orientation principles and service layers of SOA.
CO3	Explore various service delivery strategies and service modelling.
CO4	Use the basic tools and languages for service oriented design.
CO5	Compare service and object orientation methodologies.
Course Name	**Virtual and Augmented Reality**
	On successful completion of the course the students will be able to:

CO1	Identify and explain the components of VR systems.
CO2	Model and program the VR systems.
CO3	Realize the importance and applications of VR systems.
CO4	Identify and explain the components of AR systems.
CO5	Realize the importance and applications of AR systems.
Course Name	**Deep Learning**
	On successful completion of the course the students will be able to:
CO1	Explain the fundamental principles, approaches for learning with deep neural networks
CO2	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO3	Discuss Convolutional Neural Network models to Object Detection and Digit Recognition
CO4	Build and train RNN and its variants
CO5	Know the open issues in deep learning, and have a grasp of the current research directions.
Course Name	**Information Visualization**
	On successful completion of the course the students will be able to:
CO1	Identify the data types and its associated visualization mechanisms.
CO2	Collect data ethically and solve engineering problem in visualising the information.
CO3	Implement algorithms and techniques for interactive information visualization.
CO4	Conduct experiments by applying various modern visualization tool and solve the space layout problem.
CO5	Analyze and design systems to visualize multidisciplinary multivariate Data individually or in teams.
Course Name	**Project Work & Viva Voce**
	On successful completion of the course the students will be able to:
CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Design engineering solutions to complex problems utilizing a system approach.
CO3	Analyze engineering problem specification and recommend an optimum set of technical solutions.
CO4	Implement innovative ideas in solving contemporary issues.
CO5	Acquire industry relevant skills by working in team and efficiently communicating the deliverables.

Program Name	B.E. (MECHANICAL ENGINEERING)
Semester	**III**
Course Name	*Engineering Thermodynamics*
	The students will be able to
CO1	Describe the thermodynamic systems and apply first law of thermodynamics to analyze the systems.
CO2	Comprehend the second law of thermodynamics and determine the efficiencies of engines.
CO3	Acquire the knowledge to calculate specified parameters of various thermodynamic cycles.
CO4	Estimate thermodynamic properties of substances in gas or liquid state of ideal and real mixture.
CO5	Analyze the performance of various gas power cycles and to study the psychometric process.
Course Name	*Fluid Mechanics and Machinery*
	The students will be able to
CO1	Acquire the knowledge regarding basic concepts in fluid mechanics.
CO2	Determine flow rates, pressure changes, minor and major head losses for laminar and turbulent flows through pipes.
CO3	Determine the significance of dimensional parameters that influence the flow in fluid mechanics.
CO4	Acquire knowledge and concepts of various turbine and centrifugal pump with drawing velocity vector triangle.
CO5	Apply principles of fluid mechanics to the operation, design and selection of pumps.
Course Name	*Composite Materials*
CO1	The students become aware of different composite materials, reinforcement materials, matrix materials and their usages.
CO2	The students will have knowledge about different fabrication techniques for polymer matrix composites.
CO3	The students will have skills to evaluate properties and applications of metal matrix composite materials.
CO4	The students are able to develop their skills about fabrication techniques for ceramic matrix composites.
CO5	The students will have a thorough knowledge of micro & macro-structural analysis of orthotropic materials, derivation of equations and application to problem-solving.
Course Name	*Manufacturing Technology-I*
	The students will have ability to
CO1	Explain the requirements, process, applications and defects of sand casting and special casting processes.

CO2	Explain the working principles and applications of different arc welding processes, special welding processes and defects associated with it.
CO3	Select the suitable process for manufacturing of components among forging, rolling, drawing, extrusion and its types.
CO4	Explain the principles and working of shearing, bending, drawing and forming in sheet metal.
CO5	Judge the suitability of a plastic manufacturing process based on application requirements.
Course Name	**Fluid Mechanics and Machinery Laboratory**
	The students will be able to
CO1	Measure flow through the venturimeter, orifice meter and rotometer.
CO2	Acquire knowledge in flow through different pipes.
CO3	Determine the friction factor for a given set of pipes.
CO4	Draw the characteristics curve for centrifugal, reciprocating, gear oil and submersible pump.
CO5	Draw the characteristics curve for Pelton wheel, Francis and Kaplan turbine.
Course Name	**Manufacturing Technology Laboratory -I**
CO1	The students are capable to perform plain turning, taper turning, thread cutting, knurling, drilling, reaming and tapping etc.
CO2	Ability to know about the basic concepts of cold forging operations.
CO3	Ability to know the concepts of foundry technology and to develop skills on sand casting.
CO4	Students can get the knowledge on applications on welding operation.
CO5	Students can demonstrate and fabricate different types of components using the machine tools.
Semester	**IV**
Course Name	**Kinematics of Machinery**
	The students will be able to
CO1	Demonstrate the simple mechanisms with suitable examples.
CO2	Determine displacement, velocity and acceleration of any point on a link in simple mechanism.
CO3	Construct cam profile for various follower motions
CO4	Describe law of gearing, types of gears, terminologies of spur gears and gear trains.
CO5	Analyze and synthesis position, velocity and acceleration for various mechanisms
Course Name	**Thermal Engineering**
	The students will be able to

CO1	Calculate the mean effective pressure and air standard efficiency of different gas power cycles.
CO2	Calculate the efficiency of reciprocating air compressor
CO3	Acquire the basic concepts of Internal combustion engines and combustion
CO4	Evaluate the performance test on IC engine.
CO5	Evaluate COP of vapour compression refrigeration systems.
Course Name	**Strength of Materials**
	The students will be able to
CO1	Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes
CO2	Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO3	Apply basic equation of simple torsion in designing of shafts and helical spring
CO4	Calculate the slope and deflection in beams and columns using different methods.
CO5	Analyze and design thin and thick shells for the applied internal and external pressures.
Course Name	**Manufacturing Technology-II**
	The students will be able to
CO1	Gain the knowledge on the fundamentals of metal cutting, merchant circle diagram, to solve tool life problems, types of wear, tool-tip temperature.
CO2	Learn various types of centre lathe and special purpose lathes.
CO3	Learn various types and operations of drilling machine, boring and reaming, broaching, shaping and planning, grinding, honing, lapping and super finishing operations.
CO4	Learn the manufacturing processes of abrasive processes and gear cutting.
CO5	Know the concepts of Part programming and about CNC machine tools.
Course Name	**Process Planning and Cost Estimation**
CO1	The students can make analyze on the techniques of work study and principles of ergonomics.
CO2	The students will know the concept of process planning and cost estimation for various product and process of industry.
CO3	The students will be familiar with types of estimation, pricing methods and production cost estimation.
CO4	The student will have an ability to know about the calculations of finding internal rate of return, net present value and payback period.
CO5	The students will have knowledge about estimation of production costs.
Course Name	**Thermal Engineering Laboratory**

	The students will be able to
CO1	Draw the valve and port timing diagram.
CO2	Perform experiments on the engine and draw the characteristics curve.
CO3	Perform experiments on computerised VCR S.I and C.I Engine.
CO4	Perform experiments on two stage Reciprocating Air Compressor and draw the characteristics curve.
CO5	Perform experiments to determine the properties of fuels and oils.
Course Name	*Material Testing and Metallurgy Laboratory*
CO1	The student will have the knowledge to perform various mechanical testing.
CO2	The student will have the knowledge to prepare the specimens as per standard for mechanical testing.
CO3	The student will be able to analyze the microstructure of various engineering materials.
CO4	The students will have an ability to conduct experiment of materials under untreated and heat treated conditions.
CO5	The student will have the knowledge of performing various non – destructive tests.
Course Name	*Manufacturing Technology Laboratory-II*
	The students will be able to
CO1	Calculate machining time, metal removal rate for all machining operation.
CO2	Prepare the models with dimensional accuracy and tolerance using the special purpose machineries.
CO3	Find suitable machining process for various applications.
CO4	Perform Lathe, Milling and Drilling operations
CO5	Perform Grinding, Milling and Drilling operations.
Semester	**V**
Course Name	*Metrology and Instrumentation*
	The students will be able to
CO1	Know about the working principle of generalized measurement system, the knowledge on calibration and definitions of various measurement terms.
CO2	Know about the concepts of linear and angular measuring instruments.
CO3	Know the concepts of screw thread, gear measurement and surface finish.
CO4	Gain knowledge on working principle of Laser devices and Coordinate measuring machine.
CO5	Gain knowledge on how to measure the instrumentation parameters like force, power, torque, flow and temperature.
Course Name	*Heat and Mass Transfer*

	The students will be able to	
CO1	Intrepret conduction, convection and radiation heat transfer.	
CO2	Solve problems involving steady-state and transient heat conduction in simple geometries.	
CO3	Determine values of the convection heat transfer co-efficient by applying empirical correlations.	
CO4	Analyze heat transfer performance by using the method of log mean temperature difference and heat exchanger effectiveness.	
CO5	Evaluate radiation heat transfer between black body and gray body surfaces.	
Course Name	*Dynamics of Machinery*	
	The students will be able to	
CO1	Predict the force analysis in the mechanical system.	
CO2	Balance the static and dynamic balancing of rotating and reciprocating masses.	
CO3	Analyse the free vibration in a single degree of freedom.	
CO4	Analyse force vibration caused by unbalancing, vibration transmissibility and isolation.	
CO5	Find the role of governors and gyroscopes used for speed control and stability control.	
Course Name	*Design of Machine Elements*	
	The students will be able to	
CO1	Apply the concept of steady stresses in design of machine elements.	
CO2	Design shafts and couplings for various applications.	
CO3	Design temporary and permanent joints.	
CO4	Design various energy storing elements.	
CO5	Select bearings for specific applications.	
Course Name	*Applied Hydraulics and Pneumatics*	
CO1	The students are able to comprehend the concept of fluid power systems and applications in industries.	
CO2	The students are able to select appropriate fluid power driving system and actuators for any given applications.	
CO3	The students are able to know about the use of control components, accessories of hydraulic systems.	
CO4	The students are able to gain knowledge on pneumatic system and components.	
CO5	An ability to design the hydraulic and pneumatic circuits and exposure of diagnose or troubleshoot the power systems.	
Course Name	*Metrology and Instrumentation Laboratory*	

	The students will be able to
CO1	Perform calibration process for micrometer, dial gauge, vernier caliper.
CO2	Perform experiments by using sine bar, gear tooth vernier caliper and tool makers microscope.
CO3	Use autocollimator for straightness and flatness measurement and thermocouple for temperature measurement.
CO4	Learn about coordinate measuring machine for linear and angular measurements.
CO5	Identify sources of variability, error and uncertainties.
Course Name	*Heat Transfer Laboratory*
	The students will be able to
CO1	Practically relate to concepts discussed in the heat transfer course.
CO2	Conduct various experiments to determine thermal conductivity of various materials.
CO3	Conduct performance tests and thereby improve effectiveness of heat exchangers.
CO4	Conduct performance tests and improve COP of refrigeration systems.
CO5	To determine the overall heat transfer coefficient for a composite wall.
Course Name	*Dynamics Laboratory*
	The students will have the ability to
CO1	Demonstrate the principles of kinematics and dynamics of machinery.
CO2	Determine mass-moment of inertia for simple bodies experimentally.
CO3	Design the cam and follower for different applications.
CO4	Analyze natural frequency of vibratory systems.
CO5	Analyze governors and gyroscopes.
Course Name	*Advanced Manufacturing Processes*
	The students will be able to
CO1	Demonstrate the basic operation of various unconventional manufacturing processes.
CO2	Apply the knowledge of mechanical energy based processes in their projects and interpret the importance of different processes for various applications.
CO3	Apply the knowledge of electrical energy based processes in their projects and to identify the various parameters and their influence on the performance of the processes.
CO4	Explain the various chemical machining processes and its effects on environment.

CO5	Explain thermal energy based processes like laser beam machining, electron beam machining and plasma arc machining, cutting and spraying.
Course Name	**Renewable Energy Sources**
	The students will be able to
CO1	Identify the techniques used to utilize the solar energy effectively.
CO2	Appreciate the need of wind energy and the various components used in energy generation and know the classifications.
CO3	Acquire the knowledge of biomass energy resources and their classification, types of biogas plant applications.
CO4	Acquire the knowledge of modern energy conversion technologies.
CO5	Get awareness of new energy and economics of power generation.
Course Name	**Introduction to Nanotechnology**
	The students will be able to
CO1	Have a working knowledge of Nano science and nanotechnology, including theory and experiments.
CO2	Get ideas about various microscopic techniques used for studying nanomaterials was understood.
CO3	Get knowledge on synthesis of Nano materials and their applications.
CO4	Learn different lithographic techniques used for nanofabrication.
CO5	Get knowledge on plasmonics and photonics for developing various applications such as optoelectronics gained.
Course Name	**Non Destructive Testing and Materials**
	The students will be able to
CO1	Apply scientific and technical knowledge to the field of non-destructive testing.
CO2	Use the relevant non-destructive testing methods for various engineering practice.
CO3	Analyse and interpret the defects to improve the overall quality of products.
CO4	Develop their skills in inspection of the components.
CO5	Increase overall reliability of the products by selection of suitable inspection techniques.
Course Name	**Design Concepts in Engineering**
	The students will be able to
CO1	Perform design process for developing new machine members.
CO2	Notice tools in engineering design
CO3	Find the solution in materials selection and materials in designing a new machine member.

CO4	Conduct designing machine members using materials processing.
CO5	Apply knowledge to select material basing on legal, ethical environmental and safety issues in design and quality engineering.
Semester	**VI**
Course Name	*Principles of Management and Business Concepts*
	The students will be able to
CO1	Understand the elements of effective management.
CO2	Know about motivation theories.
CO3	Gain the knowledge on managerial skills and business activities.
CO4	Understand business concepts and its applications.
CO5	Organize, plan and control the process of business activity.
Course Name	*Gas Dynamics and Jet Propulsion*
CO1	The students will become familiar with basic fundamental equations of one dimensional flow of compressible fluid and isentropic flow of an ideal gas.
CO2	The students will be able to acquire knowledge on the effects of heat transfer and friction flow through ducts.
CO3	An ability to acquire the knowledge on flow parameters with normal and oblique shocks.
CO4	An ability to understand the working concepts of the gas dynamics principles in the jet propulsions.
CO5	An ability to study the working concepts of rocket propulsion and various propellants.
Course Name	*Design of Transmission Systems*
	The students will be able to
CO1	Design and select pulleys, chain drives, rope drives and belt drives.
CO2	Design and select spur gears and parallel axis helical gears.
CO3	Design and select bevel, worm and cross helical gears.
CO4	Design gear boxes.
CO5	Design brakes and clutches.
Course Name	*CAD/CAM/CIM*
	The students will be able to
CO1	Use computer and popular CAD software's for modelling.
CO2	Know the construction features of NC and CNC machines and the components.
CO3	Gain the knowledge of computer integrated manufacturing.

CO4	Develop knowledge on group technology and computer aided process planning.
CO5	Utilize knowledge of flexible manufacturing system on shop floor in industries.
Course Name	*Computer Aided Machine Drawing*
	The students will be able to
CO1	Follow the drawing standards, Fits and Tolerances
CO2	Represent the machine elements in industrial drawings.
CO3	Explain the concept of sectional views in drawings.
CO4	Prepare bill of materials for production drawings.
CO5	Re-create part drawings and assembly drawings of machine components as per standards
Course Name	*CAM Laboratory*
	The students will able to know about
CO1	PC based CNC machines and windows based CAM software packages has made CNC programming.
CO2	Good aptitude for understand by the modern CNC control system in modern manufacturing system.
CO3	Knowledge to prepare the CNC Part Programming Techniques and to perform the manufacturing operation.
CO4	CAM software packages make it easy to translate CAD files into CNC programs which enable users to handle sophisticated jobs.
CO5	Knowledge of programming codes used in industry.
Course Name	*Design of Experiments*
	The students will be able to
CO1	Apply the experimental techniques to practical problems.
CO2	Develop basic Statistical Concepts.
CO3	Able to understand the experimental designs such as factorial and fractional factorial designs.
CO4	Gaining knowledge in signal to noise ratio and parameter design.
CO5	Impart the knowledge on analyzing and interpretation of experimental data.
Course Name	*Professional Ethics and Human Values*
CO1	The students will have awareness on engineering ethics and human values to instill moral and social values.
CO2	Students will be able to know about the importance and outcomes of experimentation of ethics with a case study.
CO3	Students will be able to know about assessment of safety and risk.

CO4	The student will have an ability to develop the knowledge in the area of collegiality, loyalty, confidentiality and IPR.
CO5	The students are aware of about the global issues related to engineering.
Course Name	***Internal Combustion Engines***
	The students will be able to
CO1	Acquire the knowledge and concepts of IC engines.
CO2	Interpret the basic concept and combustion parameters in Spark Ignition engines.
CO3	Interpret the basic concept and combustion parameters in Compression Ignition engines.
CO4	Acquire knowledge in usage of alternative fuels in internal combustion engines.
CO5	Identify the source of pollution formation and its control.
Course Name	***Refrigeration and Air Conditioning***
	The students will be able to
CO1	Understanding the various refrigeration cycle and refrigerants.
CO2	Understand the function of each of the major refrigeration system and its components.
CO3	Understanding the various factors involving in human comfort of air condition systems.
CO4	Analyse the various air condition equipment and control systems.
CO5	Analyse the applications of refrigeration and air conditions systems for industrial needs.
Course Name	***Industrial Relation and Organizational Development***
	The students will be able to
CO1	Know how to manage work place conflict and they understand how to resolve industrial relations and human resource problems.
CO2	Know about the causes for strikes and its prevention.
CO3	Know about industrial safety provisions and industrial health and hygienic conditions.
CO4	Analyze organizations more accurately and deeply by applying organization theory.
CO5	Know about the applications of evolutionary and revolutionary change management system.
Course Name	***Design of Jigs and Fixtures***
	The student will have an ability to
CO1	Locate and clamp the jigs and fixtures
CO2	Design, develop, assembly and inspect the jigs and fixtures for various components

CO3	Design the various elements of dies
CO4	Develop the required views of the final design.
CO5	Use the computer aids for sheet metal forming analysis.
Course Name	*Design of Heat Exchanger*
	The students will be able to
CO1	Perform the heat transfer analysis using LMTD and NTU method depending on nature of problem and available data.
CO2	Perform the thermal and hydraulic design of concentric tube heat exchanger.
CO3	Become aware of heat transfer co-efficient and friction for shell and tube heat exchanger.
CO4	Perform the heat transfer enhancement and pressure drop on compact heat exchangers.
CO5	Understand the design of condensers and evaporators and the effect of fouling of heat exchangers.
Course Name	*Metal Forming Techniques*
CO1	The students can understand load requirements for various bulk metal forming with or without addition of heat.
CO2	The students can understand tooling and press capacity for making sheet metal components.
CO3	Ability to know about extrusion processes and its force calculations.
CO4	The students are able to develop super plastic forming processes technique.
CO5	Student can able to analyse the new develop component by using simulation software.
Course Name	*Turbomachinery*
	The students will be able to
CO1	Explain the working principle of turbo machines with suitable energy equations.
CO2	Explain the working principle and operation of centrifugal compressor.
CO3	Draw inlet and outlet velocity triangles of centrifugal Pump.
CO4	Became aware of centrifugal fans and blowers.
CO5	Draw inlet and outlet velocity triangles for impulse turbine.
Course Name	*Operations Research*
	The students will be able to
CO1	Understand the mathematical tools that are needed to solve optimization problems.
CO2	Identify and develop operational research models from the verbal description of the dual systems.

CO3	Study the techniques of integer programming.
CO4	Solve mathematical models like Newton Raphson method, Lagrangian method and Kuhn Tucker conditions.
CO5	Develop a operational event and activities effectively by use of CPM and PERT for project management
Semester	**VII**
Course Name	*Automobile Engineering*
	The students will be able to
CO1	Imparts knowledge on different types of chassis and identify suitable engine for different applications.
CO2	Develop knowledge on troubleshooting of engine auxiliary systems and emission control.
CO3	Equipped with knowledge on automatic transmission system.
CO4	Analyze the steering geometry, braking principle and suspension systems.
CO5	Identify the usage of Electrical system and advances in automotive Engineering
Course Name	*Mechatronics and Robotics*
CO1	The students will be able to analyze mechatronics systems and different sensors used for displacement, position, velocity, motion, force, fluid pressure, temperature, etc
CO2	The students acquire knowledge in system models of mechanical, electrical, fluid, thermal systems and continuous and discrete process controllers
CO3	The students will be familiar with the basic structure of programmable logic controllers and in designing mechatronics systems
CO4	The students will be able to acquire the knowledge of different types and classification of robots, end effectors and robot kinematics.
CO5	The students will be able to gain the knowledge on robot programming languages.
Course Name	*Finite Element Analysis*
	The students will be able to
CO1	Identify mathematical model for solution of common engineering problems
CO2	Formulate one dimensional finite element equation for simple problems.
CO3	Examine 2-D finite element continuum for structural applications
CO4	Formulate and solve vibration problems using finite element techniques.
CO5	Solve 1-D and 2-D heat transfer and fluid flow problems using finite element approach.
Course Name	*Power Plant and Energy Engineering*
	The students will be able to

CO1	Realize the importance of power requirement, generation and utilization in the present world energy scenario.
CO2	Apply the knowledge gained by analyzing the steam power plants, steam generators and gas turbine power plants, to improve the efficiency and reduce the thermal losses.
CO3	Analyse the processes and cycles followed in nuclear and hydro electric power plant and components used in the power plants and identify the losses to get better efficiency.
CO4	Describe the working of various components of diesel power plant and Illustrate the working of gas turbine power plant and its components.
CO5	Apply knowledge about economics of power generation and use of renewable energy.
Course Name	**Mechatronics Laboratory**
	The students will be able to
CO1	Identify the hydraulic and pneumatic systems employed in manufacturing industry.
CO2	Apply the principles of Mechatronics and automation for the development of productive and efficient manufacturing systems.
CO3	Use the engineering technique skills and modern engineering tools necessary for practical applications.
CO4	Use design principles and develop conceptual, engineering design and fabrication of various components.
CO5	Simulate the basic electrical, hydraulic and pneumatic system using simulation software.
Course Name	**CAE Laboratory**
	The students will be able to
CO1	Select the method, meshing, analysis and optimize the given problem for structural and thermal applications.
CO2	Conduct structural analyses and selected other analysis like normal modes/natural frequency analysis, harmonic analysis, steady-state heat conduction analysis.
CO3	Use professional level finite element software to solve engineering problems in solid mechanics and heat transfer.
CO4	Simulate simple kinematic mechanisms and air conditioning system using simulation software.
CO5	Recognize sources of errors in FEA.
Course Name	**Design and Fabrication Project**
	The students will be able to
CO1	Use design principles and develop conceptual design of various components
CO2	Fabricate various components using different manufacturing tools
CO3	Develop skills to be the effective members of team

CO4	Have the knowledge of contemporary issues and modern practices
CO5	Familiarize presentation, communication and team-work skills
Course Name	**Internship & Technical Seminar**
CO1	The students will have practical knowledge about various activities like process design, quality control that are takes place in industries.
CO2	The students will have the skills of effective communication, presentation and report preparation.
CO3	The students are able to improve their problem solving and critical thinking skills.
CO4	The students are able to identify the professional standards.
CO5	The students are able to create or modify the new technology policies.
Course Name	**Maintenance Engineering**
	The students will be able to
CO1	Analyze the basic concepts of different types of maintenance and selection maintenance methods for various types of organizations like product oriented and service oriented sectors based on the understanding.
CO2	Gain the knowledge of preventive maintenance concept and implementation of PM budget cost control techniques.
CO3	Know about the working principle of pistol thermometers.
CO4	Know the Concept's of repair, replacement and overhaul.
CO5	Apply the knowledge on use of computers in maintenance.
Course Name	**Mechanical Vibration**
	The student will have an ability to
CO1	Analyze the mathematical model of a linear vibratory system to determine its response.
CO2	Obtain linear mathematical models of real life engineering systems.
CO3	Use Lagrange's equations for linear and nonlinear vibratory systems.
CO4	Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation.
CO5	Conduct test by using different vibration measuring device.
Course Name	**Engineering Economics and Cost Analysis**
	The students will be able to
CO1	Get knowledge about basics of economics.
CO2	Know about make or buy decisions.
CO3	Become familiar with cost calculations.
CO4	Know the concept of challenger and defender.

CO5	Know about how to find the depreciation of an asset.
Course Name	**Rapid Prototyping**
CO1	The students will able to gain knowledge on rapid prototyping technique.
CO2	The students will be able to gain knowledge about stereo lithography process and selective laser sintering.
CO3	The students get sound knowledge on the processes like fused-deposition modeling and solid ground curing.
CO4	The students get sound knowledge on the processes like laminated object manufacturing, concept modeler and laser engineered net shaping.
CO5	The students can enhance their knowledge in rapid tooling and different software used for rapid prototyping like solid view.
Course Name	**Cryogenics Engineering**
	The students will be able to
CO1	Be familiar with the properties and applications of cryogenic substances in various field of science.
CO2	Analyze the structure of different cryogenic systems and the analytical method for cryogenic thermodynamic cycle for gases and liquid mixture.
CO3	Familiar with the measurement of cryogenic instruments.
CO4	Interpret the applications of the cryogenic insulation.
CO5	Design a low-temperature systems and machinery to meet the requirements to ensure their maximum performance of durability and safety of cryogenics life.
Course Name	**Design of Thermal Equipments**
	The students will be able to
CO1	Gain knowledge on the basics of heat transfer processes in heat exchangers.
CO2	Develop the double pipe heat exchanger and analyze various factors.
CO3	Optimize the performance of shell and tube heat exchanger.
CO4	Analyze the performance of heat exchanger with extended surfaces.
CO5	Develop a heat pipe for practical applications.
Semester	**VIII**
Course Name	**Total Quality Management**
CO1	The student will get the knowledge on philosophies of management and basic concepts.
CO2	The students will have an ability to gain the knowledge on leadership qualities and management tools of quality and statistical concepts.
CO3	The students will be able to have exposure on concepts like Benchmarking and Failure Mode Effective Anaysis.

CO4	The students will be able to gain knowledge on Quality Function Deployment, and Total Productive Maintenance.
CO5	The students will be able to gain knowledge on the Quality certification procedure on ISO 9000, QS14000 and information on Auditing can be obtained.
Course Name	**Project Work**
	The students will be able to
CO1	Use the engineering technical skills and modern engineering tools necessary for practical applications.
CO2	Use design principles and develop conceptual, engineering design and fabrication of various components.
CO3	Take up any challenging practical problems and find solution by formulating proper methodology.
CO4	Create the document of the project with correct format and structure.
CO5	Gain Practical knowledge about various activities like processes, design, quality control that are taking place in industries.
Course Name	**Computational Fluid Dynamics**
	The students will be able to
CO1	Apply the fundamentals of CFD, and develop case specific governing equations.
CO2	Perform finite difference and finite volume based analysis for steady and transient diffusion problems.
CO3	Implement various mathematical schemes under finite volume method for convention diffusion.
CO4	Solve complex problems in the field of fluid flow and heat transfer with the support of high speed computers.
CO5	Apply the various discretization methods, solution procedure and the concept of turbulence modeling.
Course Name	**Theory of Elasticity**
	The students will be able to
CO1	Analyse the stress components in different planes and form differential equations of equilibrium.
CO2	Solve problems related to principal strains, octahedral strains and plane state of strain.
CO3	Understand the Airy's function for different beam of varing load conditions.
CO4	Analyse and interpret the stress in Axisymmetric and torsional elements.
CO5	Develop the equation of equilibrium under thermal stress and elastic stability condition.
Course Name	**Six Sigma and Lean Manufacturing**
	The students will be able to

CO1	Identify key requirements and concepts in lean manufacturing.
CO2	Initiate a continuous improvement change program in a manufacturing organization.
CO3	Apply the tools in lean manufacturing to analyze a manufacturing system and plan for its importance.
CO4	Manage the manufacturing system to achieve six sigma and sustainability.
CO5	Develop a board understanding of lean/ six sigma principles and practices.
Course Name	*Introduction to Micro Electro Mechanical Systems*
	The students will be able to
CO1	Understand the difference between microsystem and microelectronics and their applications.
CO2	Explain the manufacturing, design and packing technologies of MEMS.
CO3	Understand the working principle of actuators and sensors.
CO4	Design, model, simulate and perform testing on the nano fluids and micro pump.
CO5	Design a microsystem and knowledge on packing technologies.
Course Name	*Energy Conservation in Industries*
	The students will be able to
CO1	Quantify the energy demand and energy supply scenario of nation and appreciate the need for energy auditing for becoming environmentally benign
CO2	Analyze factors behind energy billing and apply the concept of demand side management for lowering energy costs
CO3	Compute the stoichiometric air requirement for any given fuel and quantify the energy losses associated with thermal utilities of industries
CO4	Diagnose the causes for under performance of various electrical utilities and suggest remedies for improving their efficiency
CO5	Apply CUSUM and other financial evaluation techniques to estimate the accruable energy savings/monetary benefits for any energy efficiency project
Course Name	*Fracture Mechanics*
	The students will be able to
CO1	Calculate the stress-strain and load-displacement fields around a crack tip.
CO2	Identify and formulate stress intensity factor, strain energy release rate, and the stress and strain fields around a crack tip for linear and non linear materials.
CO3	Define and predict fracture toughness of materials and be familiar with the experimental methods to determine the fracture toughness and energy balance.

CO4	Calculate the life calculation for load amplitude.
CO5	Design materials and structures using fracture mechanics approaches.
Course Name	*Entrepreneurship and E-Business*
CO1	The students will understand the necessity of management in the field of engineering and it realizes the importance of entrepreneurship in the modern world.
CO2	The students will have an ability to define, characteristics and role of SSI in economic Development. Impact of privatization and globalization on SSIs and understand the meaning of project and project identification.
CO3	The students are well trained to analyze the parameters of project like project appraisal, identification of business Opportunities, market feasibility study, technical feasibility study etc.
CO4	The students will be able to understand the motivation techniques and the financial analysis in entrepreneurships.
CO5	Students will understand the concept of management as a science, art and profession and appreciate the role of planning in management.
Course Name	*Optimization Techniques*
	The students will be able to
CO1	Use the basic concept of classical optimization techniques for different applications.
CO2	Formulate the linear programming using simplex method.
CO3	Define the various non linear programming methods for 1D minimization.
CO4	Illustrate the example for dynamic and integer programming problems.
CO5	Define the working principle of various nontraditional optimization techniques.
Course Name	*Tribology*
	The students will be able to
CO1	Find the solution for surfaces and friction related problem in automobile component.
CO2	Perform wear analysis on machine components using various measuring devices.
CO3	Notice the various types of lubricants and their effect on machine components.
CO4	Conduct motion analysis of automotive components using theory of film lubrication.
CO5	Apply their knowledge to select the materials for automotive components.
Course Name	*Advanced IC Engines*
	The students will be able to
CO1	Calculate various characteristics and parameter in IC engines

CO2	Explain the process parameter in combustion of fuels
CO3	Explain thermo chemistry properties of fuels and testing of fuels.
CO4	Evaluate the measurement techniques and test procedure of exhaust gas
CO5	Acquire knowledge in recent trends in IC engines
Course Name	*Biomass Energy System*
	The students will be able to
CO1	Understand the concept of biomass energy resources and their classifications.
CO2	Acquire the knowledge of biomass conversion mechanism and its principles.
CO3	Identify the differences among biomass and biogas.
CO4	Calculate the biomass gasifier size, energy output and source required.
CO5	Describe the current potential contribution of sustainable energy resources to the global energy scenes.
Course Name	*Design of Materials Handling Equipment*
CO1	The students will be able to gain knowledge on the concepts and benefits of better material handling systems.
CO2	The students will have knowledge on proper selection, use and care through work area hazard assessments and training.
CO3	The course would familiarize the student on the technique to select suitable material handling equipment and design them based on the need.
CO4	The student will be able to design material handling equipments such as drives of hoisting gears, conveyors, elevators.
CO5	The student will have knowledge on safe shifting of materials in a diary processing operation.

Program Name	MBA (Full Time & Part Time)
Semester	I
Course Name	**Business Statistics**
	On successful completion of the course the students will be able to:
CO1	Apply the basic Statistical measures of Central Tendency and Dispersion and represent
CO2	Use probability distribution concepts for numerical measure of uncertainty, Comprehend dynamic nature of managerial data and apply statistical tools of Correlation, Regression, Time series analysis and Index numbers.
CO3	Evaluate point and interval estimate of a statistic, Draw inference & decision making through hypothesis testing and acquaint the knowledge
Course Name	**Management Concepts and Practices**
	On successful completion of the course the students will be able to:
CO1	Explain the historical backdrop and fundamentals of Management thoughts vital for understanding the conceptual frame work of Management as a discipline.
CO2	Discuss the various concepts of planning, Decision making and controlling to help solving managerial problems
CO3	Understanding concepts of Ethics, Delegation, Coordination and Team work.
Course Name	**Management Accounting for Business Decisions**
	On successful completion of the course the students will be able to:
CO1	Understand the role of different branches of accounting i.e. Financial Accounting, Cost Accounting and Management Accounting and able to understand the balance sheets of a Company under Company's Act, Banking Company and Insurance Company.
CO2	Analyse the Financial Statements through various tools like ratio analysis, fund flow and cash flow etc.
CO3	Prepare the Fund Flow Statement and Working capital.
Course Name	**Economic Analysis for Business Decisions**
	On successful completion of the course the students will be able to:
CO1	Apply the intuition for analyzing economic problems from a managerial perspective in an organizational & business context.
CO2	Analysis the basic tools that structure the microeconomic problems for optimal decision-making.
CO3	Comprehension knowledge, tools and techniques to make effective economic decisions under conditions of risk and uncertainly.
Course Name	**Organizational Behaviour**
	On successful completion of the course the students will be able to:
CO1	Understand and learn the effective interpersonal, team building and leadership skills.

CO2	Familiarized to adjust better in organizational settings (by developing an understanding of how and why others behave in a particular manner).
CO3	Improved the organizational performance through the effective management of human resources.
Course Name	**Legal Aspects of Business**
	On successful completion of the course the students will be able to:
CO1	Study the provisions of Law of Contract, Partnership and Sale of Goods Act.
CO2	Acquaint with basic negotiable instruments
CO3	Understand the fundamental provisions of Company Law & Law of Insurance.
Course Name	**Information Management**
	On successful completion of the course the students will be able to:
CO1	Understand the leadership role of Information Systems in achieving business competitive advantage through informed decision-making.
CO2	Understand the concepts system, application software and programming languages
CO3	Apply Management Information Systems knowledge and skills learned to facilitate the acquisition, development, deployment, and management of information systems.
Course Name	**Executive Communication**
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals, scope and importance of communication in business.
CO2	Develop individual reading and listening skills
CO3	Develop an ability to communicate correctly and effectively on matters having relevance to day-to-day business operations
Semester	**II**
Course Name	**INTERNATIONAL BUSINESS MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Students would be familiar with global business environment.
CO2	Students acquire clarity in international strategic management practices and get acquainted with functional domain practices.
CO3	Students would be familiar with conflicts situations and ethical issues in global business.
Course Name	**OPTIMIZATION TECHNIQUES**
	On successful completion of the course the students will be able to:
CO1	Formulate a managerial decision problem into a mathematical model
CO2	Understand Operations Research models and apply them to real-life problems.

CO3	Able to design new simple models, like: CPM, PERT to improve decision making and develop critical thinking and objective analysis of decision problem.
Course Name	**HUMAN RESOURCE MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Explain the importance of human resources and their effective management in organizations.
CO2	Demonstrate a basic understanding of different tools used in forecasting and planning human resource needs.
CO3	Analyze the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training
Course Name	**MARKETING MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Analyse the relevance of marketing concepts and theories in evaluating the impacts of environmental changes on marketing planning, strategies and practices.
CO2	Identify and demonstrate the dynamic nature of the environment in which marketing decisions are taken and appreciate the implications for marketing strategy determination and implementation.
CO3	Design themselves and members they work within a team when undertaking independent marketing management study.
Course Name	**FINANCIAL MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Familiarized with the various sources of finance which a business house can mobilize, develop the ability to measure the risk and return of the various portfolios.
CO2	Implement investment decisions, the process and methods of evaluation of various investment proposals,
CO3	Develop the skills to analyze the impact of various financing alternatives on the wealth maximization/ valuation of the firm, Develop the ability to manage the profit generating (current) assets and strike a balance between liquidity and profitability
Course Name	**OPERATIONS MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Understanding the operations and operations management in organization.
CO2	Identify the roles and responsibilities of operations managers in different organizational contexts.
CO3	Apply the 'transformation model' to identify the inputs, transformation processes and outputs of an organization.
Course Name	**TOTAL QUALITY MANAGEMENT**
	On successful completion of the course the students will be able to:

CO1	Evaluate the principles of quality management and to explain how these principles can beapplied within quality management systems.
CO2	Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving and measuring quality.
CO3	Critically appraise the organizational, communication and teamwork requirements for effective quality management
Course Name	**DATA ANALYSIS AND BUSINESS MODELLING - Lab**
	On successful completion of the course the students will be able to:
CO1	Knowledge of spreadsheets and data analysis software for business modeling.
CO2	Students would become acquainted with the scientific methodology in business domain.
CO3	They would also become analytically skillful.
Course Name	**MANAGERIAL SKILL DEVELOPMENT -I**
	On successful completion of the course the students will be able to:
CO1	Development of understanding and practice personal and professional responsibility.
CO2	Demonstrate knowledge of personal belief and value.
CO3	Apply the comprehensive set of skills and knowledge for business success.
Semester	**III**
Course Name	**STRATEGIC MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Understand the strategic management process and competitive advantage
CO2	Realize the concepts of strategic management and different types of strategies.
CO3	Ability to develop, implement the strategic control processes and new businessmodels for internet economy
Course Name	**BUSINESS RESEARCH METHODS**
	On successful completion of the course the students will be able to:
CO1	Students would become acquainted with the scientific methodology in business domain.
CO2	They would also become analytically skillful.
CO3	They would become familiar with the nuances of scientific communication.
Course Name	**INDUSTRIAL RELATIONS AND LABOR LEGISLATIONS**
	On successful completion of the course the students will be able to:
CO1	Students will know how to resolve industrial relations.

CO2	Students will know how to resolve human relations problems.
CO3	They would promote welfare of industrial labour.
Course Name	**PERFORMANCE MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Describe and apply insights of employee in the theoretical principles of performance of Appraisal
CO2	Classify and evaluate compensation theories.
CO3	Analyze the relationship between Traditional and Modern Methods of Performance Appraisal
Course Name	**TRAINING AND DEVELOPMENT**
	On successful completion of the course the students will be able to:
CO1	Able to get the overall ideas of training and development.
CO2	Practice the on the job and Off the Job training methods.
CO3	Capable of developing the training modules and become trainer.
Course Name	**DERIVATIVES MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Understand the structural differences among derivative instruments.
CO2	Understand how derivatives are traded in exchanges and/or OTC markets.
CO3	Price derivative securities with different pricing models and Use Derivatives for hedging and/or speculation purposes.
Course Name	**SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Understand the functional areas of Capital Market.
CO2	Gaining knowledge on Fundamental and Technical Analysis.
CO3	Getting exposure on share trading in share market.
Course Name	**MERCHANT BANKING AND FINANCIAL SERVICES**
	On successful completion of the course the students will be able to:
CO1	Understanding the functions of various financial service organizations.
CO2	Gaining knowledge on merchant banking services in issue management.
CO3	Getting exposure on financial products and funds raising.
Course Name	**STRATEGIC BRAND MANAGEMENT**
	On successful completion of the course the students will be able to:

CO1	Demonstrate knowledge of the nature and processes of branding and brand management
CO2	Evaluate the scope of brand management activity across the overall organizational context and analyze how it relates to other business areas.
CO3	Analyze and discuss contemporary brand related problems and develop appropriate strategies
Course Name	**RETAIL MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Students would be familiar with retail business environment, opportunities and obstacles.
CO2	Students acquire clarity in retail management practices and get acquainted to design the strategies to achieve those goals.
CO3	Students would be familiar with use of technology in retailing business.
Course Name	**SERVICES MARKETING**
	On successful completion of the course the students will be able to:
CO1	Analyse and critically evaluate differences between services and good drawing on the understanding of how these differences influence the practice of service marketing.
CO2	Identify and analyse the different components of the "Services Marketing Mix "for developing strategic thinking in service marketing.
CO3	Analyse and assess the relevance of service recovery
Course Name	**PROJECT MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	Practical applications of project management to formulate strategies allowing organizations to achieve strategic goals
CO2	To understand planning and budgeting for risk management and good performance of the organization
CO3	Critical-thinking and analytical decision-making capabilities to investigate complex business problems to propose project-based solutions using project evaluations
Course Name	**SERVICES OPERATIONS MANAGEMENT**
	On successful completion of the course the students will be able to:
CO1	An understanding of the impact Operational capability has on decision making and options in business strategy and the linkage to operations strategy
CO2	A construct of the different types of operations process types on which operational capability can be based and the strategic implications of the process choice decision.
CO3	An investigation of the relationship between business strategy, operations strategy, process type, organizational and control structures the impacts these have on managerial decision making and choices.

Course Name	Supply Chain Management
	On successful completion of the course the students will be able to:
CO1	Exploration effective decision-making skills and critical thinking ability.
CO2	Demonstrate of relevant functional areas of management and their application in SCM
CO3	Understanding of alternate managerial decisions and identify optimal solutions
Course Name	E-COMMERCE
	On successful completion of the course the students will be able to:
CO1	Student should be able to know how to build an e-Commerce
CO2	Student should be able to know how to manage an e-Commerce
CO3	Student should be able to develop server for e-Commerce
Course Name	ADVANCED DATABASE MANAGEMENT SYSTEM
	On successful completion of the course the students will be able to:
CO1	Awareness of database models
CO2	Knowledge of database technologies
CO3	Awareness of database security
Course Name	ENTERPRISE RESOURCE PLANNING
	On successful completion of the course the students will be able to:
CO1	Knowledge of ERP implementation cycle
CO2	Awareness of core of ERP
CO3	Awareness of extended modules of ERP
Course Name	Managerial Skill Development -II
	On successful completion of the course the students will be able to:
CO1	Development of understanding and practice personal and professional responsibility.
CO2	Demonstrate knowledge of personal belief and value.
CO3	Apply the comprehensive set of skills and knowledge for business success.

Program Name	MCA
Semester	**I**
Course Name	**120CAT01 - DATA STRUCTURES AND ALGORITHMS**
CO1	Student will be able to choose appropriate data structure as applied to specified problem definition
CO2	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures
CO3	Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc
CO4	Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.
CO5	Students will be able to analysis the various algorithms.
Course Name	**120CAT02 – PYTHON PROGRAMMING**
CO1	Develop algorithmic solutions to simple computational problems
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems
CO4	Represent compound data using Python lists, tuples, dictionaries
CO5	Read and write data from/to files in Python Programs
Course Name	**120CAT03 - OPERATING SYSTEM CONCEPTS**
CO1	Analyze the structure of OS and basic architectural components involved in OS design
CO2	Analyze and design the applications to run in parallel either using process or thread models of different OS
CO3	Analyze the various device and resource management techniques for timesharing and distributed systems
CO4	Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
CO5	Interpret the mechanisms adopted for file sharing in distributed Applications
Course Name	**120CAE01 - SOFTWARE ENGINEERING**
CO1	Get an insight into the processes of software development.
CO2	Understand the problem domain for developing SRS and various models of software engineering
CO3	Model software projects into high level design using DFD, UML diagrams.
CO4	Measure the process performance using various metrics
CO5	Implementation of testing strategies

Course Name	120CAE02 - COMPUTER NETWORKS
CO1	Knowledge of basic network theory and layered communication architectures.
CO2	To understand wired and wireless LAN
CO3	Ability to design network topologies
CO4	Ability to solve problems in networking
CO5	To understand the basic concept of application layer.
Course Name	120CAE03 - PROBLEM SOLVING TECHNIQUES
CO1	Able to design a computational solution for given problem
CO2	Able to break a problem in to modules that can be solved
CO3	Able to transform a problem into program
CO4	Able to introduce modularity
CO5	To implement the text processing and pattern searching.
Course Name	120CAE04 - DIGITAL FUNDAMENTALS AND COMPUTER ORGANIZATION
CO1	Design trade-offs Basic fundamentals in digital logic & structure of a digital computer
CO2	Identify performance issues in processor and memory design of a digital computer
CO3	To Develop independent learning skills and be able to learn more about different computer architectures and hardware
CO4	To articulate design issues in the development of Multiprocessor organization & architecture
CO5	To identify the process of memory organization
Course Name	120CAE05 – CYBER SECURITY
CO1	Able to understand basic concept of symmetric chipper
CO2	Able to apply block chipper and data encryption standard
CO3	Implement asymmetric chipper
CO4	Getting practice with cryptographic data integrity algorithm
CO5	Understand network and internet security
Course Name	120CAE06 - ACCOUNTING AND FINANCIAL MANAGEMENT
CO1	To understand the balance sheet preparation and do analysis
CO2	To understand the budget preparation and control of a company
CO3	Helps to decide about the state of affairs of a particular firm / company.
CO4	Ensures the preparation of fiscal policies of the organization

CO5	Ensures the factors to be considered in investment policies
Course Name	**120CAE07 - BUSINESS PROCESSES**
CO1	Develop new or improved innovative business processes from gap analysis through process design in support of a company's strategic objectives in a socially responsible manner.
CO2	Analyze the key business processes that drive the value chain of an organization throughout the entire product life cycle
CO3	Evaluate current global business issues and their impact on various enterprises.
CO4	BPR and Information Technology Process-People View and Perspectives
CO5	E-business Application in the areas of CRM,ERP,SCM and Selling
Course Name	**120CAE08 - NUMERICAL METHODS AND DISCRETE STRUCTURES**
CO1	Apply numerical methods such as direct and iterative methods to solve algebraic or transcendental equations and system of equations
CO2	Appreciate numerical solutions using interpolation methods and approximation of derivatives.
CO3	Compute numerical solutions by integral calculus.
CO4	Expertise the knowledge of logics helps to verify the correctness of computer programs and to draw conclusions from scientific experiment
CO5	Internalize the abstract algebraic structure concepts.
Course Name	**120CAE09 - ELECTRONIC COMMERCE**
CO1	Understand the e – Commerce process and its advantages
CO2	Realize the concepts of Electronic Data Interchange and its implications.
CO3	Ability to develop and to implement the Secure Web Servers.
CO4	Students would become acquainted with the Digital and Virtual Internet Payment System.
CO5	Practically become analytically skillful in Internet Strategies.
Course Name	**120CAE10 - MICROPROCESSOR AND ITS APPLICATIONS**
CO1	Write programs to run on 8086 microprocessor based systems.
CO2	Design system using memory chips and peripheral chips for 16 bit 8086 microprocessor.
CO3	Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.
CO4	Distinguish between RISC and CISC processors.
CO5	Understand multi core processor and its advantages
Course Name	**120CAP06 – PYTHON PROGRAMMING LAB**
CO1	Getting Practice with decision and branching statement

CO2	Knowledge about dictionaries and tuples
CO3	Create an exception handling application with inheritance
CO4	Able to develop a web application with MySQL database
CO5	Develop an application using file concepts
Course Name	**120CAL01 - DATA STRUCTURES ALGORITHMS LAB**
CO1	Know the big O, omega, and theta notations and their usage to give asymptotic upper, lower, and tight bounds on time and space complexity of algorithms.
CO2	Can use and implement major data structures including binary search trees, balanced search trees, priority-queues, and hash tables.
CO3	Can explain and analyze fundamental graph algorithms including depth-first and breadth-first search, single-source and all-pairs shortest paths, and minimum spanning tree.
Course Name	**120CAL02 - NETWORK PROGRAMMING LAB**
CO1	Use network programming concepts to develop and implement distributed applications.
CO2	Develop and implement next generation protocols required for emerging applications.
CO3	Model and evaluate performance of networking systems
Course Name	**120CAL03 - SOFTWARE ENGINEERING LAB**
CO1	Ability to design Software development life cycle and shaping Data models
CO2	Familiarising to cod
CO3	Enriching the efficiency to handle Semantic Data Model Generators
CO4	Makes easy to handle Selenium software IDE
CO5	Learn to automate the compatibility testing
Course Name	**120CAL04 - PROBLEM SOLVING TECHNIQUES LAB USING C**
CO1	Design an algorithm using factorial and mathematical functions
CO2	To implement array with different types of dimensions
CO3	To develop bit manipulation
CO4	Create a various operation on file concepts
Course Name	**120CAL05 - FINANCIAL MANAGEMENT LAB**
CO1	After successfully qualifying practical examination, students will be awarded certificate to work with well-known accounting software i.e. Tally ERP.9
CO2	Student will do by their own create company, enter accounting voucher entries including advance voucher entries, do reconcile bank statement, do accrual adjustments, and also print financial statements, etc. in Tally ERP.9 software.

CO3	Students do possess required skill and can also be employed as Tally data entry operator.
Course Name	**120CAB001 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING -I**
CO1	Non Computer Science Student Can Understand the components of Computers
CO2	Ability to Understand Computer Software
CO3	To Gain knowledge of Problem Solving with packages.
CO4	Basic knowledge to write a simple programmes in c
CO5	Understand Functions and pointers.
Course Name	**120CBP001 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING LAB – I**
CO1	Read, understand and trace the execution of programs written in C language.
CO2	Write the C code for a given algorithm.
CO3	Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
CO4	Write programs that perform operations using derived data types
Semester	**II**
Course Name	**220CAT01 - DATABASE MANAGEMENT SYSTEMS**
CO1	To learn the basic concepts of DBMS
CO2	To Know the concepts of SQL
CO3	To understand PL/SQL, Triggers and cursors
CO4	To know the concept of Normalization
CO5	To implement ORDBMS
Course Name	**220CAT02 OBJECT ORIENTED PROGRAMMING USING JAVA**
CO1	To apply the fundamental concept of JAVA.
CO2	Implement Exception Handling and Multithreading
CO3	Design an application using AWT.
CO4	Gain Knowledge about Networking and packages
CO5	Deploy Collection framework.
Course Name	**220CAT03 CLOUD COMPUTING**
CO1	To gain the knowledge of cloud architecture and model.
CO2	Idea about various services involved in cloud
CO3	Gain the knowledge about virtualization technology

CO4	Ability to deploy cloud infrastructure and mobility.
CO5	Develop security and standards in the cloud.
Course Name	**220CAE01 - C# AND DOT NET PROGRAMMING**
CO1	Knowledge about .Net Programming with fundamental concpets.
CO2	Ability to practice object oriented aspects of C#
CO3	Design an application on .NET
CO4	Deploy an web based application
CO5	Develop an application using ADO .Net and ASP .Net
Course Name	**220CAE02 – ARTIFICIAL INTELLIGENCE**
CO1	Provide a basic exposition to the goals and methods of Artificial Intelligence
CO2	Implement the intelligent computational concepts
CO3	Knowledge through learning can be used for problem solving
CO4	Improves problem solving, reasoning, planning, natural language understanding.
CO5	Implement the Machine Learning and Robotics Concepts
Course Name	**220CAE03 – BLOCKCHAIN TECHNOLOGY**
CO1	Understand emerging abstracts models for Blockchain technology.
CO2	Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain
CO3	Provide a conceptual understanding of Block chain function
CO4	Apply Hyper Ledge Fabric and Etheric platform to implement the block chain application
CO5	Develop a simple Blockchain Application
Course Name	**220CAE04 - MOBILE COMPUTING**
CO1	Understand the basics of mobile computing.
CO2	Understand the functionality of each layer.
CO3	Gain the knowledge of mobile internet protocol
CO4	Acquired the knowledge to use simulator tools and design Ad hoc networks.
CO5	Able to develop mobile application
Course Name	**220CAE05 - DATA MINING AND DATA WAREHOUSING**
CO1	Preprocess the data for mining applications
CO2	Apply data mining techniques and methods to large data sets
CO3	Apply the association rules for mining the data

CO4	Use data mining tools.
CO5	Compare and contrast various classifiers
Course Name	**220CAE06 - DIGITAL MARKETING**
CO1	Students would be familiar with digital business and the opportunities and obstacles.
CO2	Acquire clarity in digital management practices and Advertising on the search engines.
CO3	Students would be familiar with use of technology in retailing business.
CO4	Analyze and critically evaluate by adding social media and the practice of digital marketing.
CO5	Identify and analyses the different components of Computer based education and training in digital marketing.
Course Name	**220CAE07 - PROBABILITY AND STATISTICAL METHODS**
CO1	Imbibe the knowledge of basic probability and apply in probability functions.
CO2	Aquaint the ability of fitting the real time problems into probability distribution models and interpret.
CO3	Use the concept of two dimensional random variables that helps to understand and analyse the statistical measures of probability functions.
CO4	Draw inference & decision making through hypothesis testing.
CO5	Implement the knowledge of analysis of variance and control limits in real time applications.
Course Name	**220CAE08 - ORGANIZATIONAL BEHAVIOUR**
CO1	Understand and learn the effective interpersonal, team building and leadership skills.
CO2	Familiarized to adjust better in organizational settings (by developing an understanding of how and why others behave in a particular manner).
CO3	Improved the organizational performance through the effective management of human resources.
CO4	Acquire Professions and Professionalism – Professional ideals and virtues
CO5	Understand the importance of being loyal and develop the best leadership skills.
Course Name	**220CAE09 - EMBEDDED SYSTEMS**
CO1	Identify the basic concepts and architecture of the embedded system
CO2	Summarize the various concepts of RTOS and OS.
CO3	Design and develop application for embedded System
CO4	Gain Knowledge on various communication protocols.
CO5	Deploy the real time applications with RTOS
Course Name	**220CAE10 - ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT**

CO1	Gain the knowledge of Environment, Ecosystem and Biodiversity.
CO2	Help the Student Understand the Environment pollution.
CO3	Able to understand the Natural Resources
CO4	Gain Knowledge in disaster management
CO5	To determine the approaches to disaster risk reduction
Course Name	**220CAP06 DATABASE MANAGEMENT SYSTEMS LAB**
CO1	Design and implement a database schema for a given problem domain
CO2	Populate and query a database using SQL DDL/DML commands.
CO3	Program in PL/SQL including stored procedures, stored functions, cursors, packages.
CO4	Design and build a GUI application
Course Name	**220CAL01 - JAVA PROGRAMMING LAB**
CO1	Able to Know the fundamental concepts of OOPs.
CO2	To obtain the knowledge about Interface, Abstract and Multithreading Concepts.
CO3	Design and Develop a window based applications.
CO4	Deploy an application with database.
CO5	To Develop and Deploy an application with API
Course Name	**220CAL02 CLOUD COMPUTING LAB**
CO1	Configure the various virtualization tools such as virtual box, VMWareWorkstations.
CO2	Design and Deploy a web application in PaaS Environment.
CO3	Learn how to simulate a cloud environment to implement new schedulers
CO4	Install and use a generic cloud environment that can be used as a private cloud.
CO5	Manipulate the large dataset in a parallel environment.
Course Name	**220CAL03 C# AND DOT NET PROGRAMMING LAB**
CO1	The students able to create simple web applications and window applications.
CO2	To learn fundamentals of window application programming and create a window application.
CO3	To develop web applications and learn advanced features of C#.
Course Name	**220CAL04 IMAGE PROCESSING LAB**
CO1	Gain the knowledge of Digital Signal Processing.
CO2	Design and deploy the process of transformation and enhancement images.

CO3	Summarize the concept of Binary Image Processing
CO4	Develop compression techniques in digital images
CO5	Gain a practical knowledge in Digital Image Processing.
Course Name	**220CAL05 DATA MINING AND DATA WAREHOUSING LAB**
CO1	The data mining process and important issues around data cleaning, pre-processing and integration.
CO2	Practice the principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.
Course Name	**220CAB001 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING -II**
CO1	Understand the database management systems and design database for simple Application.
CO2	Ability to design a simple web page
CO3	Understand the management skills
CO4	Ability to improve statistical skills.
Course Name	**220CBP001 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING LAB – II**
CO1	To Understand and manipulate table operations
CO2	To implement various DML and DDL commands
CO3	To design simple web page.
CO4	To develop attractive style sheet using CSS
Semester	**III**
Course Name	**320CAT01 – WEB PROGRAMMING**
CO1	Ability to understand the fundamental concept of PHP
CO2	To Implement PHP Array and PHP Functions
CO3	Work with database and cookies for real time applications,
CO4	Work with Web application using File handling along with Object Oriented Concept.
CO5	Design and develop applications using advanced frameworks.
Course Name	**320CAT02 – MOBILE APPLICATION DEVELOPMENT**
CO1	Gain Knowledge about Android features, tool and anatomy.
CO2	Design an application using activities, intent and components
CO3	Identified the role of View and Persistence
CO4	Implement Android Application using Messaging, Location Based Services
CO5	Gain Knowledge about IoS.

Course Name	320CAT03 – BIG DATA MANAGEMENT
CO1	Gain Knowledge about data and NoSQL Data Management
CO2	Ability to understand fundamental of Hadoop.
CO3	Design and Develop a simple Map Reduce Applications
CO4	Illustrate role of Pig, HIVE and HBase
CO5	Gain Knowledge on Data Streaming and Hadoop Clustering
Course Name	320CAE01 - SERVICE ORIENTED ARCHITECTURE
CO1	To learn about fundamental of XML.
CO2	Gain the knowledge about SOA.
CO3	Improve the analysis and design in SOA.
CO4	Experience in SOA Platform.
CO5	Design an Web Service Extension in an applications.
Course Name	320CAE02 – ADVANCED JAVA SCRIPTING LANGUAGE
CO1	Provide the basic knowledge of JavaScript
CO2	Improve the technical aspects of JavaScript Object
CO3	Knowledge gained with fundamental of Angular JS
CO4	Improve the Technical Knowledge in Node JS
CO5	Ability to build a React web application
Course Name	320CAE03 - AGILE SOFTWARE DEVELOPMENT
CO1	Understand Agile development using Test Driven Development
CO2	Understand the Agile Scrum framework.
CO3	Perform testing activities within an Agile project
CO4	Apply design principles and refactoring to achieve Agility
CO5	Deploy automated build tools, version control and continuous integration
Course Name	320CAE04 – MACHINE LEARNING TECHNIQUES
CO1	Develop learning models from data.
CO2	Distinguish and apply supervised algorithm for any given problem.
CO3	Distinguish and apply unsupervised algorithm for any given problem.
CO4	Design and implement systems that uses the appropriate graph models and sequence model of machine learning.
CO5	Modify existing machine learning algorithms to improve classification efficiency

Course Name	320CAE05 – INTERNET OF THINGS
CO1	Understand the vision of IoT from a global context.
CO2	Determine the Market perspective of IoT.
CO3	Use of Devices, Gateways and Data Management in IoT.
CO4	Building state of the art architecture in IoT.
CO5	Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.
Course Name	320CAE06 - PROFESSIONAL COMMUNICATION
CO1	The ability to strengthen technical writing and speaking
CO2	The ability to be proactively read, listen, speak and present facts in a persuasive manner in both oral and written medium
CO3	The ability to interact, translate and delegate information,
CO4	The ability to face various levels of competitive examinations to upgrade educational and career options
CO5	The ability to face any challenge in the work environment.
Course Name	320CAE07 - RESOURCE MANAGEMENT TECHNIQUES
CO1	Understand and apply linear, integer programming to solve operational problem with constraints
CO2	Apply transportation and assignment models to find optimal solution in warehousing and Travelling,
CO3	To prepare project scheduling using PERT and CPM
CO4	Identify and analyze appropriate queuing model to reduce the waiting time in queue.
CO5	Able to use optimization concepts in real world problems
Course Name	320CAE08 - AD HOC AND SENSOR NETWORKS
CO1	Gain the Knowledge of Ad-hoc Networks
CO2	Analysis about Contention based protocol and mechanisms
CO3	Ability to understand about the routing protocols
CO4	Gain knowledge in Wireless Sensor Networks
CO5	Implementation of Hybrid Wireless Networks.
Course Name	318CAE09 - HUMAN RESOURCE MANAGEMENT
CO1	Explain the importance of human resources and their effective management in organizations.
CO2	Elucidate the Enhanced recruitment activities and better training and development programme.
CO3	Demonstrate a basic understanding of different tools used in forecasting and planning human resource needs.

CO4	Expose the knowledge on wage and salary administration & appraising and managing performance.
CO5	Analyse the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training
Course Name	**320CAE10 - FINANCIAL DERIVATIVE**
CO1	Provide an in-depth understanding of financial derivatives in terms of concepts, structure, instruments and trading strategies for profit and risk management.
CO2	Understand how financial derivatives are valued based on no arbitrage pricing arguments and risk-neutral valuation methods.
CO3	Understand how the instruments covered can be used to implement basic market risk management strategies, appropriate for corporate applications.
CO4	Be able to solve basic problems requiring the ability to price derivative instruments and hedge market risk based on numerical data and current market conventions.
CO5	Focus on various types of risks in derivatives and knowledge on Indian Financial System.
Course Name	**320CAL01 – WEB PROGRAMMING LAB**
CO1	Can able to work with PDO PHP code
CO2	Can able to work with query manipulations.
CO3	Can able to work with new frameworks like Larvel and Codeignter.
CO4	Can able to work with dynamic base applications
Course Name	**320CAL02 - MOBILE APPLICATION DEVELOPMENT LAB**
CO1	Getting Practices with controls, views and activities
CO2	Knowledge about various resources
CO3	Create application with database connection
CO4	Be able to develop useful mobile applications for the current scenarioa
Course Name	**320CAL03 – MACHINE LEARNING TECHNIQUES LAB**
CO1	Apply various classification and clustering techniques for problems using tools like R and Python.
CO2	Implement solutions for various prediction problems using tools.
CO3	Design and development of game and traffic control system using reinforcement learning.
Course Name	**320CAL04 – EXECUTIVE COMMUNICATION LAB**
CO1	The ability to strengthen technical writing and speaking
CO2	The ability to be proactively read, listen, speak and present facts in a persuasive manner in both oral and written medium

CO3	The ability to interact, translate and delegate information
CO4	The ability to face various levels of competitive examinations to upgrade educational and career options
Course Name	**320CAL05 - REPORT WRITING PRACTICE LAB**
CO1	Acquire Language Skills required to Write Reports
CO2	Explore Knowledge in Report Writing Tools
CO3	Able to Write a Report for an Application Projects
CO4	Known about Thesis Writing

Program Name	M.E. (COMPUTER SCIENCE AND ENGINEERING)
Semester	**I**
Course Name	*Advanced Data Structures and Algorithms*
CO1	Have a basic ability to analyze algorithms and to determine algorithm correctness and time efficiency
CO2	Master a variety of advanced data structures and their implementations and different algorithm design techniques in computational geometry and in parallel algorithms
CO3	Apply and implement the learnt algorithm design techniques and data structures to solve problems
Course Name	*Advanced Computer Architecture*
CO1	Discuss the issues related to multiprocessing and suggest solutions
CO2	Point out the salient features of different multicore architectures and how they exploit parallelism.
CO3	Design hierarchal memory system
CO4	Point out how data level parallelism is exploited in architectures
Course Name	*Network Protocols*
CO1	Ability to study, analyze and design seven layers of protocols of wired and wireless networks.
CO2	Understand the network security technologies and protocols
CO3	Gain the knowledge to design various high speed network protocols
CO4	Understand the importance of Wireless LAN & MAN protocols
Course Name	*Advanced Software Engineering*
CO1	Analytically apply general principles of software development in the development of complex software and software- intensive systems
CO2	Discuss methods and techniques for advanced software development and also to be able to use these in various development situations
CO3	Apply testing techniques for object oriented software and web-based systems
CO4	Point out how data level parallelism is exploited in architectures
Course Name	*Advanced Wireless Networks*
CO1	Familiar with the latest 4G networks and LTE
CO2	Understand about the wireless IP architecture and LTE network architecture.
CO3	Familiar with the adaptive link layer and network layer graphs and protocol.
CO4	Understand about the mobility management and cellular network.
CO5	Understand about the wireless sensor network architecture and its concept.

Course Name	Digital Image Processing
CO1	Design and implement algorithms for image processing applications that incorporates different concepts of medical Image Processing
CO2	Familiar with the use of MATLAB and its equivalent open source tools
CO3	Critically analyze different approaches to image processing applications
CO4	Explore the possibility of applying Image processing concepts in various applications
Course Name	Agile Software Engineering
CO1	The know importance of interacting with business stakeholders in determining the requirements for a software system.
CO2	Apply iterative software development process
CO3	Apply the impact of social aspects on software development success.
Course Name	Artificial Intelligence
CO1	Use existing open source tools to build an application using genetic approaches
CO2	Identify different applications suitable for different types of neural networks giving justifications
CO3	Critically analyze the use of cellular systems
CO4	Differentiate the different models of immune systems
CO5	Do a literature survey on applications of artificial immune systems
CO6	Implement the Particle swarm and Ant colony algorithms within a framework and build applications
Course Name	Web Engineering
CO1	Explain the characteristics of web applications.
CO2	Model web applications.
CO3	Design web applications.
CO4	Test web applications.
Course Name	Advanced Data Structures and Algorithms Laboratory
CO1	Design and implement basic and advanced data structures extensively.
CO2	Design algorithms using graph structures
CO3	Design and develop efficient algorithms with minimum complexity using design techniques.
Course Name	Networks Simulation Laboratory
CO1	Learn the basic idea about open source network simulator NS2 and how to download, install and work with NS2 using TCL programming
CO2	Defining the different agents and their applications like TCP, FTP over TCP, UDP , CBR and CBR over UDP etc.

CO3	Identifying and solving the installation error of NS2.
CO4	Understand the basic concepts of link layer properties including error-detection
CO5	Understand the basic concepts of application layer protocol design including Client/server models.
Semester	**II**
Course Name	*Advanced Database Management Systems*
CO1	Map ER model to Relational model to perform database design effectively
CO2	Design different types of databases
CO3	Compare and contrast various indexing strategies in different database systems
CO4	Use different query optimization techniques
Course Name	*Security in Computing*
CO1	Summarize the basic concept of cryptography and encryption standards
CO2	Identify and classify various kinds of threats
CO3	Provide secure database systems.
CO4	Accomplish the security over networks.
CO5	Familiar about economics of Cyber and ethical issues security
Course Name	*Data Mining Technologies*
CO1	Evolve Multidimensional Intelligent model from typical system
CO2	Discover the knowledge imbibed in the high dimensional system
CO3	Evaluate various mining techniques on complex data objects
Course Name	*Internet of Things*
CO1	Develop web services to access/control IoT devices.
CO2	Design a portable IoT using Rasperry Pi
CO3	Deploy an IoT application and connect to the cloud.
CO4	Analyze applications of IoT in real time scenario
Course Name	*Operating System Internals*
CO1	Explain the functionality of a large software system by reading its source.
CO2	Revise any algorithm present in a system.
CO3	Design a new algorithm to replace an existing one.
CO4	Use the data structures of the linux kernel for a different software system.

Course Name	Ad Hoc Networks
CO1	Explain the concepts, architecture and applications of Ad Hoc Networks.
CO2	Analyse the MAC protocol design concepts in Ad Hoc networks.
CO3	Design Ad Hoc routing protocols with respect to some protocol design issues.
CO4	Identify different Transport and Security Layer protocols
CO5	Evaluate the QOS related performance measurement of Ad Hoc Networks.
Course Name	Multimedia Compression Techniques
CO1	Implement basic compression algorithms with MATLAB and its equivalent open source environments.
CO2	Design and implement some basic compression standards
CO3	Critically analyze different approaches of compression algorithms in multimedia related mini projects.
Course Name	Software Testing and Quality Assurance
CO1	Describe different approaches to testing software applications
CO2	Analyze specifications and identify appropriate test generation strategies
CO3	Develop an appropriate test design for a given test object
CO4	Identify applicable measurements for the verification and validation effort
CO5	Execute the test design
CO6	Evaluate the testing effort based on adequatemeasures
Course Name	Social Network Mining and Analysis
CO1	Develop semantic web related applications.
CO2	Represent knowledge using ontology.
CO3	Predict human behaviour in social web and related communities
CO4	Visualize social networks.
Course Name	Cloud Computing
CO1	Employ the concepts of storage virtualization, network virtualization and its management
CO2	Apply the concept of virtualization in the cloud computing
CO3	Identify the architecture, infrastructure and delivery models of cloud computing
CO4	Develop services using Cloud computing
CO5	Apply the security models in the cloud environment
Course Name	Data Mining Laboratory

CO1	Ability to understand and create data warehouse.
CO2	Demonstrate the classification, clustering and etc. in large data sets.
CO3	Ability to add mining algorithms as a component to the exiting tools.
CO4	Ability to apply mining techniques for realistic data.
CO5	Demonstrate the association rule mining in large data sets.
Course Name	*Advanced Database Management Systems laboratory*
CO1	Design and develop parallel and distributed database
CO2	Create and retrieve from database with efficient query optimizer
CO3	Simulate the search engine using XML language
CO4	Apply join operations in distributed DBMS
Semester	**III**
Course Name	*Modelling And Simulation Of Wireless Communication System*
CO1	To be able to design various models for wireless communication
CO2	To be able to simulate various channels .
CO3	To apply for various wireless communication technologies
Course Name	*Wireless Sensor Networks*
CO1	Gain knowledge and understanding of basic WSN technology and supporting protocols and Technology.
CO2	Identify medium access control protocols and address physical layer issues
CO3	Apply knowledge on routing protocols for sensor networks and solve the design issues
CO4	Analyze transport layer protocols for sensor networks, and design requirements and challenges
CO5	Gain the knowledge of Localization and Security in Wireless Sensor Network
Course Name	*Machine Learning Techniques*
CO1	Develop learning models from data.
CO2	Distinguish and apply supervised algorithm for any given problem.
CO3	Distinguish and apply unsupervised algorithm for any given problem.
CO4	Design and implement systems that uses the appropriate graph models and sequence model of machine learning.
CO5	Modify existing machine learning algorithms to improve classification efficiency.
Course Name	*Integrated Software Project Management*
CO1	Identify the various elements of software management process framework .

CO2	Use available open source estimation tools for cost estimation.
CO3	Identify existing risk and perform risk assessment.
CO4	Design a software metric for software project management and people management.
Course Name	*Deep Learning*
CO1	Understand basics of deep learning.
CO2	Implement various deep learning models.
CO3	Realign high dimensional data using reduction techniques.
CO4	Analyze optimization and generalization in deep learning.
CO4	Explore the deep learning applications.
Course Name	*Big Data Analysis*
CO1	Realize how to leverage the insights from big data analytics .
CO2	Analyze data by utilizing various statistical and data mining approaches .
CO3	Perform analytics on real-time streaming data.
CO4	Recommend areas to apply big data frameworks to increase business outcome.
CO5	Implement Data analytics method using R.
Course Name	*Digital Forensics*
CO1	have a fundamental understanding of Digital Forensics and how resultant evidence can be applied within legal cases.
CO2	display their competence in the various forensic computing fields.
CO3	perform competitively as a technical support in any organization
Course Name	*Speech Processing*
CO1	Create new algorithms with speech processing
CO2	Derive new speech models
CO3	Perform various language phonetic analysis
CO4	Create a new speech identification system
CO5	Generate a new speech recognition system
Course Name	*ERP And Concepts*
CO1	Become a manager of computer service offerings, across business processes of an organization.
CO2	Understand the structure of an ERP system .
CO3	Prepare them to become knowledgeable ERP user professionals suitable to Industry and Information Technology Companies.

Course Name	Video Processing
CO1	Create a multimedia video.
CO2	Implement video processing techniques in digital cinema.
CO3	Identifies the target scenes with help of video analytics
Course Name	Virtualization Tecniques
CO1	Deploy legacy OSs on virtual machines
CO2	Understand the intricacies of server, storage, network, desktop and applications virtualizations.
CO3	Design new models for virtualization
CO4	Design and develop cloud applications on virtual machine platforms
CO5	Design new models for Bigdata processing in cloud

Program Name	M.E (Communication Systems)
Semester	**I**
Course Name	**Advanced Digital Signal Processing**
	On successful completion of the course the students will be able to:
CO1	Analyze the discrete signal parameters in time and frequency domain.
CO2	Estimate statistical parameter of the signal in frequency domain
CO3	Estimate and predict the different forms of signals.
CO4	Design and develop Adaptive filters.
CO5	Implement Sub-band coding for various Applications.
Course Name	**Modern Digital Communication Technique**
	On successful completion of the course the students will be able to:
CO1	Develop the knowledge of basic linear algebraic concepts.
CO2	Identify the major classes of error detecting and error correcting codes and how they are used in practice.
CO3	Implement Error control coding and Digital modulation techniques in MATLAB
CO4	Apply Spread Spectrum Techniques in Wireless Communication Technologies
Course Name	**Optical And Mobile Communication Network**
	On successful completion of the course the students will be able to:
CO1	Recall knowledge of basic optical components for realizing any optical function
CO2	Discuss and formulate different networking Topologies
CO3	Design and analyze about MIMI communication system and Broadcast system
CO4	Summarize the functioning of wireless networks
Course Name	**Advanced Radiation Systems**
	On successful completion of the course the students will be able to:
CO1	Calculate the Power radiated in far field and also familiar with Polarization concept
CO2	Apply Antenna Arrays with N elements for specified Application
CO3	Summarize the Antenna based on their Specification and Performance, for various Applications
CO4	Categorize the micro strip antennas for different applications

Course Name	Communication Systems Laboratory- I
	On successful completion of the course the students will be able to:
CO1	Analyse the radiation pattern of various antenna's in the polar graphs.
CO2	Design the modulation and coding in different applications
CO3	Discover the video links and digital data transmission using optical fibres.
CO4	Reproduce sim links models of the OFDM and channel equalizer.
Course Name	RECONFIGURABLE COMPUTING
	On successful completion of the course the students will be able to:
CO1	Identify the need for reconfigurable architecture
CO2	Discuss the architecture of FPGAs
CO3	Develop applications using any HDL and appropriate tools
CO4	Design and build an SoPC for a particular application
Course Name	NETWORK MANAGEMENT
	On successful completion of the course the students will be able to:
CO1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets
CO2	Formulate possible approaches for managing OSI network model.
CO3	Apply network management standards to manage practical networks.
CO4	Prescribe the services offered by broad band networks
CO5	Identify the various components of network and formulate the scheme for the managing them.
Course Name	RESEARCH METHODOLOGY
	On successful completion of the course the students will be able to:
CO1	Understand the concept of Qualitative and Quantitative Research
CO2	Experiment the Design and Testing concepts for Research
CO3	Knowledge in concept of Data Collection and Statistical Techniques
CO4	Knowledge in Learn the concept of Report Making
Course Name	Wavelet Signal Processing
	On successful completion of the course the students will be able to:
CO1	Apply Fourier tools to analyse signals
CO2	Gain knowledge about MRA and representation using wavelet bases

CO3	Acquire knowledge about various wavelet transforms and design wavelet transform.
CO4	Apply wavelet transform for various signal & image processing applications
CO5	Generatethedifferentfamilyofwaveletsforreal-time
Course Name	**WDM OPTICAL NETWORKS**
	On successful completion of the course the students will be able to:
CO1	Apply the Optical System Components worldwide
CO2	Create Optical Network Architecture for reasoning
CO3	Develop skills on Wavelength Routing Network,
CO4	Intregate on Packet Switching Network ,Access Network
CO5	Devise and Manage Optical Network for desired Application
Course Name	**ADVANCED SATELLITE BASED SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Analyze different navigational services
CO2	Apply various remote sensing concepts for Safety of Life Services
CO3	Describe the performance of any satellite networks
CO4	Determine the image processing concepts on remote sensing data
Semester	**II**
Course Name	**SOFTWARE RADIO ARCHITECTURE**
	On successful completion of the course the students will be able to:
CO1	Conceptualize the SDR and implementation details
CO2	Design SDR for a specific application
CO3	Identify the challenges in the maintenance of SDR
CO4	Analyse the transmitter and receiver architectures
Course Name	**PHOTONIC AND MICROWAVE INTEGRATED CIRCUITS**
	On successful completion of the course the students will be able to:
CO1	Design the Photonics components.
CO2	Acquire knowledge in the design and fabrication of the Photonic Integrated Circuits
CO3	Design and fabricate the hybrid MIC's in thick and thin film technology.
CO4	Implement the different methods for the fabrication of the monolithic MICs
Course Name	**MULTIMEDIA COMPRESSION TECHNIQUES**

	On successful completion of the course the students will be able to:
CO1	Understand the various requirements of the multimedia compression techniques.
CO2	Implement text compression using the LZW algorithms and coding techniques
CO3	Acquire knowledge in the various audio compression techniques and its applications
CO4	Design and analyze of images compression using wavelet based compression.
Course Name	**COMMUNICATION SYSTEM LAB II**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in various characteristics of the Non-reciprocal components in micro strip lines..
CO2	Implement the various compression techniques using MATLAB
CO3	Measure the losses for the fiber optic components.
Course Name	**RF SYSTEM DESIGN**
	On successful completion of the course the students will be able to:
CO1	Analyze the scattering parameters through the smith chart.
CO2	Design the filter realizations and implementations with knowledge of basic characteristics.
CO3	Analyze the parameters of matching networks using the discrete components
CO4	Explain the basic definition and to choose the appropriate method for high frequency applications
Course Name	**ADVANCED MICROWAVE SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Understand the different modes of the planar transmission lines.
CO2	Determine of the impedance and radiation pattern for the waveguide systems
CO3	Acquire knowledge in image parameter method and spatial harmonics.
CO4	Analyze in the conditional and unconditional stability criteria for the solid state amplifiers
Course Name	**COMMUNICATION PROTOCOL ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in the OSI model and TCP/IP protocol suite.
CO2	Implement the SDL based protocol for interface and other entity.
CO3	Acquire knowledge in the protocol verification approach for SDL

CO4	Acquire knowledge in analysis of the conformance protocol
Course Name	**GLOBAL POSITIONING SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in GPS constellation and its operations..
CO2	Understand the various motion and their coordinate systems.
CO3	Implement the signal processing techniques and tracking networks.
CO4	Apply the various parameters to processes data and observables
Course Name	**ANALYSIS AND DESIGN OF PLANAR TRANSMISSION LINES**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge about analysis of planar transmission lines.
CO2	Design of strip lines and co-planar lines.
CO3	Learn about the design consideration of microstrip lines and coplanar waveguides
Course Name	**MIXED - SIGNAL CIRCUIT DESIGN**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in mixed signal circuits like DAC, ADC, PLL etc.
CO2	Acquire knowledge in filter design in mixed signal mode.
CO3	Design different architectures in mixed signal mode.
Course Name	**NETWORK ROUTING ALGORITHMS**
	On successful completion of the course the students will be able to:
CO1	Analyze the data transmission with the various routing algorithm in circuit and packet switching networks.
CO2	Design the secured data transmission based on the optical and ATM networks.
CO3	Design, operate and debug mobile network architecture
CO4	Acquire knowledge in the different routing algorithms for the MANET
Course Name	**DIGITAL COMMUNICATION RECEIVERS**
	On successful completion of the course the students will be able to:
CO1	Learn the fundamentals of the digital communication techniquese
CO2	Design the optimum receivers for AWGN channel
CO3	Apply the diversity technique for fading channels
CO4	Implement the carrier estimation and symbol synchronization
Course Name	**ADVANCED MICROPROCESSORS & MICROCONTROLLERS**

	On successful completion of the course the students will be able to:
CO1	Understand the piplining, segmentation, instruction level parallelism and RISC and CISC evaluation
CO2	Design the high performance Pentium processor
CO3	Apply the ARM processor for the global demands
CO4	Interface the programmable timer, pulse accumulator and serial communication.
Course Name	**DIGITAL IMAGE PROCESSING**
	On successful completion of the course the students will be able to:
CO1	Apply the image acquisition, sampling and quantization.
CO2	Design and analyze the various transform of images
CO3	Implement the image segmentation and restoration for the different images.
CO4	Design the neural network to recognize images.
Course Name	**SPECTRAL ANALYSIS OF SIGNALS**
	On successful completion of the course the students will be able to:
CO1	Understand concept of Power and Energy spectral density of signals.
CO2	Implementation of the Parametric and non parametric methods of estimation of PSD
CO3	Design the Filter bank methods of spectral analysis.
Course Name	**DETECTION AND ESTIMATION**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in minimum variance unbiased estimator (MVUE) exists & computation
CO2	Determine if an efficient estimator exists and computation
CO3	Compute the Cramer-Rao lower bound for scalar, vector cases and MVUE for linear models
CO4	Compute maximum likelihood estimator, linear least-squares estimator, and maximum aposteriori estimator etc..,
CO5	Apply theory and estimation algorithms learned in class to real-world examples
Course Name	**INTERNETWORKING MULTIMEDIA**
	On successful completion of the course the students will be able to:
CO1	Understand network requirement for the multimedia applications.
CO2	Analyze the various services related to the broadband network technology

CO3	Apply the adaptation algorithm in various applications such as video conferencing and distribution of virtual reality.
CO4	Demonstrate the content representation and management in multimedia protocol
Course Name	**DSP PROCESSOR ARCHITECTURE AND PROGRAMMING**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in the fundamentals of the P-DSP'S.
CO2	Implement the different processor for domestic and industrial applications.
Course Name	**ERROR CONTROL CODING**
	On successful completion of the course the students will be able to:
CO1	Understand the concepts of linear block codes, cyclic and non-binary codes.
CO2	Apply the various convolution decoding methods in the receiver system.
CO3	Implement the modulation codes in the data transmission.
CO4	Apply the various iterative decoding methods of the turbo codes.
Course Name	**SMART ANTENNAS**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in the Digital radio receiver techniques and spatial processing for wireless systems.
CO2	Implement the applications related to the CDMA technique.
CO3	Measure the signal parameters for the geometrically based single bounce elliptical model.
CO4	Design the smart antenna application with optimal spatial filtering and adaptive algorithms for CDMA.
Course Name	**COGNITIVE RADIO**
	On successful completion of the course the students will be able to:
CO1	Describe the basics of the software defined radios.
CO2	Design the wireless networks based on the cognitive radios.
CO3	Explain the concepts behind the wireless networks and next generation networks
Course Name	**ULTRA WIDEBAND COMMUNICATION SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Understand the basic signal processing techniques that concerns present and future dynamic UWB communication systems.
CO2	Understand the all areas of design and implementation of UWB systems.
Semester	**III**

Course Name	EMBEDDED SYSTEMS FOR COMMUNICATION
	On successful completion of the course the students will be able to:
CO1	Design hardware and software components
CO2	Knowledge in Embedded processor and computing platform
CO3	Knowledge in Embedded Networks
CO4	Design the Real time Characteristic and System design for Embedded Systems
Course Name	SPEECH AND AUDIO SIGNAL PROCESSING
	On successful completion of the course the students will be able to:
CO1	Demonstrate the concept of Speech and Audi
CO2	Knowledge of Speech Processing in time and Frequency domains
CO3	Demonstrate the Homomorphic Speech analysis
CO4	Analyze Speech in Linear Predictive Method
Course Name	COMMUNICATION NETWORK SECURITY
	On successful completion of the course the students will be able to:
CO1	Familiar with Symmetric CIPHERS
CO2	Knowledge in ADVANCED ENCRYPTION STANDARD (AES) and implementing for Network security
CO3	Demonstrate Network security practice
CO4	Design work in system security
Course Name	HIGH SPEED SWITCHING ARCHITECTURE
	On successful completion of the course the students will be able to:
CO1	Familiar with switching of High Speed Networks
CO2	Knowledge in ISDN and B-ISDN functions, Layers and services
CO3	Understand ATM architecture with different networks
CO4	Knowledge in Queues and IP switching.
Course Name	OFDM FOR COMMUNICATION SYSTEMS
	On successful completion of the course the students will be able to:
CO1	Understanding of application of OFDM for communication systems
CO2	Knowledge of various techniques and aspects of OFDM
CO3	Discussion about design and simulation of modulation and coding techniques using software
CO4	Learn the problems in OFDM and Hybrid OFDM.

Course Name	BEAMFORMING IN WIRELESS COMMUNICATION
	On successful completion of the course the students will be able to:
CO1	Understanding of application of Beamforming.
CO2	Knowledge of various Beamforming techniques
CO3	Discussion about design and simulation of various beamformers using software
Course Name	SIMULATION OF COMMUNICATION SYSTEMS & NETWORKS
	On successful completion of the course the students will be able to:
CO1	Design the reliable Communication systems
CO2	Simulating the random variable and random process for designing the channel
CO3	Estimate the various performance measure in channel
CO4	Knowledge in network Queues
Course Name	HIGH PERFORMANCE COMMUNICATION NETWORKS
	On successful completion of the course the students will be able to:
CO1	Familiar with Switching Networks
CO2	Knowledge in VPN,MPLS,RSVP Protocols
CO3	Understand ATM and FRAME relay protocols
CO4	Knowledge in Advanced Network Technology and High Performance Communication
Course Name	Electromagnetic Interference and Compatibility in System Design
	On successful completion of the course the students will be able to:
CO1	Demonstrate the EMI/EMC concept in Time and Frequency domain
CO2	Demonstrate the EMI Coupling Concept
CO3	Knowledge in EMI standards and Measurements
CO4	Design the PCB for various applications
Course Name	RF MEMS
	On successful completion of the course the students will be able to:
CO1	Understand the linear dynamic analysis and switching time calculations.
CO2	Demonstration of the various fabrication technique of the MEMS switch.
CO3	Implementation of the MEMS switches with fault handling mechanisms.
CO4	Designing the various phase shifters for DMTL and wide band distributed switches

Course Name	OPTICAL SIGNAL PROCESSING
	On successful completion of the course the students will be able to:
CO1	Develop a OSP system.
CO2	Model the heterodyne systems
CO3	Implement the applications of optical spatial filtering
Course Name	ADVANCED MOBILE COMPUTING
	On successful completion of the course the students will be able to:
CO1	Develop personal communication systems.
CO2	Model the mobile internet protocol
CO3	Write the wireless mark-up language programming for wireless network
CO4	Implement WLL and Ad hoc networks
Course Name	AD HOC NETWORK
	On successful completion of the course the students will be able to:
CO1	Identifying various issues in Ad-Hoc
CO2	Identifying various issues in Ad-Hoc Network Routing & TCP
CO3	Knowledge in WSN Architecture and Protocols
CO4	Knowledge in WSN Routing, Localization, QoS and Mesh Networks
Course Name	ADVANCED TECHNIQUES FOR WIRELESS RECEPTION
	On successful completion of the course the students will be able to:
CO1	Understand the linear receivers for synchronous CDMA
CO2	Analyze the various application of the TDMA
CO3	Comparing performance of the various wireless coding techniques.
CO4	Design the signal processing and coherent detection of the OFDM and EM algorithm
Course Name	Wavelets and Multi resolution Processing
	On successful completion of the course the students will be able to:
CO1	Understand Fourier tools to analyse signals
CO2	Knowledge in MRA and representation using wavelet bases
CO3	Knowledge in various wavelet transforms and design wavelet transform
CO4	Apply wavelet transform for various signal & image processing applications
Course Name	SOFT COMPUTING

	On successful completion of the course the students will be able to:
CO1	Knowledge in Conventional and Computational AI
CO2	Knowledge in Genetic Algorithms and Application
CO3	Knowledge in Neural Networks and Fuzzy Logic Concepts
CO4	Design Neuro-Fuzzy modeling
Course Name	**INFORMATION THEORY AND CODING**
	On successful completion of the course the students will be able to:
CO1	Demonstrate the Probability theory, random variables and Random Process
CO2	Understand the memory less finite Schemes for Channels
CO3	Knowledge in Continuous channel
CO4	Compute to perform different encoding Process
Course Name	**SPREAD SPECTRUM COMMUNICATION SYSTEMS**
	On successful completion of the course the students will be able to:
CO1	Understanding of applications of spread spectrum communication systems.
CO2	Knowledge of various types of spread spectrum communication systems
CO3	Knowledge of different techniques and aspects of synchronization.
CO4	Knowing the method of implementing spread spectrum systems.

Program Name	M.E (VLSI DESIGN)
Semester	I
Course Name	VLSI SIGNAL PROCESSING
	On successful completion of the course the students will be able to:
CO1	Explain the design architectures for DSP algorithms.
CO2	Show the critical path reduction with adder, multiplier and accumulator
CO3	Design a filter and to reduction methods for algorithm strength
CO4	Generalize the performance parameters, viz. area, speed and power
CO5	Distinguish synchronous and asynchronous pipelining concepts
Course Name	VLSI DESIGN TECHNIQUES
	On successful completion of the course the students will be able to:
CO1	Analyze the MOS transistor operations and their AC, DC characteristic
CO2	Describe fabrication process of CMOS technology and layout design
CO3	Demonstrate the CMOS invertors and their sizing methods
CO4	Analyze latch up problem in CMOS circuits.
Co5	Estimate power and delay calculation in CMOS circuits.
Course Name	ASIC AND FPGA DESIGN
	On successful completion of the course the students will be able to:
CO1	Describe the programming techniques and PLD concepts.
CO2	Discuss floor planning and routing process.
CO3	Measure the flow of VLSI circuit testing process.
CO4	Compute the concepts of FPGA internal architectures.
CO5	Analysis various architecture and its implementation.
Course Name	ADVANCED DIGITAL SYSTEM DESIGN
	On successful completion of the course the students will be able to:
CO1	Develop the sequential circuits using state diagram, state table and ASM chart.
CO2	Discover the fault in PLA using the compact algorithm.
CO3	Design of finite state machine using PLD and FPGA.
CO4	Apply The Concepts of Synchronous Design Using Programmable Devices
CO5	Design of the combinational and sequential circuits using VHDL.

Course Name	VLSI DESIGN LABORATORY I
	On successful completion of the course the students will be able to:
CO1	Compute Multiplexers, Decoders, Comparators, Counters and Shift registers
CO2	Design the FIR Filter, High Speed Multipliers, ALU using FPGA
CO3	Design and implement the Universal Modulator, Real Time Clock, Traffic Light Controller and Stepper motor using FPGA
CO4	Design the Monitoring the temperature using FPGA
CO5	Design the LED Display using FPGA.
Course Name	DATA CONVERTERS
	On successful completion of the course the students will be able to:
CO1	State the evolution and applications of AD/DA characteristics.
CO2	Generalize the working of Switch Capacitor Circuits And Comparators.
CO3	Discover issues in current element matching.
CO4	Relate pipeline architectures in real time applications.
CO5	Revise the parameters and characteristics of delta converters.
Course Name	DIGITAL SPEECH SIGNAL PROCESSING
	On successful completion of the course the students will be able to:
CO1	Apply the concept of speech processing
CO2	Examine digital transmission and storage of speech
CO3	Analyse speech in time and frequency domain
CO4	Compute the LPC for speech
CO5	Apply Speech and Audio signal processing in real-time application
Course Name	Asynchronous System Design
	On successful completion of the course the students will be able to:
CO1	Recognize the protocols and pipeline.
CO2	Demonstrate the implementation of hand shake circuits.
CO3	Outline the independent control circuits.
CO4	Develop the process of VHDL asynchronous design.
CO5	Explain the programming balsa language
Course Name	SECURITY SOLUTIONS IN VLSI
	On successful completion of the course the students will be able to:

CO1	Categorize the different kinds of threats to information security.
CO2	Analyse the techniques used for data encryption.
CO3	Implement the design principles of firewall.
CO4	Summarize case study based on VLSI for security threats.
CO5	Revise and integrate the various cryptography algorithms in VLSI.
Course Name	**Nano Scale Devices and Circuit Design**
	On successful completion of the course the students will be able to:
CO1	Illustrate about leakage current and its control and reduction techniques in CMOS devices.
CO2	Extrapolate the device scaling of single and multigate MOSFETs.
CO3	Point out the emerging nanoscale devices
CO4	Explain the low power design and voltage scaling issues in Nano scale devices.
CO5	Compose the design of CMOS circuit using non-classical devices**.**
Course Name	**DIGITAL IMAGE PROCESSING**
	On successful completion of the course the students will be able to:
CO1	Analyze the principle of transforms in image processing.
CO2	Design and implement image enhancement and restoration schemes.
CO3	Explain the types of image segmentation algorithms.
CO4	Apply image compression schemes.
CO5	Assess image processing algorithms with simulation.
Semester	**II**
Course Name	**ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS**
	On successful completion of the course the students will be able to:
CO1	Analyze low-frequency characteristics of single-stage amplifiers and differential amplifiers .
CO2	Analyze and design current sources/sinks/mirrors .
CO3	Analyze and design voltage and current references including band gap references
CO4	Understand stability compensation for amplifiers
Course Name	**TESTING OF VLSI CIRCUITS**
	On successful completion of the course the students will be able to:

CO1	Design for test - basic concepts, fault models (stuck-at) for combinational circuits, fault equivalence and dominance, test-vector generation, scan-path based testing.
CO2	Understand scan based design.
CO3	Understand the generation of test pattern for BIST and embedded RAMs
CO4	Diagnose the fault.
Course Name	**LOW POWER VLSI DESIGN**
	On successful completion of the course the students will be able to:
CO1	Recognize advanced issues in VLSI systems, specific to the deep-submicron silicon technologies
CO2	Classify the mechanisms of power dissipation and in CMOS integrated circuits;
CO3	Estimate power dissipation and use optimization methods on various levels;
CO4	Apply in practice ,synthesis and software design technology-level, circuit-level, and system-level power optimization techniques.
Course Name	**VLSI DESIGN LABORATORY II**
	On successful completion of the course the students will be able to:
CO1	Design FIFO, MAC Unit, Vetribi decoder
CO2	Realize ADC, I^2C Bus, LCD (Touch and Character).
CO3	Realize FFT, convolution filter
Course Name	**DSP Integrated Circuits**
	On successful completion of the course the students will be able to:
CO1	Understand the procedural flow of system design in DSP and Integrated Circuits.
CO2	Understand the flow of frequency response and transfer functions fror DSP systems.
CO3	Understand the performance of various transforms for signal processing.
CO4	Design FIR and IIR filters for the given specifications.
	Understand the architecture and layout of the VLSI circuits.
Course Name	**COMPUTER ARCHITECTURE AND PARALLEL PROCESSING**
	On successful completion of the course the students will be able to:
CO1	Understand the fundamentals of computer design and their performance measure.
CO2	Explain parallel processing, pipelining and scheduling concepts.
CO3	Explain different memory hierarchies.

CO4	Explain various multiprocessors and multi-core architectures.
Course Name	**SOLID STATE DEVICE MODELING AND SIMULATION**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in characteristic of MOSFET
CO2	Acquire knowledge in different techniques for device modelling
CO3	Compute various mathematical technique for device simulation
CO4	Simulate simple devices like P.N Junction, MOS capacitor and MOSFET
Course Name	**ANALOG AND MIXED MODE VLSI DESIGN**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in characteristics of MOS devices
CO2	Design circuits in submicron level
CO3	Acquire knowledge in the characteristics of data converters and their SNR
CO4	Acquire knowledge in switched capacitor circuits
Course Name	**ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY**
	On successful completion of the course the students will be able to:
CO1	Design a EMI free system
CO2	Reduce system level crosstalk
CO3	Design high speed Printed Circuit board with minimum interference
CO4	Make our world free from unwanted electromagnetic environment
Course Name	**Artificial Intelligence And Optimization Techniques**
	On successful completion of the course the students will be able to:
CO1	Understand of the fundamental Computational Intelligence models
CO2	Understand the concepts of neural networks, genetic algorithms, fuzzy neural networks algorithms
CO3	Understand the concepts of ant colony optimization algorithms
CO4	Apply computational Intelligence techniques to classification, pattern recognition, prediction rule extraction, and optimization problems.
Course Name	**CAD FOR VLSI CIRCUITS**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in various physical design methods in VLSI.
CO2	Use the simulation techniques at various levels in VLSI design flow.
CO3	Apply various algorithms used for floor planning and routing techniques.

Course Name	RECONFIGURABLE COMPUTING
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in device Reconfigurable architecture
CO2	Acquire knowledge in programming Reconfigurable systems
CO3	Acquire knowledge in mapping designs
Course Name	ADVANCED MICROPROCESSORS & MICROCONTROLLERS
	On successful completion of the course the students will be able to:
CO1	Understand the piplining, segmentation, instruction level parallelism and RISC and CISC evaluation.
CO2	Design the high performance Pentium processor.
CO3	Apply the ARM processor for the global demands.
CO4	Interface the programmable timer, pulse accumulator and serial communication.
Course Name	MEMS AND NEMS
	On successful completion of the course the students will be able to:
CO1	Learn fundamental knowledge about micro & nano electro mechanical systems.
CO2	Understand the theoretical knowledge in micro machining and fabrication techniques
CO3	Learn the basic knowledge about micro sensors and actuators.
CO4	Acquire knowledge about Nano scale systems/structures, synthesis and characterization procedures for Nano materials
Course Name	INTRODUCTION TO MEMS SYSTEM DESIGN
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in mechanics for MEMS design
CO2	Acquire knowledge in Electrostatic design concepts
CO3	Model MEMS system
CO4	Acquire knowledge in about MEMS devices
Course Name	DIGITAL CONTROL ENGINEERING
	On successful completion of the course the students will be able to:
CO1	Acquire working knowledge of discrete system science-related mathematics.
CO2	Design a discrete system, component or process to meet desired needs.
CO3	Identify, formulate and solve discrete control engineering problems.

CO4	Use the techniques, tools and skills related to discrete signals, computer science and modern discrete control engineering in modern engineering practice Communicate system related concepts effectively
Course Name	**Physical Design of VLSI Circuits**
	On successful completion of the course the students will be able to:
CO1	Place the blocks and to partition the blocks while designing the layout for IC.
CO2	Solve the performance issues in circuit layout.
CO3	Design the layout efficiently.
Course Name	**ANALOG VLSI DESIGN**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in CMOS circuit for Low Voltage Signal Processing
CO2	Acquire knowledge in BiCMOS circuit techniques
CO3	Acquire knowledge in Analog filters and A/D converters, DFT and analog interconnect
CO4	Design statistical model and simulation for analog and mixed signal layout
Course Name	**SCRIPTING LANGUAGES**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in Scripts and Scripting
CO2	Write PERL scripting
CO3	Write TCL scripting
CO4	Write ADVANCED TCL and JAVA scripting
Course Name	**PROCESS AND DEVICE SIMULATION**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in technology Oriented CAD
CO2	Acquire knowledge in Device CAD
CO3	Acquire knowledge in MOS Structures and its Characteristics
CO4	Acquire knowledge in Senataurus TCAD and Scripting
Course Name	**Design of Analog Filters and Signal Conditioning Circuits**
	On successful completion of the course the students will be able to:
CO1	Design various filter types for real time applications
CO2	Design integrator filter with appropriate bandwidth specification to meet the desired objective

CO3	Explain various signal conditioning techniques.
CO4	Design various signal conditioning circuits for various real time applications
Course Name	**ADVANCED MOSFET MODELING**
	On successful completion of the course the students will be able to:
CO1	Acquire knowledge in MOSFET devices
CO2	Acquire knowledge in Classical MOSFET as Nanoscaled devices
CO3	Acquire knowledge in Non-Classical MOSFET as Nanoscaled devices
CO4	Simulate compact model MOSFET
Semester	**III**
Course Name	**DESIGN OF SEMICONDUCTOR MEMORIES**
	On successful completion of the course the students will be able to:
CO1	Describe the technology used in the construction of digital memory
CO2	Draw the schematic of a static and dynamic memory cell
Course Name	**HARDWARE SOFTWARE CO-DESIGN**
	On successful completion of the course the students will be able to:
CO1	Design hardware and softwareco-design.
CO2	Knowledge in Hardware/Software Partitioning.
CO3	Solve Co-Synthesis Problem.
CO4	Knowledge in prototyping and system level synthesis
Course Name	**RELIABILITY ENGINEERING**
	On successful completion of the course the students will be able to:
CO1	Compute in mathematical model for reliability and rate of failure.
CO2	Knowledge in different statistical experiments
CO3	Knowledge in electronic systems, software reliability, reliability testing
CO4	Understand reliability in manufacture and maintenance
Course Name	**NANO SCALE TRANSISTORS**
	On successful completion of the course the students will be able to:
CO1	Knowledge in characteristic of MOSFET
CO2	Understand physical characteristic of MOS system
CO3	Knowledge in characteristics of Nanowire FETs and transistors

CO4	Knowledge in multi-gate transistor
Course Name	**DIGITAL SYSTEMS DESIGN USING VERILOG**
	On successful completion of the course the students will be able to:
CO1	Learn basic concept of verilog and MOS transistor ,logics.
CO2	Illustrate CMOS logic for combinational circuits.
CO3	Learn CMOS design for sequential circuits.
CO4	Analyze sub-system design using system verilog.
Course Name	**CMOS ANALOG VLSI**
	On successful completion of the course the students will be able to:
CO1	Understand the concept of CMOS converters and op-amp.
CO2	Explain the BICMOS Circuit Techniques and Neural information processing.
CO3	Knowledge in first order and second order systems in filter and modulator.
	Design for testability and interconnection of VLSI circuits.
Course Name	**SYSTEM ON CHIP DESIGN**
	On successful completion of the course the students will be able to:
CO1	Knowledge in delay through interconnects.
CO2	Design combinational logic networks.
CO3	Knowledge in sequential system design.
CO4	Design FPGA and PLA based problematic approach.
Course Name	**GENETIC ALGORITHMS AND THEIR APPLICATIONS**
	On successful completion of the course the students will be able to:
CO1	Analyze the concepts of Genetic algorithm
CO2	Implement Genetic algorithm in VLSI Circuits
Course Name	**SUBMICRON VLSI DESIGN**
	On successful completion of the course the students will be able to:
CO1	Design hardware and software co-design.
CO2	Knowledge in Hardware/Software Partitioning.
CO3	Solve Co-Synthesis Problem.
CO4	Knowledge in prototyping and system level synthesis.
Course Name	**IP BASED VLSI DESIGN**

	On successful completion of the course the students will be able to:
CO1	Knowledge about IC manufacturing and fabrication
CO2	Analysis of the combinational, sequential and subsystem design
CO3	Introduction to IP design security
Course Name	**VLSI DESIGN AUTOMATION**
	On successful completion of the course the students will be able to:
CO1	Knowledge on automation methods for VLSI design
CO2	Analysis about the synthesis methodologies
Course Name	**CMOS MIXED SIGNAL CIRCUIT DESIGN**
	On successful completion of the course the students will be able to:
CO1	Knowledge about problems in implementing both in a single silicon wafer
CO2	Knowledge about the applications of mixed signal designs like DAC, ADC, PLL
Course Name	**SIGNAL INTEGRITY FOR HIGH SPEED DEVICES**
	On successful completion of the course the students will be able to:
CO1	Knowledge in cross talk in signal integrity
CO2	Knowledge in various parameters of different di-electric material
CO3	Understanding the differential signalling and its drawback in signal integrity
CO4	Knowledge in physical transmission model
Course Name	**MIXED SIGNAL IC TEST AND MEASUREMENTS**
	On successful completion of the course the students will be able to:
CO1	Understand the concept of various mixed signal testing
CO2	Knowledge in various measurement techniques
CO3	Knowledge in hardware tester
CO4	Understand DSP based testing and DFT
Course Name	**Real Time Embedded Systems**
	On successful completion of the course the students will be able to:
CO1	Knowledge in the Real time Embedded systems
CO2	Computation required for the real time embedded systems
CO3	Applying the concept Real time Embedded system
Course Name	**VLSI FOR WIRELESS COMMUNICATION**

	On successful completion of the course the students will be able to:
CO1	Understand various band of frequency response.
CO2	Understanding the Active mixer and Passive mixer.
CO3	Understand Phase detector and oscillator.
CO4	Study applications of VLSI wireless communications.
Course Name	**MAGNETO-ELECTRONICS**
	On successful completion of the course the students will be able to:
CO1	Knowledge in Nano magnetics
CO2	Applying the Concepts of Nano magnetics
CO3	Knowledge in software skills in n-mag simulation tool for micro magnetics.
Course Name	**High Speed VLSI**
	On successful completion of the course the students will be able to:
CO1	Knowledge on run time computing and its applications to VLSI.
CO2	Knowledge in optical reconfigurable models.
CO3	Knowledge in various multi core architectures for High Speed VLSI

Program Name	M.E. (POWER SYSTEMS ENGINEERING)
Semester	I
Course Name	118PST01-System Theory
	On successful completion of the course the students will be able to:
CO1	Acquire the concept of State-space equation for Dynamic systems and understand the uniqueness of state model.
CO2	Ability to differentiate the existence and uniqueness of Continuous time state equations.
CO3	Ability to anlayse the controllability and observability of a system.
CO4	Acquire detail knowledge on stability analysis of Linear & Non linear Continuous Time Autonomous Systems.
CO5	Acquire detail knowledge on Optimal and Adaptive Control.
Course Name	118PST02-Power System Optimization Techniques
	On successful completion of the course the students will be able to:
CO1	Will be able to know the basic ANN architectures, algorithms and its limitations.
CO2	Will be able to know the different operation on the fuzzy sets.
CO3	Will be competent to use hybrid control schemes and P.S.O.
CO4	Will be knowledgeable to use FUZZY logic for modeling and control of non-linear systems.
CO5	Will be knowledgeable to Solve Multi Objective Optimization technique.
Course Name	118PST03-Computer Aided Power System Analysis
	On successful completion of the course the students will be able to:
CO1	Learners are equipped with the power system studies that needed for the transmission system planning.
CO2	Learners will be able to analyze the impact of distributed generators on the performance of distribution system.
CO3	Learners will be able to understand the need for Power Flow Studies.
CO4	Learners will be able to understand the need for short circuit studies.
CO5	Learners will be able to explain the stability in multi machine.
Course Name	118PST04-Power System Estimation And Security
	On successful completion of the course the students will be able to:
CO1	Learners will be able to understand system load variations and get an overview of power system operations.
CO2	This course gives knowledge about various system components and communication protocols of SCADA system and its applications.
CO3	Learners will be able to analyze power system security.
CO4	Learners will be exposed to power system state estimation.

CO5	Learners will be able to analyze the enhancement and assessment of power system security.
Course Name	**118PST05-applied Mathematics for Electrical Engineers**
	On successful completion of the course the students will be able to:
CO1	Apply various methods in matrix theory to solve system of linear equations.
CO2	Compute maxima and minima of a functional that occur in various branches of engineering disciplines.
CO3	Imbibe the knowledge of random variables which helps to understand the various probability distributions.
CO4	Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.
CO5	Describe an oscillating function which appear in a veriety of physical problem by Fourier Series.
Course Name	**118PSP07-Computer Aided Power System analysis Laboratory**
	On successful completion of the course the students will be able to:
CO1	Learners will be able to analyze the power flow using Newton-Raphson method and Fast decoupled method.
CO2	Learners will be able to perform contingency analysis & economic dispatch.
CO3	Learners will be able to simulate the variable speed wind energy system.
CO4	Learners will be able to simulate the transient stability.
CO5	Learners will be able to perform DC Load Flow Analysis.
Course Name	**118PSE01-Wind and Solar Energy Systems**
	On successful completion of the course the students will be able to:
CO1	Ability to design grid connected/standalone renewable energy system employing embedded energy storage and MPPT strategy.
CO2	Students will develop more understanding on solar energy storage systems.
CO3	Students will develop basic knowledge on standalone PV system.
CO4	Students will attain knowledge on the basic concepts of wind energy conversion system.
CO5	Students will attain knowledge on Grid connected Solar and Wind energy system.
Course Name	**118PSE02-Energy Auditing and Management**
	On successful completion of the course the students will be able to:
CO1	Ability to design grid connected/standalone renewable energy system employing embedded energy storage and MPPT strategy.
CO2	Students will develop more understanding on solar energy storage systems.
CO3	Students will develop basic knowledge on standalone PV system.
CO4	Students will attain knowledge on the basic concepts of wind energy conversion system.
CO5	Students will attain knowledge on Grid connected Solar and Wind energy system.
Course Name	**118PSE03-Industrial Power System Analysis and Design**

	On successful completion of the course the students will be able to:
CO1	Ability to conduct harmonic analysis on power supplies and drive systems.
CO2	Ability to conduct load tests on power supplies and drive systems.
CO3	Ability to conduct the Harmonic Analysis.
CO4	Ability to conduct the flicker analysis.
CO5	Ability to conduct the ground grid analysis in computer aided software.
Course Name	**118PSE04-Electric and Hybrid Vehicles**
	On successful completion of the course the students will be able to:
CO1	Understand mathematical models, performance and characteristics of hybrid and electric vehicles.
CO2	Analyze the concepts, topologies and power flow control of electric traction systems.
CO3	Appraise the configuration and control of various hybrid electric motor drives.
CO4	Plan and design appropriate vehicle management system.
CO5	Analyze the concepts of Energy Management Strategies.
Semester	**II**
Course Name	**218PST01-Power System Planning and Reliability**
	On successful completion of the course the students will be able to:
CO1	Students will develop the ability to learn about load forecasting, reliability analysis of ISO and interconnected systems.
CO2	Students will understand the concepts of Contingency analysis and Probabilistic Load flow analysis.
CO3	Students will be able to understand the concepts of Reliability analysis on Transmission system.
CO4	Students will be able to understand the concepts of Expansion planning.
CO5	Students will have knowledge on the fundamental concepts of the Distribution system planning.
Course Name	**218PST02-Power System Dynamics and Stability**
	On successful completion of the course the students will be able to:
CO1	Learners about the modeling of Synchronous machines.
CO2	Learners about the modeling of Excitation and speed governing systems.
CO3	Analyzing the small signal stability with and without controllers.
CO4	Analyzing the transient stability of power system.
CO5	Understanding of small signal and transient instabilities.
Course Name	218PST03-Advanced Power System Protection
	On successful completion of the course the students will be able to:
CO1	Learners will be able to understand the various schemes available in Transformer protection.

CO2	Learners will attain basic knowledge on substation automation.
CO3	Learners will attain knowledge about Distance and Carrier protection in transmission lines.
CO4	Learners will understand the concepts of Microprocessor Based Protective Relays.
CO5	Learners will understand the concepts of Bus bar protection.
Course Name	*218PST04-Distributed Generation and Micro Grid*
	On successful completion of the course the students will be able to:
CO1	Attaining knowledge on the various scheme of conventional and non conventional power generation.
CO2	Learning about energy sources of distributed generation.
CO3	Learning about the fundamental concept of Microgrid and the requirements for grid interconnection.
CO4	Understanding protection issues and control schemes.
CO5	Understanding the operation of MicroGrid.
Course Name	*218PSE01-Power Quality Management*
	On successful completion of the course the students will be able to:
CO1	To study various methods of power quality monitoring and the production of voltages sags.
CO2	To study the interruptions types and its influence in various components.
CO3	To study the effects of harmonics on various equipments.
CO4	Understand power quality monitoring and classification techniques.
CO5	Understanding the concepts of Waveform Distortion in Wiring and grounding.
Course Name	*218PSE02-Reactive Power Compensation and Management*
	On successful completion of the course the students will be able to:
CO1	Distinguish the importance of load compensation in symmetrical as well as un symmetrical loads.
CO2	Observe various compensation methods in transmission lines.
CO3	Construct model for reactive power coordination.
CO4	Distinguish demand side reactive power management & user side reactive power manangement.
CO5	Understand the Concepts of Reactive Power Coordination.
Course Name	*218PSE03-Power System Economics and Control*
	On successful completion of the course the students will be able to:
CO1	Learners will be able to understand system load variations and get an overview of power system operations.
CO2	Learners will be able to analyze power system security.
CO3	Learners will understand the significance of unit commitment and different solution methods.

CO4	Learners will attain knowledge about hydrothermal scheduling.
CO5	Learners will attain knowledge about Load Frequency Control.
Course Name	**218PSE04-Electrical Transients in Power Systems**
	On successful completion of the course the students will be able to:
CO1	Ability to understand to explain the over voltages in lightning.
CO2	Ability to illustrate about the traveling wave i9n transmission lines.
CO3	Ability to illustrate about insulation coordination.
CO4	Ability to describe about the computation of power systems transients.
CO5	Ability to describe about the Switching and Temporary Over Voltages.
Course Name	**218PSE05-Demand Side Energy Management**
	On successful completion of the course the students will be able to:
CO1	Able to explain about the energy auditing.
CO2	Knowledge about the energy conservation in electrical utilities.
CO3	Able to describe about the electric lighting.
CO4	Able to explain about the working methodology of air conditioning, co-generation and storage.
CO5	Able to explain about the Space Heating and Ventilation.
Course Name	**218PSE06-HVDC and FACTS Controllers**
	On successful completion of the course the students will be able to:
CO1	Ability to explain about the HVDC converters.
CO2	Ability to analysis about the HVDC Converters.
CO3	Ability to describe about the operation of facts.
CO4	Able to describe about the static Var compensation.
CO5	Able to understand about the unified power flow control.
Course Name	**218PSE07-Electromagnetic Interference and capability**
	On successful completion of the course the students will be able to:
CO1	Find solution to EMI sources, EMI problems in PCB level/ Subsystem and system level design.
CO2	To measure emission immunity level from different systems to couple with the prescribed EMC standards.
CO3	Usage of modern technology and tools in risk reduction.
CO4	Develop the ability of Planning in emergency situations.
CO5	Develop the ability to know about the EMI Test methods and Instrumentation.
Course Name	**218PSE08-Power Electronics for Renewable Energy Systems**
	On successful completion of the course the students will be able to:

CO1	Knowledge about the stand alone and grid connected renewable energy systems.
CO2	Equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
CO3	Design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.
CO4	Analyze and comprehend the various operating modes of wind electrical generators and solar energy systems.
CO5	Develop maximum power point tracking algorithms.
Course Name	**218PSP07-SEMINAR**
	On successful completion of the course the students will be able to:
CO1	Identification of real time problems.
CO2	Awareness of design methodologies & its implementation.
CO3	Implementing advance simulation software techniques.
CO4	Able to produce a comprehensive report covering background information, literature surveey .
CO5	Able to produce a comprehensive report covering problem statement, project work details and conclusion.
CO5	Ability to explain the hybrid renewable energy systems
Course Name	**218PSP08-Advanced Power System Simulation Laboratory**
	On successful completion of the course the students will be able to:
CO1	Students are able to gain Hands on experience on various power systems dynamic studies using own program and validation of results using software packages.
CO2	Learners will be able to perform load flow analysis and transient analysis
CO3	Learners will be able to simulate the variable speed wind energy system
CO4	Learners will be able to design the filter for mitigating harmonics.
CO5	Learners will be able to Calculate the Transfer Capability of Transmission line using Load Flow Program.
Semester	**III**
Course Name	**318PST01-EHV Power Transmission**
	On successful completion of the course the students will be able to:
CO1	Gain knowledge in the fundamental concept of transmission line and its parameters.
CO2	Extrapolate the knowledge of calculate the line parameters of RLC.
CO3	Familiar in voltage gradients of conductors in high voltage engineering.
CO4	Gain the knowledge of corona effects in power systems.
CO5	Gain the knowledge of electrostatic field of EHV lines.
Course Name	**318PSP01-PROJECT WORK (PHASE I)**
	On successful completion of the course the students will be able to:

CO1	Identification of real time problems.
CO2	Knowledge about new technologies.
CO3	Awareness of design methodologies and its implementation.
CO4	Implementing advanced simulation software techniques.
CO5	Able to produce a comprehensive report covering background information, literature survey,problem statement, project work details and conclusion.
Course Name	*318PSE01-RESTRUCTURE POWE SYSTEM*
	On successful completion of the course the students will be able to:
CO1	Understand the need for restructuring of power systems, discuss different market models, different stakeholders and market power.
CO2	Understand and generalize the functioning and planning activities of ISO.
CO3	Understand transmission open access pricing issues and congestion management.
CO4	Define transfer capability and estimate the transfer capability of small power systems (Numerical examples).
CO5	Define ancillary services and understand reactive power as ancillary service and management through synchronous generator.
Course Name	*318PSE02-POWER SYSTEM DEREGULATION*
	On successful completion of the course the students will be able to:
CO1	Ability to understand the basic of power system deregulation.
CO2	Able to understand the power system operation in electricity market.
CO3	Able to understand the marginal pricing and transmission pricing in transmission side.
CO4	Able to understand the capability of congestion management in transmission side.
CO5	Understand the Indian power market challenges and Indian power sector in past and present status.
Course Name	*318PSE03-Smart Grid Design and Analysis*
	On successful completion of the course the students will be able to:
CO1	Acquired the knowledge about the basis of smart grid.
CO2	Attained the idea about working of DC distribution.
CO3	Gained the acquaintance of energy system dynamics.
CO4	Gained the knowledge about the real time implementation of smart grid.
CO5	Gained the innovative idea about end use technologies of electric end.
Semester	
Course Name	*318PSE04-Insulation Technology and High Voltage Engineering*
	On successful completion of the course the students will be able to:
CO1	Learning about the various insulating materials, properties and breakdown mechanisms.

CO2	Learning about the Breakdown mechanism of Gaseous Dielectrics.
CO3	Learning about the Breakdown mechanism of Solid Dielectrics.
CO4	Learning about the Breakdown mechanism of Liquid Dielectrics.
CO5	Analyzing various applications of insulating materials in electrical equipments.
Course Name	**318PSE05-Power System Instrumentation**
	On successful completion of the course the students will be able to:
CO1	Use power system instrument for automatic generation and voltage control in power generation station.
CO2	Able to use signal transmission techniques for specific power system purposes.
CO3	Identify instrumentation schemes for monitoring and control.
CO4	Apply signal transmission techniques for sharing process information.
CO5	Understand the concepts of standard soft control techniques in power system.
Course Name	**318PSE06-Design of Controllers in Power Application**
	On successful completion of the course the students will be able to:
CO1	Understand the mathematical derivation behind the controller design.
CO2	Ability to know the properties and theory concept in controllers.
CO3	Ability to differentiate the different in controller design.
CO4	Able to know the robust control theory and robust controller design.
CO5	Able to analyze the uncertainties in system by using controller.
Course Name	**318PSE07-Artificial Neural Networks Applied to Power Systems**
	On successful completion of the course the students will be able to:
CO1	Understand the basic concepts of Artificial Neural Networks.
CO2	Analyses the various types of Architectures that are used in Neural networks.
CO3	Learnt about the statistical methods in Neural Networks.
CO4	Gained knowledge about different types of Algorithms.
C05	Analyzing various applications of Artificial Neural Networks in Power Systems.
Course Name	**318PSE08-Analysis of Electrical Machines**
	On successful completion of the course the students will be able to:
CO1	Understand the basic concepts of electro mechanical energy conversion.
CO2	Understand the digital computer simulation of permanent magnet D.C machine and shunt Motor.
CO3	Understand the phase transformation and commutator transformation.
CO4	Understand the digital computer simulation of induction machines.

CO5	Understand the digital computer simulation of synchronous machines.
Semester	**IV**
Course Name	*418PSP01-PROJECT WORK (PHASE II)*
	On successful completion of the course the students will be able to:
CO1	Identification of real time problems.
CO2	Knowledge about new technologies.
CO3	Awareness of design methodologies and its implementation.
CO4	Implementing advanced simulation software techniques.
CO5	Able to produce a comprehensive report covering background information, literature survey,problem statement, project work details and conclusion.

Program Name	M.E. (STRUCTURAL ENGINEERING)
Semester	**I**
Course Name	**APPLIED MATHEMATICS AND STATISTICS**
	On successful completion of the course the students will be able to:
CO1	Solve the boundary value problems using Laplace and Fourier Transform techniques.
CO2	Compute maxima and minima of a functional that occur in various branches of engineering disciplines.
CO3	Acquire the knowledge of solving eigen value problems.
CO4	Draw inference and make decision through hypothesis testing.
CO5	Apply the concept of analysis of variance.
Course Name	**ADVANCED CONCRETE DESIGN**
	On successful completion of the course the students will be able to:
CO1	To know the design philosophy of limit state method of various concrete structures and structural elements according to IS codes
CO2	To design RC walls, deep beams and grid floors
CO3	To design flat slabs and flat plates according to IS method
CO4	To know inelastic behaviour of concrete structures
CO5	To know the concept of ductility and detailing for ductility
Course Name	**STRUCTURAL DYNAMICS**
	On successful completion of the course the students will be able to:
CO1	Do vibration analysis of system/structures with single degree of freedom and can explain
CO2	Do dynamic analysis of system/structures with Multi degrees of freedom under free and forced vibration
CO3	Derive a mathematical model of continuous system and do a dynamic analysis under free and forced vibration
CO4	know the dynamic response of continuous systems
CO5	Analyse damping in multidegree of freedom systems
Course Name	**THEORY OF ELASTICITY AND PLASTICITY**
	On successful completion of the course the students will be able to:
CO1	Derive and write the fundamental equations of elasticity describing the linear behavior of element and
	develop constitutive models based on material behavior

CO2	CO2 Demonstrate the application of plane stress and plane strain in a given situation in both cartesian
	and polar coordinate systems
CO3	Solve torsion problems in circular and non-circular cross-sections
CO4	Analyse beams resting on elastic foundations
CO5	Solve analytically the simple boundary value problems with elasto-plastic and strain hardening
	properties
Course Name	**ADVANCED CONCRETE TECHNOLOGY**
	On successful completion of the course the students will be able to:
CO1	To understand concrete making materials
CO2	To conduct tests on fresh, hardened concrete, special concrete concrete
CO3	To carry out the mix design of concrete
CO4	To use special concretes
CO5	To know the various methods of manufacturing of concrete.
Course Name	**MECHANICS OF COMPOSITE MATERIALS**
	On successful completion of the course the students will be able to:
CO1	To relate the stress –strain properties, longitudinal and transverse properties of composites
	lamina
CO2	To understand the stress strain relations and properties of composite fiber and matrix
	constituents
CO3	To analyse the laminated composites
CO4	To compute the lamina strength and
CO5	To apply the load deformation relation, residual stresses for the design of composites.
Course Name	**CRACKS AND CRACK CONTROL IN CONCRETE STRUCTURES**
	On successful completion of the course the students will be able to:
CO1	To know the causes and propagation of cracks
CO2	To understand the long term effects of cracking
CO3	To know the various theories of cracks.
CO4	To know the properties of cracks
CO5	To detect various cracks and measuring techniques for the same

Course Name	OPTIMIZATION OF STRUCTURES
	On successful completion of the course the students will be able to:
CO1	To know the basic principles and classification of optimization techniques
CO2	To know about linear and non-linear programming
CO3	To know about geometric programming
CO4	To know about dynamic programming
CO5	To know the structural applications of optimisation techniques
	ANALYSIS AND DESIGN OF TALL BUILDINGS
	On successful completion of the course the students will be able to:
CO1	To know the behaviour, analysis and design of tall structures.
CO2	To know about structural system components
CO3	To analyse modelling and structural design
CO4	To know the mechanical properties of stuctural components
CO5	To know the various features of tall buildings
Course Name	NONLINEAR ANALYSIS OF STRUCTURES
	On successful completion of the course the students will be able to:
CO1	To know on inelastic and vibration analysis of Flexural members..
CO2	To analyse inelastic bhaviour of uniform and variable thickness members
CO3	To know vibration of different modes
CO4	To know the difference between elastic and inelastic analysis of plates and Instabilities of
	elastically supported beams.
CO5	To know about non linear vibration technique
Course Name	MAINTENANCE AND REHABILITATION OF STRUCTURES
	On successful completion of the course the students will be able to:
CO1	To point out the causes of distress in concrete, masonry and steel structures.
CO2	To suggest the remedial measures of cracks
CO3	To know effect of dampness on structural components
CO4	To know the causes and remidal measures of cracks in steel and concrete structures
CO5	To know about the restrengthening of structures
	MATRIX METHODS FOR STRUCTURAL ANALYSIS

CO1	*On successful completion of the course the students will be able to:*
CO2	To transform the unknown from system coordinates to element coordinates
CO3	To identify the degree of freedom
CO4	To formulate flexibility matrix of components of structure
CO5	To formulate the stiffness matrix and apply to 2D & 3D structure
	To develop stiffness matrix in structural components
Semester	**II**
	FINITE ELEMENT ANALYSIS
	On successful completion of the course the students will be able to:
CO1	Develop finite element formulations of single degree of freedom problems and solve them
CO2	Use finite element analysis programs based upon either "p-method" or "h-method" finite element mathematical formulations
CO3	Compute the stiffness values of noded elements.
CO4	Identify the Eigen values of non-linear vibration problems
CO5	Perform modal analysis to determine its natural frequencies, and analyze harmonically-forced vibrations.
	Experimental Techniques and Instrumenttion
	On successful completion of the course the students will be able to:
CO1	Choose the methodology of measuring errors and strains and calibrate the machineries and equipment used in the laboratory.
CO2	Use various vibration measuring instruments and analyse the structures using digital display unit.
CO3	Scale the model using direct and indirect model analysis (Using Buckingham PI Theorem).
CO4	Measure distress in the structures using various electronic equipment.
CO5	Perform advanced NDT methods in accessing the load testing of structures.
	Advanced Structural Steel Design
	On successful completion of the course the students will be able to:
CO1	Construct industrial buildings for the intended purpose
CO2	Design different types of steel connections and joints.
CO3	Have an exposure to design steel tower and chimneys.
CO4	Design for plasticity.
CO5	Perform design of light gauge steel structures.
	Earthquake Analysis and Design of Structures
	On successful completion of the course the students will be able to:

CO1	Montitor the earth quake using various seismic instrumentation
CO2	Describe ground motion and its relationship to seismic design of structures and calculate earthquake induced lateral force on the structure.
CO3	Include earthquake resistant features in masonry buildings.
CO4	Apply the basic principles of conceptual design for earthquake resistant RC buildings and carry out the detailed design of earthquake resistant RC buildings.
CO5	Adopt vibration control methods for buildings located in earthquake zone
	Design of Bridges
	On successful completion of the course the students will be able to:
CO1	Understand the design theories for super structure and sub structure of bridges
CO2	Design short span bridges as per IRC specifications
CO3	Understand the behaviour of continuous bridges, box girder bridges.
CO4	Design prestressed concrete bridges.
CO5	Design railway bridges, plate girder bridges, different types of bearings, abutments, piers and various types of foundations for Bridges
	Design of Shell and Spatial Structures
	On successful completion of the course the students will be able to:
CO1	Analyse the shells and plates using membrane theory
CO2	Design various shell and spatial structures
CO3	Design all types of domes and Understand the behaviour of folded plates.
CO4	Know the structural behaviour and philosophy of space frames.
CO5	Proficient with finite element analysis of shell structures.
	Design of Precast Components and Ferro-cement
	On successful completion of the course the students will be able to:
CO1	Handle large projects like stadium, bridges etc.,
CO2	Understand the design theories of precast components and its behaviour.
CO3	Understand the joints and connections in precast construction.
CO4	Design of Ferrocrete Structures.
CO5	Knowledge about manufacture, transport and erection technologies of precast components.
	Computer Aided Analysis and Design
	On successful completion of the course the students will be able to:
CO1	Handle 2 D drafting and can use drafting software.
CO2	Perform structural analysis using analysis package

CO3	Design the structures with computer methodologies.
CO4	Optimize the structural design with various computer packages and graphics.
CO5	Apply artificial intelligence to real life applications.
	Stability Of Structures
	On successful completion of the course the students will be able to:
CO1	Analyse both static and dynamic instabilities, by both theoretical and numerical methods
CO2	Examine the behaviour of beam columns and frames with and without side sway using classical and stiffness methods.
CO3	Well versed in the lateral buckling, torsional buckling, Flexural torsional buckling of various beams and non-circular sections.
CO4	Evaluate buckling of thin plates using energy methods and various numerical techniques.
CO5	Execute and work out the inelastic buckling using various methodologies.
	THEORY OF PLATES
	On successful completion of the course the students will be able to:
CO1	Apply the knowledge about various plate theories and Navier's solution, Levy's solution and solve for the rectangular plates.
CO2	Analyse circular plates for any boundary conditions.
CO3	Solve plate problems using finite difference method.
CO4	Understand the potential energy principle
CO5	Find the solution of rectangular plates for various loadings
	Space Structures
	On successful completion of the course the students will be able to:
CO1	Understand materials and practical difficulties
CO2	Analyse and design the space structures
CO3	Solving using finite difference method.
CO4	Understand the concepts about various connectors available.
CO5	Analyse the spatial structures using various methods
	Construction Safety And Management
	On successful completion of the course the students will be able to:
CO1	Understand the basic mandatory procedures to be followed in the construction industry.
CO2	Know the fundamental planning and safety practices commonly implemented on construction sites and the key factor for causing accidents.
CO3	Understand the requirements for compliance and inspection imposed for the safety in construction site

CO4	Understand the importance of agencies involved in rescue operation by various case studies.	
CO5	Execute a given site with zero percent accident	
	Advanced Structural Engineering Laboratory	
	On successful completion of the course the students will be able to:	
CO1	Operate loading frame to conduct flexural and compression tests.	
CO2	Understand the behaviour of reinforced concrete and steel beam for strength and deflection.	
CO3	Understand the dynamic behaviour of cantilever steel beam and also able to understand the strength and quality of concrete.	
CO4	Understand the behaviour of reinforced concrete column subjected to concentric and eccentric loading.	
Semester	**III**	
	INDUSTRIAL STRUCTURES	
	On successful completion of the course the students will be able to:	
CO1	Able to know the Planning and Functional requirements of various industries.	
CO2	Understand about the materials used and design of industry structural elements.	
CO3	Realize the basic concepts and design of power plant structures.	
CO4	Able to design power transmission structures.	
CO5	Able to design Chimneys, cooling towers, bunkers and silos	
	OFFSHORE STRUCTURES	
	On successful completion of the course the students will be able to:	
	PREFABRICATED STRUCTURES	
	On successful completion of the course the students will be able to:	
CO1	Understand the basic concepts of prefabrication and their needs in construction industry.	
CO2	Knowing the behaviour of prefabricated structures.	
CO3	Design the cross section and joints of prefabricated units	
CO4	To know about the joints for different structural connections	
CO5	To design for abnormal loads in structures	
	SMART STRUCTURES AND APPLICATIONS	
	On successful completion of the course the students will be able to:	
CO1	To understand active and passive systems	
CO2	To know the components of smart systems and its features	
CO3	To know the materials used in smart system and its physical properties	

CO4	To know about the types of actuators and the characteristics of control system
CO5	To know about the sensors used in smart structures
	WIND AND CYCLONE EFFECTS ON STRUCTURES
	On successful completion of the course the students will be able to:
CO1	To know the consequence of wind effects, analysis and design of structures.
CO2	To know the types of wind tunnels and its modelling
CO3	To know the effect of wind on structures
CO4	To design chimneys and roofs using IS codes
CO5	To analyse the effect of cyclone on structures
	PRE-STRESSED CONCRETE STRUCTURES
	On successful completion of the course the students will be able to:
CO1	Design a prestressed concrete beam accounting for losses.
CO2	Design for flexure and shear.
CO3	Design the anchorage zone for post tensioned members and deflection in beams.
CO4	Design composite members and continuous beams.
CO5	Design water tanks, pipes and poles.
	POWER PLANT STRUCTURES
	On successful completion of the course the students will be able to:
CO1	The student will be able to formulate the planning and layout of different power plants.
CO2	The student can analyse and design chimneys as per codal provisions
CO3	The student will be efficient in design of cooling towers.
CO4	The student may be familiar with all types of machine foundations. The students will be able
CO5	The students will be able to design all types of material handling systems
	ENERGY EFFICIENT STRUCTURES
	On successful completion of the course the students will be able to:
CO1	To understand the concepts of energy efficient building
CO2	To understand te influence of climate and environmental factors affecting building design
CO3	To gain knowledge on design of buildings according to thermal environment
CO4	To acquire the skills of utilisation of appliances and the principles
CO5	To obtain the knowledge of energy audit in buildings

		DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES
		On successful completion of the course the students will be able to:
	CO1	To possess knowledge of the composite behaviour of structures
	CO2	To design various composite structural elements such as beams, columns, floors, slabs and concrete filled steel tube
	CO3	To understand the behaviour of box girder bridges and the design concepts of the same
	CO4	The student will have practical knowledge of construction and design of various structural elements
	CO5	To understand the concepts through case studies
		STRUCTURES IN DISASTER PRONE AREAS
		On successful completion of the course the students will be able to:
	CO1	The students are able to overview disaster situations
	CO2	To know the methods of strengthening for different disasters
	CO3	To know preparedness and planning for urban earthquake disaster
	CO4	To know about modern analysis, design and construction techniques
	CO5	To know about the various stages of disaster management
		RANDOM VIBRATIONS AND STRUCTURAL RELIABILITY
		On successful completion of the course the students will be able to:
	CO1	To design for structural safety
	CO2	To perform probabilistic analysis
	CO3	To compute the structural reliability analysis of beams and columns
	CO4	To determine the load and resistance factors of design
	CO5	To solve simple risk decision problems
		DESIGN OF SUB STRUCTURE
		On successful completion of the course the students will be able to:
	CO1	Attain the perception of site investigation to select suitable type of foundation based on soil category
	CO2	To design different types of shallow foundation.
	CO3	To design different types of pile and evaluation of pile group capacity.
	CO4	To design different types of well foundation
	CO5	To design transmission line tower foundation.
		PRACTICAL TRAINING (4 WEEKS)
		On successful completion of the course the students will be able to:

CO1	They are trained in tackling a practical field/industry orientated problem related to Structural Engineering.
	SEMINAR
	On successful completion of the course the students will be able to:
CO1	The students will be trained to face an audience and to tackle any problem during group discussion in the Interviews.
	PROJECT WORK (PHASE – I)
	On successful completion of the course the students will be able to:
CO1	At the end of the course the students will have a clear idea of his/her area of work and they are in a position to carry out the remaining phase II work in a systematic way.
IV	
	PROJECT WORK (PHASE – II)
	On successful completion of the course the students will be able to:
CO1	To be in a position to take up any challenging practical problem and find better solutions.

Program Name	M.E. (ENGINEERING DESIGN)
Semester	I
Course Name	Advanced Numerical Methods
	The students will be able to
CO1	Apply numerical methods such as direct, iterative to solve system of equations and to solve integrals.
CO2	Solve the boundary value problems and Eigen value problems.
CO3	Compute maxima and minima of a functional dependent of functions using different methods.
CO4	Solve Elliptic type of partial differential equations using iterative methods.
CO5	Evaluate numerically the solutions of parabolic equations using initial and boundary conditions.
Course Name	Concepts of Engineering Design
	The students will be able to
CO1	Perform design process for developing new machine members.
CO2	Notice tools in engineering design
CO3	Find the solution in materials selection and materials in designing a new machine member.
CO4	Conduct designing machine members using materials processing.
CO5	Apply knowledge to select material basing on legal, ethical environmental and safety issues in design and quality engineering.
Course Name	Computer Application in Design
	The students will be able to
CO1	Familiarized with the computer graphics application in design.
CO2	Perform design of machine tools using computers
CO3	Find the solution in programming the tool design
CO4	Apply computer knowledge in development of product design
CO5	Manage design data for producing new tools.
Course Name	Finite Element Analysis
CO1	Students will capable of formulate and analysis of 1D Problems.
CO2	Students will capable of formulate and analysis of 2D and 3D Problems.
CO3	Students will have the ability to solve isoparametric problems using FEA.
CO4	Students will able to solve dynamic analysis problem using FEA
CO5	Students will have the ability to apply finite element to formulate and solve thermal and fluid flow problems.

Course Name	Optimization Techniques in Design
CO1	Students will be familiarized with different approaches of optimizing an engineering problem or a function which is essentially required in industries today.
CO2	Students acquire knowledge to optimize an existing design with single or multiple objective functions.
CO3	Students will get familiarized with the different approaches of optimizing disciplines in engineering problem or a function.
CO4	Students will able to solve the optimization problems in manufacturability using various optimization methods.
CO5	Students will able to write the procedure for dynamic programming using computational process.
Course Name	CAE Laboratory-I
	The students will be able to
CO1	Select the method, meshing, analysis and optimize the given problem for structural and thermal applications.
CO2	Conduct structural analyses and selected other analysis like normal modes/natural frequency analysis, harmonic analysis, steady-state heat conduction analysis
CO3	Use professional level finite element software to solve engineering problems in solid mechanics and heat transfer
CO4	Simulate simple kinematic mechanisms using simulation software.
CO5	Recognize sources of errors in FEA.
Course Name	Design of Hydraulic and Pneumatic Systems
CO1	The students will have fundamental knowledge on fluid power control.
CO2	The students will be able to select various control valves and use them in hydraulic and pneumatic circuit development.
CO3	The students will be able to design hydraulic circuits for automation.
CO4	The students will be able to analyse the pneumatic circuit for energy efficiency.
CO5	The students know installation, maintenance of power systems.
Course Name	Additive Manufacturing
CO1	The students will able to gain knowledge about the various rapid prototyping technologies.
CO2	The students will able to gain knowledge about stereo lithography process and selective laser sintering.
CO3	The students will have sound knowledge on processes like fusion deposition modeling and solid ground curing.
CO4	The students will have sound knowledge on processes includes laminated object manufacturing concept modeler and laser engineered net shaping.
CO5	The students can enhance the knowledge in rapid tooling and different softwares used for rapid prototyping like solid view.

Course Name	Smart Materials and Structures
	The students will be able to
CO1	Describe the behavior and applicability of various smart materials.
CO2	Analyse the different Shape memory alloys and their experimental phenomenon.
CO3	Characterize the different vibration absorber.
CO4	Design, analysis and testing of MEMS for different applications.
CO5	Describe the polymer and optical MEMS
Course Name	**Composite Materials and Mechanics**
CO1	The students will have ability to identify the properties of composite materials.
CO2	The students will have knowledge of manufacturing composite materials by using various methods.
CO3	The students can analyse the mechanism of composite materials.
CO4	The students can perform various tests on composite materials.
CO5	The students can be able to develop the equations based on laminates and to determine lamina stress within laminates.
Course Name	**Advanced Mechanics of Materials**
	The students will be able to
CO1	Comprehend the basic concepts of mechanics of materials.
CO2	Cognize the stresses and deflection in unsymmetrical beams.
CO3	Interpret the stresses and strains associated with thick-wall cylindrical pressure vessels and rotating disks, non circular rotating shafts.
CO4	Interpret the stresses and strains in noncircular cross section members.
CO5	Interpret the stresses and strains in flat plates.
Semester	**II**
Course Name	**Tribology in Design**
	The students will be able to
CO1	Select compatible materials for minimizing friction and wear in machinery.
CO2	Design or choose efficient tribological systems such as rolling element bearings, hydrodynamic bearings, and dry sliding bearings, for the needs of a specific application.
CO3	Design bearings under Hydrostatic condition.
CO4	Explain the concepts advanced bearings like porous bearings and gas lubricated bearings.
CO5	Performs space and automotive tribology related study.
Course Name	**Vibration Analysis and Control**

		The students will be able to
CO1	Analyze the mathematical model of a linear vibratory system to determine its response.
CO2	Obtain linear mathematical models of real life engineering systems.
CO3	Use Lagrange's equations for linear and nonlinear vibratory systems.
CO4	Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation.
CO5	Conduct test by using different vibration measuring device.
Course Name	*Integrated Mechanical Design*
	The students will be able to
CO1	Design components based on process and function tolerances.
CO2	Design shafts for different applications.
CO3	Design different types of gears and gear boxes.
CO4	Solve the problems in brakes and clutches.
CO5	Understand the basics procedure of design of machine in engineering field.
Course Name	*Mechanisms Design and Simulation*
	The students will be able to
CO1	Use the concept of analysis for different kinematic mechanism.
CO2	Use the position analysis method to determine the velocity and acceleration.
CO3	Formulate the coupler curve for straight line and six bar mechanism.
CO4	Perform the dimensional synthesis of four bar mechanism.
CO5	Synthesis the coupler curve for cam mechanism.
Course Name	*CAE Laboratory-II*
	The students will be able to
CO1	Model and assemble the drawings of any mechanical products using modeling software.
CO2	Select the method, meshing, analysis and optimize the real time problems using finite element analysis software.
CO3	Evaluate and interpret FEA analysis results for design and evaluation purposes
CO4	Develop a basic understanding of the limitations of the FE method and understand the possible error sources in its use.
CO5	Use analysis software for the application and use of the FE method for heat transfer and structural problems.
Course Name	*Integrated Product and Process Development*
CO1	The students will have the knowledge about the product development process and challenges in product development.

CO2	The student will be able to implement the projects and execute them.
CO3	The students will have an ability to gain knowledge on writing about the product specifications.
CO4	The students will be able to know about concept selection process and concept testing.
CO5	The students will have an ability to gain knowledge on product level design issues.
Course Name	*Integrated Manufacturing Systems*
	The students will be able to
CO1	Get good exposure on manufacturing systems.
CO2	Get good exposure on CAPP systems for rotational and prismatic parts and GT.
CO3	Understand the effect of manufacturing automation strategies and derive production metrics with computer monitoring and control of manufacturing.
CO4	Understand the production monitoring system.
CO5	Understand the applications of FMS and Rapid prototyping concepts.
Course Name	*Concepts of Design for Manufacture and Assembly*
	The students will be able to
CO1	Understand the complex interrelationships between design and manufacturing.
CO2	Explore and understand basic manufacturing processes and the design for manufacturing (DFM) implications of design choices for specific manufacturing processes.
CO3	Understand the role of components design with machining consideration.
CO4	Understand approaches and practices related to CAD model building and model checking for specific manufacturing processes such as models for sheet metal and models for casts and molds.
CO5	Know about the environmental issues with case study.
Course Name	*Engineering Fracture Mechanics*
	The students will be able to
CO1	Calculate the stress-strain and load-displacement fields around a crack tip.
CO2	It helps the engineers to get familiarized with the design of components that contain crack under static load condition.
CO3	It helps the engineers to get familiarized with the design of components that contain crack and its growth under fatigue load condition.
CO4	Design materials and structures using fracture mechanics approaches.
CO5	Know different application of fracture mechanics.
Course Name	*Design of Automotive System*
	The students will be able to
CO1	Design the various automobile components.

CO2	Design of clutch with different parameters.
CO3	Design the various transmission components
CO4	Design the suspension and steering system.
CO5	Design the brakes at various pressure & torques.
Course Name	*Mechatronics System in Design*
	The students will be able to
CO1	Understand the functions of Mechatronics system.
CO2	Select appropriate sensors for an engineering application.
CO3	Write microcontroller programs.
CO4	Learn Programmable Logic Controllers and their applications.
CO5	Design solutions for a Mechatronic system.
Course Name	*Nanomaterial & Nanotechnology*
	The students will be able to
CO1	Understand the importance of reduction in materials dimensionality, and its relationship with materials properties.
CO2	Know about the nano structures and dimensions.
CO3	Synthesis different nanomaterials.
CO4	Understand the properties of nanostructured materials.
CO5	Learn deeply about the physical properties and magnetic behaviour of nanomaterials.
Course Name	*Plates and Shell*
	The students will be able to
CO1	Use the different energy equation and stress equation for analysis of plates.
CO2	Analyse the plates with varying load conditions using classical theory.
CO3	Perform the buckling analysis of rectangular plate under different load conditions.
CO4	Design the rectangular plates under the transient analysis condition.
CO5	Analyse the stress resultants of thin spherical and cylindrical shell structures.
Semester	**III**
Course Name	*Project Work (Phase – I)*
	The students will have
CO1	Clear idea of their area of project work.
CO2	The knowledge to carryout the phase II work in systematic way.
Course Name	*Internship*

		The student will have
	CO1	Practical knowledge about various activities like processes, design, quality control, etc that are taking place in industries.
	CO2	The skills about effective communication, presentation and report preparation.
Course Name		*Micro Electro Mechanical Systems*
		The students will be able to
	CO1	Have basic foundation education in MEMS.
	CO2	Become familiar with micro fabrication techniques.
	CO3	Become fluent with design, analysis and testing of MEMS.
	CO4	Select the most suitable manufacturing process and strategies for micro fabrication.
	CO5	Assess whether using a MEMS based solution is relevant and best approach.
Course Name		*Engineering Materials and their Applications*
		The students will be able to
	CO1	Familiarize the researchers in the area of material behaviour under different loading conditions.
	CO2	Analyze material behavior under dynamic loads and perform failure analysis.
	CO3	Select materials for the design of engineering structures.
	CO4	Know about the modern metallic materials used for different applications.
	CO5	Know about the polymers, its processing methods and its applications.
Course Name		*Product Life Cycle Management*
		The students will be able to
	CO1	Compare product data, information, structures and PLM concepts.
	CO2	Apply PLM systems in organization verticals including production, after sales, sales and marketing, and subcontracting.
	CO3	Measure benefits of PLM implementation in daily operations, material costs, productivity of labor and quality costs.
	CO4	Apply PLM concepts for service industry and E-Business.
	CO5	Know about the applications of soft corrupting.
Course Name		*Design of Materials Handling Systems*
		The students will be able to
	CO1	Comprehend the concepts and benefits of better material handling systems.
	CO2	Familiarize about the proper selection, use and care through work area hazard assessments and training.
	CO3	Familiarize on the technique to select suitable material handling equipment and design them based on the need.

CO4	Design material handling equipments such as drives of hoisting gears.
CO5	Design material handling equipments such as conveyors, elevators for different applications.
Course Name	**Vibration Control & Condition Monitoring**
CO1	Students will have the knowledge about the fundamentals of various degrees of freedom.
CO2	Students are able to find solution to reduce the vibration at source.
CO3	Students are able to perform modern treatment of vibrations, the control strategies using active and passive control methods.
CO4	Students are able to provide valuable information on machine condition monitoring for achieving precise operation, and improving machinery performance.
CO5	Students are capable to do dynamic balancing and alignment of machinery.
Course Name	**Design and Optimization of Thermal Energy System**
	The students will be able to
CO1	Apply basic principles underlying heat exchanger.
CO2	Apply mathematical modeling and optimization in design of thermal systems.
CO3	Develop representational models of real processes and systems.
CO4	Develop the optimization method.
CO5	Analyze dynamic behavior of thermal systems.
Course Name	**Surface Engineering**
	The students will be able to
CO1	Know the importance of surface topography in friction materials.
CO2	Aware of the need of wear measurements and standards.
CO3	Know the various types of corrosion and how to prevent it.
CO4	Compare different methods of surface treatment and coating techniques.
CO5	Apply the engineering materials and alloys in various applications.
Course Name	**Industrial Robotics & Experts System**
	The students will be able to
CO1	Design robotics and write program for controlling the robotics.
CO2	Analysis the robotic kinematics.
CO3	Know about the robot vision system and pattern recognition.
CO4	Design robot work cell for different industrial applications.
CO5	Apply artificial intelligence and expect systems in robotics.
Course Name	**Mechanical Behavior of Engineering Materials**

	The students will be able to
CO1	Know about the mechanism of plastic deformation and origin of materials strength.
CO2	Suggest the ways by which engineering materials may be intrinsically strengthened.
CO3	Identify ductile-brittle transition temperature and select materials accordingly.
CO4	Know about high temperature mechanical behavior of materials and be able to select the materials for high temperature applications.
CO5	Know about the creep mechanism, variables affecting creep while selecting materials for various applications.
Course Name	***Design of Pressure Vessels & Piping***
	The students will be able to
CO1	Know about the fundamentals involved in the design of pressure vessels.
CO2	Apply the mathematical fundamental for the design of pressure vessels and piping.
CO3	Design and analyze pressure vessels and piping.
CO4	Perform buckling and fracture analysis in pressure vessels.
CO5	Apply the knowledge of piping layout and piping stress analysis while designing piping for different applications.
Course Name	***Applied Engineering Acoustics***
	The students will be able to
CO1	Understand the basic knowledge required to measure, assess the sound.
CO2	Analyze and solve noise and vibration problems in industrial situations.
CO3	Gain some hands-on experience on the characteristics of sound waves.
CO4	Familiarize with the effects of sound and vibration on humans and how to mediate these effects and of how sound propagates and is controlled.
CO5	Describe the measures available to control noise and vibration problems.
Course Name	***Computational Fluid Dynamics***
	The students will be able to
CO1	Simplify a real fluid-flow system into a simplified model problem, to select the proper governing equations for the physics involved in the system, to solve for the flow, to investigate the fluid-flow behavior, and to understand the results.
CO2	Use modern tools to build flow geometries for conduction heat transfer.
CO3	Generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field.
CO4	Analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, etc., using flow visualization and analysis tools.
CO5	Analyze problems in turbulence and predict fluid flow and heat transfer.
Course Name	***Research Methodology and IPR***

		The students will be able to
	CO1	Determine research problem formulation.
	CO2	Equip research related skills like writing a research paper, report preparation and format of research proposal.
	CO3	Analyse the process of patenting and its procedure.
	CO4	Know about the scope of patent rights and applications of technology transfer.
	CO5	Gather information about recent developments about IPR.
Semester	**IV**	
Course Name	*Project Work(Phase-II)*	
		The students will be able to
	CO1	Use the engineering technical skills and modern engineering tools necessary for practical applications.
	CO2	Use design principles and develop conceptual, engineering design and fabrication of various components.
	CO3	Take up any challenging practical problems and find solution by formulating proper methodology by attending different conferences.
	CO4	Create the document for research article with correct format and structure.
	CO5	Gain Practical knowledge about various activities like processes, design, quality control that are taking place in industries.