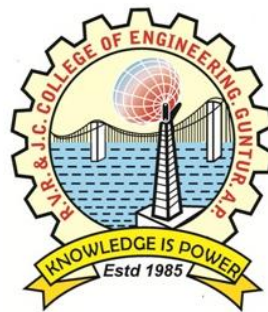


# **R. V. R. & J. C. COLLEGE OF ENGINEERING**

(Autonomous)

ACCREDITED BY NBA AND NAAC WITH 'A' GRADE

**Chowdavaram, GUNTUR – 522 019**



## **CHEMICAL ENGINEERING**

**I Year I Semester****CH 101 ENGINEERING MATHEMATICS – I****Course Out comes:**

- i. Understand methods of solving first order differential equations.
- ii. Understand some physical applications of first order differential equations.
- iii. Solve higher order differential equations.
- iv. Understand the basic linear algebraic concepts.
- v. Evaluate double, triple integrals and the area, volume by double & triple integrals respectively.

**CH 102 ENGINEERING PHYSICS****Course Outcomes:**

- i. After completion of the course the student will be able to:
- ii. Introducing the Concepts of Ultrasonic waves, production and applications in NDT.
- iii. Interference in thin films and its application, Concept of diffraction and grating, birefringence and production and detection of different polarized lights.
- iv. Acquire Knowledge on basics of lasers, holography, fibers and their applications.
- v. Introducing the student to the domain of quantum world by Schrodinger wave equation and its applications in 1-D. To describe the nature of electromagnetic radiation and matter in terms of the particles.

**CH 103 INORGANIC CHEMISTRY****Course Outcomes:**

- i. Student can establish relationship between various parameters involved in Stoichiometry. (useful in - chemical technology)
- ii. Student can relate various theories, using which he can have insight at structure and reactivity of compounds.
- iii. The student would be able to arrive at various properties of compounds based on their bonding by acquiring knowledge on the chemistry of various elements.
- iv. Shall be able to know the chemistry of inorganic polymers and various metallurgical operations.
- v. Would understand how water is treated using different methods and use it wisely for further development.

**CH 104: ENVIRONMENTAL STUDIES****Course Outcomes**

The students are able

- i. Acquire knowledge regarding proper utilization of natural resources
- ii. To understand the concept of ecosystems and biodiversity
- iii. To understand the causes, effects and controlling measures of different types of environmental pollutions.
- iv. To define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.
- v. To create awareness among worldwide environmental legislation.

## **CH105 APPLIED MECHANICS & MECHANICAL ENGINEERING**

### ***Course Outcomes:***

- i. The student must be in a position to understand different coplanar forces and determine the resultant forces. He is also able to estimate centre of gravity and moment of inertia for simple objects.
- ii. The student must be able to estimate the tensile, compressive, shear and thermal stresses in a body when subjected for different forces, change in temperature etc., He can also understand the difference between thick and thin cylinders and able to estimate hoop and longitudinal stresses, changes in dimensions of the cylinder due to these stresses and strains.
- iii. The student can understand the formation of steam, working principles of Babcock and Wilcox boilers, different mountings and accessories used in the boilers.
- iv. He must be in a position to know what is I.C.Engine, its important components, working principles of CI and SI engines, 2 stroke and 4 stroke engines and their differences. He is in a position to estimate the different performance characteristics.
- v. The student must be in a position to know how the power is transmitted through belt and gear drives, estimate the tensions, power transmitted, length of the belt required etc., He is also in position to understand the importance of bearing and couplings in power transmission and different types of bearing and couplings.

## **CH 106BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

### ***Course Outcomes:***

- i. To understand the concept of DC/AC circuits and analyze.
- ii. Able to analyze performance of D.C. machines in terms of efficiency and their utilizations in different applications.
- iii. Able to analyze performance of Transformers and induction motors.
- iv. To know various electronic devices operation and their applications.
- v. To know the principles of operation of Electrical and electronic measuring devices.

## **CH 152 WORKSHOPPRACTICE**

### ***Course Outcomes:***

- i. To familiarize with -The Basics of tools and equipment used in Carpentry, Tin Smithy, Welding and House Wiring.
- ii. The production of simple models in the above four trades

## **CH 153 COMMUNICATION SKILLS LABORATORY**

### ***Course Outcomes:***

At the end of the course the students will be able to:

- i. Know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.
- ii. Employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.
- iii. Use confidently phrases and idioms for effective communication.

- iv. Develop appropriate speech dynamics in professional situations.
- v. Focus on communication skills and social graces necessary for effective communication.

## **I Year II Semester**

### **CH 107 ENGINEERING MATHEMATICS – II**

#### ***Course Outcomes:***

- i. Assess the importance of derivative in series expansions and extreme values.
- ii. Able to solve problems related to gradient, divergence and curl of vector differentiation.
- iii. Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.
- iv. Evaluate complex line integrals.
- v. Find singularities of complex functions and determine the values of integrals using residues.

### **CH 108 PHYSICAL CHEMISTRY**

#### ***Course Outcomes:***

- i. Able to apply the gaseous laws in solving industrial problems.
- ii. Able to calculate molar heat capacities and internal energy & work.
- iii. Able to know the number of phases, components and degree of freedom.
- iv. Able to calculate the distribution of solute in liquid-liquid systems.
- v. Able to calculate rate of reaction and do selection of catalyst.

### **CH 109 MATERIAL SCIENCE**

#### ***Course Outcomes:***

- i. Characterizing the crystals and amorphous materials and appropriate selection of materials for desired property.
- ii. Acquire Knowledge on imperfections in solids and mechanical properties of solids
- iii. Significance of optical properties of matter when interacted with optical energy and the knowledge of Composites.
- iv. Importance of polarization and magnetization phenomena and their applications.
- v. Relevance of superconductivity and Nano materials

### **CH 110 ENGLISH FOR COMMUNICATION**

(Common to all branches)

#### **Course Outcomes:**

At the end of the course, the student will be able to:

- Use vocabulary contextually;
- Compose effectively the various forms of professional communication.
- Apply grammar rules efficiently in spoken and written forms.
- Understand and overcome the barriers in communication.
- Develop professional writing.

## **CH 111 PROBLEM SOLVING WITH C** (Common to all branches)

### ***Course Outcomes:***

At the end of the course, the student will be able to

- i. Develop algorithms and flow charts for simple problems.
- ii. Use suitable control structures for developing code in C.
- iii. Design modular programs using the concepts of functions and arrays.
- iv. Design well-structured programs using the concepts of structures and pointers.
- v. Develop code for complex applications using file handling features.

## **CH 112 INTRODUCTION TO CHEMICAL ENGINEERING**

### ***Course Outcomes:***

- i. Awareness of career options, potential job functions, contemporary and professional issues.
- ii. Understand what Chemical Engineering is and what careers are possible with a degree in Chemical Engineering.
- iii. Acquire basic principles of momentum and heat transfer & heat transfer equipment.
- iv. Acquire basic principles of mass transfer and equipment.
- v. Understand the reaction kinetics and various types of industrial reactors.

## **CH 154 CHEMISTRY LABORATORY**

### ***Course Outcomes:***

- i. Students acquire knowledge on equivalent weight, molecular weight, normality, molarity, oxidants and reductants.
- ii. Students can prepare solutions of different concentrations.
- iii. Students can analyze water for its hardness, alkalinity, chloride ion and iron content.
- iv. Student understands the principles behind the development of the instruments suitable for chemical analysis. Later he can use the knowledge in modifying the instruments.

## **CH 155 C – PROGRAMMING LABORATORY**

### ***Course Outcomes:***

- i. Write simple programs using C fundamentals and control statements.
- ii. Develop various menu driven programs using concepts of control statements, arrays, functions and pointers.
- iii. Use dynamic memory allocation for efficient memory management.
- iv. Design well-structured programs using the concepts of structures, unions and file handling features.
- v. Design applications using C.

## **CH 156 ENGINEERING GRAPHICS LABORATORY**

### ***Course Outcomes:***

- i. Acquire basic skills in Technical graphic communication.

- ii. The students will be able to visualize and communicate with 2D as well as three dimensional shapes.
- iii. Understands the application of Industry standards and best practices applied in Engineering Graphics.
- iv. The student is able to apply the knowledge of development of surfaces in real life situations.
- v. Student is introduced to modern CAD system using Auto CAD.
- vi. The students will be able to draw simple 2D Engineering Drawings using Auto CAD.

**II Year I Semester****CH 201 PROBABILITY AND TRANSFORMS*****Course Outcomes:***

- i. Find Fourier series.
- ii. Find Fourier transforms.
- iii. Find solution of differential equations using Laplace transforms.
- iv. Apply knowledge of distribution theory to various data.
- v. Test hypotheses and draw inference for engineering problems

**CH 202 ORGANIC CHEMISTRY*****Course Outcomes:***

- i. The graduate acquires the knowledge of stability of organic compounds based on their chemical reactivity according to rules.
- ii. The student would be able to predict stereochemistry of simple organic compounds and influence of substituents on aromatic compounds.
- iii. The graduate can understand the mechanism of different named reactions and able to predict products formed.
- iv. The graduate acquires knowledge about the acidic and basic strength of different organic compounds.
- v. Student would know the importance of Drugs and other Biomolecules in their day to day life.

**CH 203 CHEMICAL PROCESS CALCULATIONS*****Course Outcomes:***

- i. Ability to troubleshoot problems in material flow rate handling in chemical production.
- ii. Apply Ideal gas law for gaseous mixtures and gases in chemical reactions.
- iii. Ability to design air flow rates in drying and humidification processes.
- iv. Ability to calculate the yield in chemical production processes.
- v. Ability to calculate energy requirement.

**CH 204 MOMENTUM TRANSFER*****Course Outcomes:***

- i. To apply the concept of hydrostatic equilibrium and to have a knowledge on fluid flow Phenomena.
- ii. To determine engineering design quantities for laminar and turbulent flows.
- iii. To work with compressible fluids, packed bed and fluidized bed columns.
- iv. To work with variety of pumps and to estimate pressure losses due to various flow measuring Apparatus.
- v. To handle important engineering tasks of moving fluids through process equipment and measuring and controlling in flow.

**CH 205: MECHANICAL OPERATIONS*****Course Outcomes:***

- i. To understand the characterization of solid particles and Properties of particulate.

- ii. To solve mathematical problems related to comminution operations by using different laws.
- iii. To choose appropriate screening equipment and calculate the screening effectiveness.
- iv. To understand the concepts of filtration, equipment and design of filtration equipment.
- v. To understand the concepts of clarifiers, cyclone separators and other separation equipment's. Selection of appropriate mixing process for the fluids and solids.

## **CH 206 MATERIAL TECHNOLOGY**

### ***Course Outcomes:***

- i. An ability to apply knowledge of mathematics, physics, chemistry, materials and statistics to identify, formulate and solve the problems encountered in the production or application of a material.
- ii. Apply and integrate knowledge from the major elements of the field (structure, properties, processing, and performance) to solve materials selection and design problems.
- iii. Use the techniques, skills and modern engineering tools necessary engineering practice.
- iv. To graduate the students who contribute to their profession in process industry through engineering practice.
- v. Identify various types of corrosion, illustrate methods to mitigate corrosion and select suitable material for various chemical processes.

## **CH 251 MOMENTUM TRANSFER LABORATORY**

### ***Course Outcomes:***

- i. Students should be able to collect quality raw data from an operation
- ii. Students should be able to compare observed with predicted performance
- iii. Students should be able to communicate the results of their analysis effectively in written and oral reports
- iv. Students should be able to function effectively in a lab team

## **CH 252 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**

### ***Course Outcomes:***

- i. Acquires knowledge basic electrical circuits and parameters.
- ii. Acquires knowledge on operation of transformer.
- iii. Acquires knowledge on operation of DC and AC Machines
- iv. Acquires knowledge on electronic devices operation and their applications

## **CH 253 PROFESSIONAL COMMUNICATION SKILLS LABORATORY**

### ***Course Outcomes:***

- i. Develop effective communication and presentation skills.
- ii. Learn corporate etiquette - organizing and managing professional events.
- iii. Understands how reading enhances their communicative competency.
- iv. Conduct effective correspondence and prepare reports which produce results.
- v. Develop all-round personalities with a mature outlook to function effectively in different circumstances.
- vi. Know his/her skills and abilities for better career plans.



**II Year II Semester****CH 207 PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS*****Course Outcomes:***

1. To solve partial differential equations.
2. To apply partial differential equations in solving the chemical engineering processes.
3. To solve system of equations numerically.
4. Find numerical solution of ordinary differential equations.
5. Find numerical solution of partial differential equations.

**CH 208 PROCESS HEAT TRANSFER*****Course Outcomes:***

- i. Describe the three modes of heat transfer mathematically and physically.
- ii. Estimate the thermal conductivity, convective heat transfer coefficient and emissivity for any application.
- iii. Calculate convective heat transfer coefficients for forced, free, phase change problems.
- iv. Design or predict the performance of different types of heat exchangers.
- v. Design different types of evaporators.

**CH 209 CHEMICAL ENGINEERING THERMODYNAMICS-I*****Course Outcomes:***

- i. Students will be able to understand the scope and relevance of Chemical Engineering Thermodynamics.
- ii. Students will be able to estimate the volumetric properties of pure fluids.
- iii. Students will be able to state the second law of thermodynamics and to estimate the efficiency of heat engines.
- iv. Students will be able to apply the concepts of first and second law of thermodynamics to analyze the specific process.
- v. Students will be able to perceive the principles of heat effects of industrial reactions and temperature dependency of heat of reaction.

**CH 210 INORGANIC CHEMICAL TECHNOLOGY*****Course Outcomes:***

Student should be able to

- i. Acquire the basic knowledge of Alkali industries, Water treatment.
- ii. Gain the complete knowledge of unit operations of major inorganic chemical industries like ceramics, glasses and cements.
- iii. Acquire the complete knowledge of N, P, K fertilizers.
- iv. Acquire the knowledge of S, H<sub>2</sub>SO<sub>4</sub> industries.
- v. Gain the basic knowledge of industrial gases and nuclear industries.

**CH 211: PROCESS INSTRUMENTATION & INSTRUMENTAL METHODS OF ANALYSIS*****Course Outcomes:***

- i. Understand the basic measurement principles of the physical quantities of interest and

- elements of control system.
- ii. Understand principles expansion and resistance thermometers.
  - iii. Learn various sensors used for measurement of process parameters such as flow, pressure, level etc. covering principle of operation, specifications etc.
  - iv. Familiar with principles and various spectrometric instrumental methods used for measurement of chemical composition.
  - v. Familiar with principles and various chromatographic methods used for measurement of chemical composition.

## **CH 212 PROFESSIONAL ETHICS & HUMAN VALUES**

### ***Course Outcomes:***

- i. To understand the importance of human values.
- ii. To understand the issues of engineering ethics and to perform right actions.
- iii. To understand the basic duties of engineering professional and perform safety & risk analysis.
- iv. To understand the work place rights and responsibilities and to bring goodness to the society.
- v. To understand the global issues and code of ethics of professional societies.

## **CH 254 ORGANIC CHEMISTRY LABORATORY**

### ***Course Outcomes:***

- i. Students would be able to identify the nature and type of the given organic compound.
- ii. Students can prepare the required organic compound or derivative and confirm its identity by suitable methods.
- iii. Students can prepare solutions of different concentrations.
- iv. Student understands the principles behind the development of the instruments suitable for chemical analysis. Later he can use the knowledge in modifying the instruments.

## **CH 255 MECHANICAL OPERATIONS LABORATORY**

### ***Course Outcomes:***

- i. Understand the properties of solids and different types of size reduction principles
- ii. Able to Use the best screening and settling methods in chemical industries.
- iii. Able to decide the best separation operation needed in chemical process industries
- iv. Able to design a liquid solid separation equipments.

1. Sampling by Riffle, Cone & Quartering and Bulk method
2. Grindability index (G.I.) of coal.
3. Ball Mill
4. Sink and float.
5. Optimum time of sieving.
6. Verify the laws of crushing.
7. Effectiveness of a given screen by hand sieving
8. Effectiveness of a given screen using vibrating/Rotap sieving
9. Magnetic separator

10. Terminal settling velocity in viscous medium.
11. Plate & Frame filter press
12. Centrifugal separator.
13. Mixing Index
14. Cyclone separator.

### **CH 256: COMPUTATIONAL PROGRAMMING LABORATORY**

***CourseOutcomes:***

Students shall be able to:

- i. Successfully employ EXCEL/MATLAB skills
- ii. Solve linear/polynomial regression problems
- iii. Solve problems involving iterative solutions
- iv. Successfully employ programming both In EXCEL and MATLAB

**III Year I Semester****CH 301 MASS TRANSFER OPERATIONS – I*****Course Outcomes:***

- i. An ability to define the basic principles of mass transfer operations and other separation processes.
- ii. An ability to calculate the mass transfer coefficients.
- iii. An ability to identify the major parts of various mass transfer equipment and calculate the number of stages and solvent required for absorption.
- iv. An ability to design humidification and dehumidification processes.
- v. An ability to calculate the drying rate, design the drier, crystallization rate and equipment.

**CH 302 CHEMICAL REACTION ENGINEERING –I*****Course Outcomes:***

- i. Analyze kinetic data and determine the rate expressions (reaction order and specific reaction rate) for a reaction.
- ii. Derive and solve design equations for batch, semi batch and steady state flow reactors.
- iii. Solve appropriate rate expressions for series, parallel and reversible reactions. Understand the performance characteristics and the advantages and disadvantages of major reactor types
- iv. Analyze multiple reactions to determine selectivity and yield.
- v. Able to explain the thermal characteristics and design of adiabatic reactors for single and multiple reactions.

**CH 303 CHEMICAL ENGINEERING THERMODYNAMICS-II*****Course Outcomes:***

- i. Student will be able to estimate the thermodynamic properties of pure fluids and to apply the power cycles for the production of heat.
- ii. Students will be able to estimate partial properties and fugacity coefficients.
- iii. Student will be able to apply the concepts of solution thermodynamics to estimate the properties of gas mixtures and liquid solutions.
- iv. Students will be able to perform the bubble point and dew point calculations.
- v. Students will be able to estimate the equilibrium compositions of mixtures under chemical-reaction equilibria.

**CH 304 ORGANIC CHEMICAL TECHNOLOGY*****Course outcomes:***

Student should be able to

- i. Acquire the knowledge of manufacturing processes of sugars, pulp and paper industries.
- ii. Gain the complete knowledge of petroleum crude.
- iii. Gain the complete knowledge of petroleum refining processes.
- iv. Acquire the knowledge of organic chemical products like rubbers, fibres, oils and soaps.
- v. Acquire the knowledge of organic chemical products like plastics, paints and varnishes.

## **CH 305 INDUSTRIAL POLLUTION CONTROL**

### ***Course Outcomes:***

The student will be able to

- i. Describe and quantify health risks due to toxic chemicals.
- ii. Perform basic mass balances, formulate flow sheets and carry out preliminary sizing for biological unit operations for pollutant removal including activated sludge and trickling filters.
- iii. Describe mobile and stationary sources of air pollutants and their removal processes from the environment
- iv. Describe the sources of solid waste and their removal processes from the environment.
- v. Define hierarchies for pollution prevention and to discuss concepts of waste minimization.

### **ELECTIVE-I**

#### **CH 306(A): COMPUTER SIMULATORS**

### ***Course Outcomes:***

At the end of the course, the students will be able to:

- i. Understand the stages involved in the development of a process model.
- ii. Simulate by Using FLUENT.
- iii. Simulate the Chemical Engineering Problem by using MATLAB
- iv. Solve a Chemical Engineering by using SIMULINK.
- v. Understand the Simulation and Design concepts by using ASPEN PLUS.

#### **CH 306 (B) GENERAL PHARMACY**

### ***Course Outcomes:***

- i. Upon completion of the topic the student shall be able to perform the calculations required for development of formulations, packaging materials used and labeling requirements.
- ii. Upon completion of the unit the student shall be able to acquire the knowledge on different formulations available, formulation requirements for formulating different types of dosage forms.
- iii. Upon completion of the unit the student shall be able to acquire the knowledge on of monophasic liquid preparations available, formulate different types of monophasic liquid
- iv. Upon completion of the unit the student shall be able to acquire the knowledge on of biphasic liquid preparations available, formulate different types of biphasic liquid preparations.
- v. Upon completion of the unit the student shall be able to prepare galenicals, suppositories and peccaries.

#### **CH306 (C) PETROLEUM EXPLORATION**

### ***Course Outcomes:***

- i. Able to know Sedimentological and biostratigraphic approaches in hydrocarbon exploration.
- ii. Able to know about acquisition methods, processing and interpretation.
- iii. Acquires knowledge on the Seismic methods for Oil exploration.

- iv. Able to do seismic refraction survey.
- v. Able to perform various flooding processes.

### **CH 306 (D) ELECTRO CHEMICAL ENGINEERING**

#### ***Course Outcomes:***

- i. Students will be able to understand balanced electrochemical reactions; analyze the open-circuit potentials of electrochemical cells, including liquid-junction potentials and understand the structure of the electric double layer, based partly on surface-tension data.
- ii. Students will be able to understand the reaction mechanisms and kinetics to obtain electrode over potentials and mass-transfer phenomena, including the estimation of limiting currents.
- iii. Students will be able to explain the principles and working conditions of the different types of primary and secondary batteries.
- iv. Students will be able to understand the uses of electrodes in used in various electro chemical and Students will be able to understand the industries like metal finishing, electroplating and electro polishing, etc.
- v. To provide basic knowledge on operations to minimize corrosion rates

### **CH 351 PROCESS HEAT TRANSFER LABORATORY**

#### ***Course Outcomes:***

Students should be able to

- i. Collect quality raw data from an operation
- ii. Compare observed with predicted performance
- iii. Communicate the results of their analysis effectively in written and oral reports
- iv. Function effectively in a lab team

### **CH 352 MASS TRANSFER OPERATIONS LABORATORY-I**

#### ***Course Outcomes:***

- i. Ability to design experiments to obtain mass transfer coefficients like diffusion coefficient in liquids and gases.
- ii. Ability to troubleshoot problems in liquid – liquid extraction perforated towers or spray towers.
- iii. Ability to calculate drying rates of wet solids and volatile chemical spills.
- iv. Ability to design gas – liquid absorption columns.

### **CH 353 CHEMICAL TECHNOLOGY LABORATORY**

#### ***Course Outcomes:***

- i. Ability to demonstrate knowledge and understanding on fundamental principles of chemistry and Inorganic chemical technology and on contemporary applications.
- ii. Ability to design and conduct experiments, as well as critically analyze and interpret experiment results.
- iii. Ability to demonstrate and understand the principles of organic chemical technology and other applications.
- iv. Ability to identify, modify and design a component process or system to meet the required product quality.

**III Year II Semester****CH 307 MASS TRANSFER OPERATIONS-II*****Course Outcomes:***

- i. An ability to understand the basic concepts of different principles of distillation.
- ii. An ability to understand the Continuous rectification and design of distillation process.
- iii. An ability to apply the principles Liquid-Liquid Extraction and equipment for Liquid-Liquid Extraction.
- iv. An ability to design adsorption column and Ion exchange.
- v. An ability to select suitable equipment for leaching and design of solid liquid extraction, membrane techniques for the separation of miscible systems.

**CH 308 CHEMICAL REACTION ENGINEERING – II*****Course Outcomes:***

- i. Able to apply the non-ideality concepts in the reacting system for better understanding of the deviations from ideality by applying the tanks-in-series model and the dispersion model.
- ii. Able to develop the progressive conversion model and shrinking core model for explaining the fluid particle reaction.
- iii. Able to understand the properties of catalyst and to estimate the surface area of the catalyst.
- iv. Able to understand the principles and mechanism involved in heterogeneous catalysis and analyze the data of heterogeneous catalytic reactions.
- v. Able to estimate the conversion of reactions involving deactivating catalysts.

**CH 309 PROCESS DYNAMICS & CONTROL*****Course Outcomes:***

- i. Analyze typical process dynamics with and without feedback control using both time domain and Laplace domain approaches.
- ii. Be able to analyze open loop and closed loop system properties.
- iii. Be able to develop the closed loop transfer functions for single and multi loop systems and to apply the Routh test, root locus methods for stability analysis.
- iv. Be able to apply the frequency response based analysis for control system stability and performance.
- v. Be able to perform model based tuning and testing of PID controllers and other types of controllers.

## CH 310 PROCESS ECONOMICS AND PLANT DESIGN

### *Course Outcomes:*

- i. Synthesize and analyze process flow sheets, draw flow charts, layout and specification of equipment.
- ii. Effectively design chemical engineering projects.
- iii. Be able to perform process selection, pollution & its abatement and safety & health considerations.
- iv. Be able to calculate the depreciation, payback period.
- v. Select the suitable material, design the storage equipment.

## CH 311 INDUSTRIAL HAZARDS AND SAFETY ANALYSIS

### *Course Outcomes:*

- i. To attain the knowledge of human error and human factors principles and how they relate to Process Safety Management.
- ii. To improve human performance by reducing human error-likely work situations through design, improved work instructions, training and the recognition of human factors hazards.
- iii. To practice performing human factors and procedures analyses in realistic workshops and safety education training programmes.
- iv. Able to reduce the process hazards by using protective equipments and fire extinguishers
- v. Able to reduce the process hazards and communicate the safety and hazard analysis reports

### **Elective–II**

## CH 312(A): COMPUTATIONAL FLUID DYNAMICS

### *Course Outcomes:*

At the end of the course, the students will be able to:

- i. Understand the basic principles of formulation of governing equations.
- ii. Apply the finite difference techniques.
- iii. Apply the finite difference techniques to solve convective equations.
- iv. Write the algorithms for one, two and three dimensional equations.
- v. Write the TDMA algorithms.

## CH 312 (B) PREFORMULATION STUDIES INCLUDING STABILITY STUDIES

### *Course Outcomes:*

- i. Upon completion of the unit the student shall be able to understand and carry preformulation studies for the successful development dosage form.
- ii. Upon completion of the unit the student shall be able to consider the various factors influencing the absorption for the successful development of dosage form, able evaluate drug release by dissolution studies.
- iii. Upon completion of the unit the student shall be able to know the various Study designs involved in the bioavailability studies and methods for assessment of bioavailability.
- iv. Upon completion of the unit the student shall be able to know the various factors affecting the stability of drugs and ICH guideline for conducting stability & photostability studies.



- v. Upon completion of the unit the student shall be able to know the specifications of QA & QC for maintaining the quality of product, good manufacturing practices in the pharmaceutical industry.

### **CH 312 (C) PETROLEUM WELL LOGGING AND TECHNOLOGY**

#### ***Course Outcomes:***

- i. Able to know various well logging methods.
- ii. Able to know resistivity logs method.
- iii. Able to know the gamma ray log and density logs methods.
- iv. Able to do cased hole logging and production logging methods.
- v. Able to do the hydrocarbon saturation in different reservoir rocks can be calculated at the well site itself.

### **CH 312(D): FLUIDIZATION ENGINEERING**

#### ***Course Outcomes:***

At the end of the course, the students will be able to:

- i. Differentiate various fluidized beds
- ii. Derive expression for the minimum fluidization and terminal velocities
- iii. Explain the concept of bubble formation and its rise in a fluidized bed.
- iv. Estimate the TDH and Entrainment rate.
- v. To understand how the solid particles circulate through stand pipes.

### **CH 354 POLLUTION CONTROL LABORATORY**

#### ***Course Outcomes:***

- i. Ability to determine the amount of oxygen and the extent of pollution of water due to organic matter
- ii. Ability to determine the extent of suspended and dissolved solid pollution in the given sample of water
- iii. Ability to predict the optimum dosage of alum and coagulant required for purification of water
- iv. Ability to determine the salt dyes and metallic components in a given sample of water.

### **CH 355 CHEMICAL REACTION ENGINEERING LABORATORY**

#### ***Course Outcomes:***

- i. Design ideal continuous reactors operating at isothermal conditions given kinetic data and conversion.
- ii. Solve for conversion in a non-ideal reactor given a residence time distribution
- iii. To understand how to measure reaction rates using integral and differential methods
- iv. Students are aware that materials, construction, operability, safety and ethical issues must be considered in reactor

### **CH 356 MASS TRANSFER OPERATIONS LABORATORY – II**

#### ***Course Outcomes:***

- i. Ability to obtain experimentally the data relevant to different types of distillation.

- ii. Ability to determine experimentally the data relevant for liquid-liquid extraction.
- iii. Ability to identify solvents for leaching.
- iv. Ability to evaluate single versus multi stage operations.

#### **IV Year I Semester**

### **CH 401 TRANSPORT PHENOMENA**

#### ***Course Outcomes:***

- i. To develop the shell momentum balances and solve them to obtain a velocity profiles.
- ii. To develop equations of change and apply them to obtain a velocity profile.
- iii. To estimate the friction factors and understand the mechanisms of energy transport.
- iv. To develop shell energy balances and solve them to obtain a temperature profile.
- v. To develop the shell mass balances and solve them to obtain a concentration profiles.

### **CH 402 CHEMICAL PROCESS EQUIPMENT DESIGN**

#### ***Course Outcomes:***

- i. Able to calculate the power requirements for transport of fluids
- ii. Effectively design chemical engineering projects.
- iii. Able to design heat transfer equipment and evaporators
- iv. Analyse and design mass equipment including Packed and fluidized bed columns for separation and reactors.
- v. Able to do Mechanical design of process equipment including Pressure, Tall and storage vessels.

### **CH 403 MOOCS\***

#### **Elective-III**

#### **Open Elective**

### **CE 404(A) BASIC SURVEYING**

#### ***Course Outcomes:***

By the end of the course surveying-I, the students will be able

- 1. To know about the various surveying instruments.
- 2. To determine the relative positions of a point on the existing ground by conducting the survey.
- 3. To use all basic surveying instruments.
- 4. To operate Total Station instrument.
- 5. To take the levels of existing ground and to determine the reduced levels.

### **CE 404 (B) BUILDING MATERIALS & ESTIMATION**

#### ***Course Outcomes:***

At the end of this course,

- i. Students are familiar with various building materials
- ii. Students knows about various building elements and their specifications
- iii. Students are familiar with types of masonry works and bonds used in construction
- iv. Students are capable of understanding building plan and have knowledge about building rules, bye-laws and building elements
- v. Students will have knowledge about Valuation of building and rent fixation

## **CS 404 (A) JAVA PROGRAMMING**

### **Course Outcomes:**

- i. Use the syntax and semantics of java programming language and basic concepts of OOP.
- ii. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
- iii. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
- iv. Demonstrate how the java program communicates with the console and disk files using the concept of streams.
- v. Design event driven GUI and web related applications which mimic the real word scenarios.

## **CS 404(B) DATABASE MANAGEMENT SYSTEMS**

### **Course Outcomes:**

- i. An understanding of basic concepts and use of various database systems.
- ii. An ability to enforce integrity constraints to maintain validity & accuracy.
- iii. An ability to write relational expressions for the queries.
- iv. An ability to design and develop a database using normalization theory.
- v. An ability to use different concurrency control and Recovery techniques.

## **EC 404(A) APPLIED ELECTRONICS**

### **COURSE OUTCOMES:**

1. Able to understand the working, types and applications of microphones and loudspeakers.
2. Able to understand the features of commercial, theatre sound recording and colour TV standards
3. Able to understand the working of various electronic systems, telecommunication and switching systems.
4. Able to understand the working of various applications like digital clocks, fiber optics, microprocessor and mobile radio systems.
5. Able to understand consumer electronic equipment and systems like washing machines

## **EC404 (B) BASIC COMMUNICATION**

### **COURSE OUTCOMES:**

1. Able to understand transmission of analog signals using amplitude modulation.
2. Able to understand transmission of digital signals through PCM, PAM, PPM and DELTA Modulation techniques
3. Able to know about various Broad band communication systems.
4. Able to know about the monochrome and colour Television fundamentals.
5. Able to know about Optical communication systems.

### **EE 404(A)NON-CONVENTIONAL ENERGY SOURCES**

#### ***Course Outcomes:***

Upon successful completion of the course, the student will be able to:

- i. Know the national scene of energy production, utilization, consumption and energy storage systems.
- ii. Understand about the basics of solar energy, collectors & generation of electricity from solar energy & photovoltaic's.
- iii. Understand the assessment of wind energy potential, wind turbines and wind generators.
- iv. Know about ocean energy, temperature differences & principles, extraction of energy from waves.
- v. Understand about geothermal, types & how biogas is produced & digester for power generation.

### **EE 404(B) UTILIZATION OF ELECTRICAL ENERGY**

#### ***Course Outcomes:***

Upon successful completion of the course, the student will be able:

- i. To give the overall idea for the different types of lamps & lighting schemes.
- ii. To know about the different types electric heating methods.
- iii. To know the designing of heat elements such as furnaces and ovens.
- iv. To know how to utilize the electrical energy for production of heat and welding process.
- v. To gain knowledge on principles and characteristics of storage batteries.

### **IT 404(A)SOFTWARE ENGINEERING**

#### ***Course Outcomes***

At the end of the course the students will be able to

- i. Identify, formulate, and solve Software Engineering problems.
- ii. Elicit, analyze and specify software requirements for various stakeholders.
- iii. Familiar with Design, development, deployment and maintenance of a software project.
- iv. Familiar with Architecture design and User Interface design
- v. Apply software engineering paradigms to web apps.

### **IT 404(B) WEB TECHNOLOGIES**

#### ***Course Outcomes***

At the end of the course the students will be able to

- i. Apply technologies to develop web documents.
- ii. Design web pages with css and apply scripting to web documents.
- iii. Create dynamic web pages with javascript.
- iv. Create valid and well-formed xml documents.
- v. Write server side scripts with php and database access.

### **ME404(A) ROBOTICS**

#### ***Course Outcomes:***

- i. At the end of the course, students will be familiarized in basic components of robotics, classification of robots and their applications.
- ii. They will have knowledge on types of robot grippers, their usage and design considerations.

- iii. They attain knowledge on various types of sensory devices their working and applications.
- iv. Students will apply basic transformations related to the movement of manipulator.
- v. An ability to design a robot mechanism to meet kinematics requirements and to write simple programs.

### **ME 404(B) OPERATIONS RESEARCH**

#### ***Course Outcomes:***

- i. Recognize the importance and value of Operations Research and linear programming in solving practical problems in industry
- ii. Interpret the transportation models' solutions and infer solutions to the real-world problems.
- iii. Recognize and solve game theory and assignment problems.
- iv. Gain knowledge of drawing project networks for quantitative analysis of projects
- v. Know when simulation and dynamic programming can be applied in real world problems.

### **CH 405: PROCESS MODELLING AND SIMULATION**

#### ***Course Outcomes:***

- i. To analyze processes in terms of their fundamental transport rates and thermodynamic equilibria.
- ii. To develop mass and energy balance equations for continuous stirred tank reactors, two heated tanks and gas phase pressurised CSTR.
- iii. To develop mathematical models for batch reactor, flash drum and ideal binary distillation columns.
- iv. To use the appropriate numerical methods to solve the non linear algebraic, ordinary and partial differential equations.
- v. To develop simulation algorithms for various chemical engineering systems.

#### **Elective-IV**

### **CH 406(A): COMPUTER AIDED PROCESS ENGINEERING**

#### ***Course outcomes:***

- i. Upon completion of the unit the student shall be able to understand the principle involved in formulation of solid dosage forms, Preparation and Evaluation of Tablets and Capsules.
- ii. Upon completion of the unit the student shall be able to understand the principle involved in formulation of, preparation and evaluation of solutions, suspensions and emulsions.
- iii. Upon completion of the unit the student shall be able to understand the formulation aspects, production facilities required, manufacturing and evaluation of sterile products
- iv. Upon completion of the unit the student shall be able to understand the manufacturing and evaluation of semisolid preparations.
- v. Upon completion of the unit the student shall be able to understand the manufacturing and evaluation of semisolid preparations.

### **CH 406 (B) INDUSTRIAL PHARMACY**

#### ***Course Outcomes:***

- i. Development of the ability to integrate pharmaceutical skills in pharmaceutical production processes.
- ii. Exposure to pharmaceutical pre formulation and product development.
- iii. Development of skills in management skills pertaining to industrial pharmacy
- iv. Ethical and behavioural skills.
- v. The student shall be able to Use laboratory scale production equipments and Communicate of laboratory results.

### **CH 406 (C) NATURAL GAS PRODUCTION AND APPLICATIONS**

#### ***Course Outcomes:***

- i. Have knowledge on Natural Gas potential, composition and resources.
- ii. Able to apply different liquification techniques.
- iii. Understand different steps in NG processing.
- iv. Have knowledge associated with safety aspects of NG, transportation and storage.
- v. Able to know Unconventional gassources and NG specification, utilization and marketing of natural gas.

### **CH 406 (D) NANOTECHNOLOGY**

#### ***Course Outcomes:***

- i. An ability to explain about molecular nanotechnology, nanolithography
- ii. An ability to explain the concept of preparation of Nanomaterial, sol-gels.
- iii. An ability to explain the .synthesis of rotaxanes and catenanes
- iv. An ability to explain about lipids, DNA structure.
- v. An ability to understand the synthesis of Nanobiology and apply the Nanomaterial's in environmental pollution control.

### **CH 451 MINI PROJECT /TERM PAPER**

#### ***Course Outcomes***

- i. Ability to collect information on own regarding a chemical product or process.
- ii. Ability to perform basic and detailed engineering for a given process.
- iii. Ability to carry out economic feasibility of a given product production.
- iv. Ability to present coherent data and analysis about a given process.

### **CH 452: COMPUTER APPLICATIONS IN CHEMICAL ENGINEERING LABORATORY**

#### ***Course Outcomes:***

- i. Able to analyze the Chemical Engineering problems with computed knowledge
- ii. Able to develop the computer program for the real chemical engineering problems
- iii. Able to solve the chemical engineering problems using ASPEN software
- iv. Able to solve the numerical methods as well as the roots of various function using C language

### **CH 453 INSTRUMENTATION AND PROCESS CONTROL LABORATORY**

#### ***Course Outcomes:***

- i. To obtain and analyze the dynamic responses of the physical systems.

- ii. To calibrate and use the measuring instruments.
- iii. To obtain the transfer function of the unknown processes.
- iv. To obtain tuning parameters of Pneumatic P+I controller, to control a particular process.

**IV Year II Semester****CH 407 INDUSTRIAL MANAGEMENT****Course Outcomes:**

- i. To gain insight on contemporary issues in General and Industrial Management.
- ii. The course helps the students to get knowledge about time value of money and the linkage of various cost concepts to understand how to maintain breakeven scenario for a business.
- iii. The course helps to linkage corporate vision, mission, strategies, and policies to human resource management to acquire competitive advantage and to frame strategies to develop talent and to retaining talent.
- iv. Recognition of the need and ability to engage in inventory management.
- v. The course helps the students to understand the customer perception, making him to buy the products and retaining the customer in a business.

**CH 408: OPTIMIZATION OF CHEMICAL PROCESS****Course Outcomes:**

At the end of the course, the students will be able to:

1. Apply the knowledge of optimization to formulate the problems
2. Apply different methods of optimization and to suggest a technique for specific problem
3. Apply simplex method for linear optimization problems
4. Understand advanced optimization techniques like Genetic algorithms
5. Understand how optimization can be used to solve the industrial problems of relevance to the chemical industry

**Elective-V****CH 409(A) COMPUTER AIDED DESIGN****Course Outcomes:**

At the end of the course, the students will be able to:

- i. An ability to prepare process flow sheets for design of process equipment
- ii. An ability to apply design techniques to solve a chemical process.
- iii. An ability to solve heat transfer design problems.
- iv. An ability to solve mass transfer design problems.
- v. An ability to design a chemical reactor.

**CH 409 (B) QUALITY CONTROL OF PHARMACEUTICAL DOSAGE FORMS****Course Outcomes:**

- i. Upon completion of the topic the student shall be able to understand the need, procedure for assessing the quality of tablets and capsules.
- ii. Upon completion of the topic the student shall be able to understand the need, procedure for evaluation of solutions, suspensions and emulsions.
- iii. Upon completion of the topic the student shall be able to understand the need, procedure for performing the quality control tests for sterile products.
- iv. Upon completion of the topic the student shall be able to understand the procedure for assessing the quality of topical preparations and aerosols.



- v. Upon completion of the topic the student shall be able to understand the procedure for evaluating the quality of. Suppositories, Pessaries and Oral controlled release dosage forms

### **CH 409 (C) PETROLEUM REFINING**

#### ***Course Outcomes:***

- i. Able to the overall scenario of quality of crude oil.
- ii. Able to calculatedifferent Petroleum Products and their specifications.
- iii. Able to know the different processes involving for up gradation of petroleum fractions.
- iv. Able to do Thermal & Catalytic cracking processes.
- v. Able to do quality estimation, adopt different storage methods and transportation methods.

### **CH 409(D) – ADVANCED SEPARATION TECHNIQUES**

#### ***Course Outcomes:***

- i. An ability to extract the solutes with supercritical fluid extraction.
- ii. An ability to identify and understand the membrane technology applications for energy efficient and environmental friendly operations.
- iii. An ability to select the right material and membrane structure according to the properties of the involved compounds.
- iv. An ability to understand the membrane technology to use according to the characteristics of the species to be separated.
- v. An ability to evaluate the flux and concentration modulei for membrane separation techniques.

### **Elective –VI**

#### **CH 410 (A) MICROPROCESSORS AND APPLICATIONS**

#### ***Course Outcomes:***

At the end of the course, the students will be able to:

- i. Understand basic concepts on microprocessors and microcomputers and to use 8086 microprocessor addressing modes, registers and instruction sets.
- ii. Debug their assembly language programs through different programs.
- iii. Understand Digital Interfacing, Analog interfacing with 8086.
- iv. Understand the architecture of 8051, addressing modes of 8051.
- v. Understand about A/D and D/A convertors.

#### **CH 410 (B) VALIDATION AND DOCUMENTATION OF PHARMACEUTICALS**

#### ***Course Outcomes:***

- i. Role and Responsibility of Validation team Significance of Distilled water and Water for Injection
- ii. Timely Calibration and avoiding the occurrence of deviations in Measurements
- iii. Timely Calibration and avoiding the occurrence of deviations in Measurements Giving Assurance to a marketed formulation
- iv. Acquiring International Trade and Avoiding Duplicate testing Make sure that Internal Systems are ready to face Regulatory Audits

- v. Overcome the inappropriate sampling Establishing the GMP and GLP Principle in most sophisticated way and simplified form

### **CH 410(C) PETROCHEMICAL TECHNOLOGY**

#### ***Course Outcome:***

- i. Able to know Petrochemical industry-Feedstock, various important Chemicals produced from methane, ethane, ethylene.
- ii. Able to produce different petrochemicals from C<sub>3</sub>, C<sub>4</sub> and higher carbon atoms, polymerization and production of various polymers.
- iii. Able to produce different petroleum aromatics.
- iv. Able to produce different intermediate chemicals, synthetic fibers.
- v. Able to classify the synthetic detergents and production of Synthetic detergents.

### **CH 410 (D) BIO-CHEMICAL ENGINEERING**

#### ***Course Outcomes:***

- i. To understand and use the basic principles of biology and biochemistry to successfully design and operate a biochemical process.
- ii. To derive the kinetic expression for the rates of enzyme catalysed reactions.
- iii. To understand the factors effecting cell growth and to design and operate various bioreactors.
- iv. To implement fermentation technology and sterilization techniques
- v. To apply various unit operations and unit processes for carrying out downstream processing

### **CH 454 COMPUTER AIDED PROCESS EQUIPMENT DESIGN LABORATORY**

### **CH 455 PROJECT WORK**

#### ***Course Outcomes***

- i. Ability to analyze and improve a chemical process or a chemical plant.
- ii. Ability to provide alternative methods to reduce energy requirements and raw material requirement.
- iii. Ability to design a virtual chemical plant using computer software.
- iv. Ability to create a comprehensive technical report and present it.

## COURSE OBJECTIVES AND COURSE OUTCOMES (R16 Regulation)

Year & Semester	Course Code & Name	Course Outcomes
I Year I Semester	CE 101 Differential Equations	On completion of this course, students will be able to: <ol style="list-style-type: none"> <li>1 Understand methods of solving first order differential equations.</li> <li>2 Understand some physical applications of first order differential equations.</li> <li>3 To solve higher order differential equations</li> <li>4 To solve partial differential equations</li> <li>5 To understand Laplace transforms</li> </ol>
I Year I Semester	CE 102 Engineering Physics	After successful completion of the course, the students are able to <ol style="list-style-type: none"> <li>1 Understand the concepts of Ultrasonic waves, production and applications in NDT.</li> <li>2 Understand the interference in thin films and its application, Concept of diffraction and grating, birefringence and production and detection of different polarized lights.</li> <li>3 Acquire Knowledge on basics of lasers, holography, fibers and their applications.</li> <li>4 Understand Schrodinger wave equation and its applications in 1-D with respect to the domain of quantum world</li> <li>5 Describe the nature of electromagnetic radiation and matter in terms of the particles</li> </ol>
I Year I Semester	CE 103 Applied Chemistry	<ol style="list-style-type: none"> <li>1 Students acquire knowledge on quality and utility of water in industries.</li> <li>2 Students gain knowledge on water treatment for drinking purpose.</li> <li>3 Able to understand functioning of electrochemical energy systems.</li> <li>4 Students can relate corrosion and environment and suggest methods to prevent corrosion.</li> <li>5 Can analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry</li> </ol>
I Year I Semester	CE104 English for	At the end of the course, the student will be able to: <ol style="list-style-type: none"> <li>1 Use vocabulary contextually.</li> <li>2 Compose effectively the various forms of professional communication.</li> </ol>

	Communication	<ul style="list-style-type: none"> <li>3 Apply grammar rules efficiently in spoken and written forms.</li> <li>4 Understand and overcome the barriers in communication.</li> </ul> <p>Develop professional writing</p>
I Year I Semester	CE 105 Problem solving with C	<p>At the end of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>1. Develop algorithms and flow charts for simple problems.</li> <li>2. Use suitable control structures for developing code in C.</li> <li>3. Design modular programs using the concepts of functions and arrays.</li> <li>4. Design well-structured programs using the concepts of structures and pointers.</li> <li>5. Develop code for complex applications using file handling features</li> </ul>
I Year I Semester	CE 106 Engineering Mechanics	<p>At the end of this course, the student should be able to :</p> <ul style="list-style-type: none"> <li>1 Construct free body diagrams and use appropriate equilibrium equations</li> <li>2 Calculate unknown forces in a plane by resolution of force and equilibrium equations</li> <li>3 Locate Centroid of composite figures and determine moment of inertia of material bodies, plane figures</li> <li>4 Determine the axial forces in the members of determinate truss.</li> <li>5 Analyze the systems with friction.</li> <li>6 Calculate unknown forces using virtual work equation</li> <li>7 Determine forces in space using equilibrium equations</li> </ul>
I Year I Semester	CE 151 Engineering Chemistry Lab	<ul style="list-style-type: none"> <li>1. Students acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.</li> <li>2. Students can prepare solutions with different concentrations.</li> <li>3. Students can analyze water for its hardness, alkalinity, chloride ion content, iron content.</li> <li>4. Students understand the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments</li> </ul>

<p>I Year I Semester</p>	<p>CE 152 C- Programming Lab</p>	<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> <li>1. Write simple programs using C fundamentals and control statements.</li> <li>2. Develop various menu driven programs using concepts of control statements, arrays, functions and pointers.</li> <li>3. Use dynamic memory allocation for efficient memory management.</li> <li>4. Design well-structured programs using the concepts of structures, unions and file handling features.</li> <li>5. Design applications using C</li> </ol>
<p>I Year I Semester</p>	<p>CE 153 Engineering Graphics Lab</p>	<p>On completion of the course, students will</p> <ol style="list-style-type: none"> <li>1 Acquire basic skills in technical graphic communication and also get thorough knowledge of various geometrical elements used in Engineering practice.</li> <li>2 Be able to use the instruments required for Drawing.</li> <li>3 Be able to dimension, print letters which can be understood globally.</li> <li>4 Gather good knowledge in various kinds of scales and their practical usage.</li> <li>5 Understand the Projections of points, lines and planes and their representation and dimensioning.</li> </ol>
<p>I Year II Semester</p>	<p>CE 107 Calculus</p>	<p>On completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1 Understand the basic linear algebraic concepts.</li> <li>2 To evaluate double, triple integrals and the area, volume by double &amp; triple integrals respectively.</li> <li>3 To solve gradient, divergence, curl and integration of vector function problems.</li> <li>4 Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.</li> <li>5 Find singularities of complex functions and determine the values of integrals using residues</li> </ol>

I Year II Semester	CE 108 Physics of Materials	<ol style="list-style-type: none"> <li>1 Characterization of materials and introduction to advanced materials to present technologies.</li> <li>2 Acquire knowledge on properties of solids, fluids &amp; nano, composite materials and their applications.</li> <li>3 To know the concepts of rotational motion, principles &amp; moment of inertia.</li> <li>4 To understand the modern engineering materials (shape memory &amp; ceramic materials) and their applications</li> </ol>
I Year II Semester	CE 109 Chemistry of Engg. Materials	<ol style="list-style-type: none"> <li>1. Students know the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.</li> <li>2. Students would be able to know usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.</li> <li>3. Would acquire knowledge on composition, quality and uses of various fuels.</li> <li>4. Would be capable of selecting appropriate lubricant for a given system, and know the characteristics and utility of refractories.</li> <li>5. Students acquire knowledge on the requirements, applications of liquid crystals and explosives</li> </ol>
I Year II Semester	CE 110 Environmental Studies	<p>After successful completion of the course, the students are able to</p> <ol style="list-style-type: none"> <li>1. Define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.</li> <li>2. Describe and discuss the environmental implications of biologically important materials through the ecosystems.</li> <li>3. Describe and discuss the environmental pollution implications and watershed management.</li> <li>4. Discuss the benefits of sustaining each of the following resources - food, health, habitats, energy, water, air, soil and minerals.</li> <li>5. Understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies</li> </ol>

I Year II Semester	CE 111 Engineering Drawing	On completion of the course the students will: <ol style="list-style-type: none"> <li>1. Be able to visualize and communicate with two dimensional as well as three dimensional shapes.</li> <li>2. Understand the application of industry standards and best practices applied in Engineering drawing.</li> <li>3. Be able to apply the knowledge of development of surfaces in real life situations.</li> <li>4. Get insight into the concepts of projection, representation and dimensioning of three dimensional objects like Prisms, Cylinders, Pyramids, Cones.</li> <li>5. Thoroughly understand the concept of isometric &amp; orthographic projections which will be useful for the visualization of any object. This subject also paves the way for learning Auto Cad and advanced software packages</li> </ol>
I Year II Semester	CE 112 Solid Mechanics I	At the end of this course, the student should be able to <ol style="list-style-type: none"> <li>1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.</li> <li>2. Draw bending moment and shearing force diagrams for beams. □</li> <li>3. Design simple bars, beams, and circular shafts for allowable stresses and loads.</li> <li>4. Understand the concept of shear flow in sections.</li> <li>5. Understands the core and kernel of the section</li> </ol>
I Year II Semester	CE 154 Physics Lab	<ol style="list-style-type: none"> <li>1. Use CRO, signal generator, spectrometer for making measurements.</li> <li>2. Test the optical components using principles of interference &amp; diffraction.</li> <li>3. Determination of the selectivity parameter in electrical circuits.</li> </ol>
I Year II Semester	CE 155 English Communication	At the end of the course the students will be able to: <ol style="list-style-type: none"> <li>1. Know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and</li> </ol>

	Skills Lab	<p>neutral accent of English.</p> <ol style="list-style-type: none"> <li>2. Employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.</li> <li>3. Use confidently phrases and idioms for effective communication.</li> <li>4. Develop appropriate speech dynamics in professional situations.</li> <li>5. Focus on communication skills and social graces necessary for effective communication</li> </ol>
I Year II Semester	CE 156 Workshop Practice Lab	<ol style="list-style-type: none"> <li>1 To familiarize with_ The Basics of tools and equipment used in Carpentry, Tin Smithy,</li> <li>2 Welding and House Wiring.</li> <li>3 The production of simple models in the above four trades</li> </ol>
II Year I Semester	CE 201 Computational Techniques & Statistical Methods	<p>On completion of this course, students will be able to :</p> <ol style="list-style-type: none"> <li>1. Find Fourier series.</li> <li>2. Find numerical solution of ordinary differential equations.</li> <li>3. Evaluate integrals using numerical techniques.</li> <li>4. Apply knowledge of distribution theory to various data.</li> <li>5. Test hypotheses and draw inference for engineering problems</li> </ol>
II Year I Semester	CE 202 Surveying I	<p>By the end of the course surveying-I, the students will be able to</p> <ol style="list-style-type: none"> <li>1. To determine the relative positions of a point on the existing ground by conducting the survey.</li> <li>2. To take the levels of existing ground and to determine the reduced levels.</li> <li>3. To minimize the errors while taking measurements.</li> <li>4. To gain knowledge about traversing and various methods of adjustments.</li> <li>5. To know about difficulties in leveling</li> </ol>
II Year I Semester	CE 203 Fluid Mechanics	<p>By the end of the course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand properties of fluids and pressure measurement.</li> <li>2. Calculate the hydrostatic forces on plane &amp; curved surfaces and Analyze the stability of</li> </ol>



		<p>submerged and floating bodies.</p> <ol style="list-style-type: none"> <li>3. Determine the variation of pressure and velocity in a flow field and force on pipe bends.</li> <li>4. Determine the discharge by using various flow measuring devices.</li> <li>5. Calculate the head loss, power loss and discharge in laminar &amp; turbulent flow through pipes</li> </ol>
<p>II Year I Semester</p>	<p>CE 204  Solid Mechanics II</p>	<p>At the end of this course, the student should be able to</p> <ol style="list-style-type: none"> <li>1. Understand and application to several number of stresses on a plane.</li> <li>2. Understand problems on columns.</li> <li>3. Apply mathematics to deflection of beams along with other methods of finding the deflections of beams.</li> <li>4. Analyze determinate arches subjected to different loading which in turn helps them to resolve forces of certain type of circular and arched structures.</li> <li>5. Draw influence line diagrams for Determinate Beams, simple trusses and three-hinged arches</li> </ol>
<p>II Year I Semester</p>	<p>CE 205  Building Materials, Planning &amp; Construction</p>	<p>After successful completion of the course, the students</p> <ol style="list-style-type: none"> <li>1. Students are familiar with various building materials</li> <li>2. Students are familiar with types of masonry works and bonds used in construction</li> <li>3. Students will have knowledge regarding acoustics of building</li> <li>4. Students are capable of understanding building plan and have knowledge about building rules, bye-laws and building elements</li> <li>5. Students will have knowledge about the form work, scaffolding and shoring</li> </ol>
<p>II Year I Semester</p>	<p>CE 206  Engineering Geology</p>	<ol style="list-style-type: none"> <li>1. Students able to understand the importance of geology in civil engineering</li> <li>2. Students are familiar with identifying the geological process of the region related to the civil engineering works</li> <li>3. Students are able to evaluate the formation and properties of the minerals , rocks and soil</li> <li>4. Develops the ability to understand the site</li> </ol>

		<p>and solutions for different geological problems.</p> <p>5. Will be able to know that GIS &amp; RS can be used for managing resources and solving the problems</p>
<p>II Year I Semester</p>	<p>CE251 Material Testing Laboratory</p>	<p>By the end of this course students will have the capability/knowledge of</p> <ol style="list-style-type: none"> <li>1. Behavior of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending</li> <li>2. Finding properties of materials like young's modulus, modulus of rigidity, hardness, impact resistance</li> <li>3. Determining the strength properties of concrete</li> <li>4. Determinining the percentage of water absorption of bricks</li> </ol>
<p>II Year I Semester</p>	<p>CE252 Building Drawing Laboratory</p>	<p>By the end of this course students will have the capability/knowledge of</p> <ol style="list-style-type: none"> <li>1. Basic Auto CAD commands.</li> <li>2. Various conventional signs, symbols of materials and building services.</li> <li>3. Drawing plan, section and elevations of buildings and various building components.</li> <li>4. Basics of creating 3D building model and rendering the mode</li> </ol>
<p>II Year I Semester</p>	<p>CE253 Surveying Field Work-I Laboratory</p>	<p>By the end of the course the students will be able</p> <ol style="list-style-type: none"> <li>1 To perform basic field surveys.</li> <li>2 To prepare a plan of residential building by making use of a chain and compass.</li> <li>3 To gain excellence in using Auto level, theodolite instruments.</li> <li>4 To take the levels of existing ground &amp; prepare a contour plan.</li> <li>5 To prepare the plan or map showing the ground features from the data obtained by surveying</li> </ol>
<p>II Year II Semester</p>	<p>CE 207 Professional Ethics &amp; Human Values</p>	<p>After successful completion of the course, the students are able to</p> <ol style="list-style-type: none"> <li>1. Comprehend a specific set of behaviours and values the professional interpreter must know and must abide by, including confidentiality, honesty and integrity.</li> <li>2. Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.</li> </ol>

		<ol style="list-style-type: none"> <li>3. Understand the moral requirements of engineering experiments, and have the ability to apply their knowledge to the solution of practical and useful problems;</li> <li>4. Understand Lack of communication, prejudice in not asking for clarification, fear of law and plain neglect will lead to the occurrence of many repetitions of past mistakes.</li> <li>5. Know and respect existing laws pertaining to professional work. The students can speak out against abuses in these areas affecting the public interest</li> </ol>
II Year II Semester	CE 208 Surveying II	<p>By the end of the course, the students will be able</p> <ol style="list-style-type: none"> <li>1. To know about the latest Surveying Instruments.</li> <li>2. He gains enough knowledge about tachometric survey.</li> <li>3. To find out the reduced level of different structures when base is inaccessible and accessible.</li> <li>4. To design and layout curves for a roads and railways.</li> <li>5. To layout or to mark the positions of the proposed structures on the ground</li> </ol>
II Year II Semester	CE209 Hydraulics & Hydraulic Machines	<p>By the end of the course, the student will be able to</p> <ol style="list-style-type: none"> <li>1. Analyze and design open channel</li> <li>2. Analyze GVF problems.</li> <li>3. Determine the relation between sequent depths and energy loss in hydraulic jump.</li> <li>4. Obtain dimension less numbers and construct models using similarity laws.</li> <li>5. Apply momentum principle in the analysis of flow through turbines and pumps</li> </ol>
II Year II Semester	CE 210 Structural Analysis I	<p>At the end of this course, the student are able to</p> <ol style="list-style-type: none"> <li>1. Analyze the statically indeterminate structures like fixed beams, continuous beams, two hinged arches and influence lines for continuous members</li> <li>2. Calculate the forces in arches, cables with different end conditions of the structure subjected to different loading which in turn helps them to resolve forces of certain type of parabolic and circular arched structures</li> <li>3. Formulate questions and develop analytical answers for analysis of structures, and solve</li> </ol>

		<p>broad- based structural analysis problems.</p> <ol style="list-style-type: none"> <li>4. Make qualitatively correct sketches of Shear force and bending moment diagrams, Deflections for beams and frames.</li> <li>5. Students will learn to analyze multistoried frames by using portal and cantilever methods</li> </ol>
<p>II Year II Semester</p>	<p>CE 211 Environmental Engineering I</p>	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Determine the future population at the end of design period and select a suitable water supply source to satisfy present and future water demands.</li> <li>2. Conduct tests on physical, chemical and biological characteristics of water and to ascertain the suitability of water for drinking purpose based on water quality standards.</li> <li>3. Design various water treatment facilities and select a suitable method of disinfection.</li> <li>4. Suggest suitable treatment method for the removal of hardness, salinity, excess fluorides and colour, odour and taste.</li> <li>5. Analyse complex water distribution networks</li> </ol>
<p>II Year II Semester</p>	<p>CE 212 Concrete Technology</p>	<p>Going through the course,</p> <ol style="list-style-type: none"> <li>1. Students are familiar with the properties of materials used for concrete production</li> <li>2. Students will have knowledge about the behaviour of the concrete during fresh and hardened state</li> <li>3. Students are capable of designing the concrete mix as per IS:10262 code</li> <li>4. Students will have knowledge in special concretes using different admixtures and construction chemicals</li> <li>5. Students are familiar with the problems associated with concrete during its life time</li> </ol>
<p>II Year II Semester</p>	<p>CE 254 Concrete Technology Laboratory</p>	<p>By the end of this course students will have the capability/knowledge of</p> <ol style="list-style-type: none"> <li>1. Behavior of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending</li> <li>2. Finding properties of materials like young's modulus, modulus of rigidity, hardness, impact resistance</li> <li>3. Finding the quality of cement</li> <li>4. fresh concrete workability properties to judge the suitability of concrete for the field</li> </ol>

		<p>conditions</p> <ol style="list-style-type: none"> <li>Physical properties of concrete making materials like cement, fine aggregate and coarse aggregate to judge suitability for making concrete</li> <li>Know the quality of concrete i.e compressive, tensile strength of concrete and also by using non destructive testing methods.</li> </ol>
II Year II Semester	CE 255 Hydraulics & Hydraulic Machines Laboratory	<p>By the end of the course the students will be able</p> <ol style="list-style-type: none"> <li>To understand the determination of discharge for hydraulic equipments.</li> <li>To understand the minor and major losses in pipes.</li> <li>To understand the performance of turbines and pumps with varying speed</li> </ol>
II Year II Semester	CE 256 Environmental Engineering Laboratory	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>Conduct tests for physical, chemical, biological quality of water/sew-age.</li> <li>Use the instruments with appropriate precautions to obtain maximum precision in the readings.</li> <li>Conduct jar test to determine the exact quantity of alum needed at treatment plant based on the turbidity of the given sample.</li> <li>Ascertain whether the given water sample contain pathogens or not.</li> <li>Conclude whether the given water is fit for drinking or not by comparing the quality parameters with BIS standards (IS 10500 - 1991</li> <li>Decide whether the given sewage can be directly disposed off into a stream or to be treated.</li> </ol>
III Year I Semester	CE 301 Geotechnical Engineering -I	<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>Understand index properties of soils</li> <li>Classify the soil.</li> <li>Assess engineering properties of soils like permeability,</li> <li>Compaction, consolidation, shears strength and their importance.</li> <li>Calculate vertical stresses increase due to applied loads, useful to determine settlement of structures</li> </ol>
III Year	CE 302	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>Compute rainfall, runoff and peak flood</li> </ol>

I Semester	Water Resources Engineering I	<p>discharge over a basin.</p> <ol style="list-style-type: none"> <li>2. Measure stream flow by different methods.</li> <li>3. Determine the discharge from tube wells and open wells.</li> <li>4. Estimate crop water requirement and irrigation scheduling.</li> <li>5. Design lined and unlined canals.</li> <li>6. Suggest suitable methods to control water logging of irrigation lands</li> </ol>
III Year I Semester	CE 303 Railway, Airport & Harbour Engineering	<ol style="list-style-type: none"> <li>1. An ability to understand the importance of railway sector</li> <li>2. An ability to judge and select proper material and component for a railway track and to understand and design various component of a track.</li> <li>3. For basic knowledge of a railway station.</li> <li>4. Better planning of various amenities of an airport and planning and also serves as a basic for air port pavement design and runway design.</li> <li>5. Creates a basic introduction of various features of a harbor and a port to enable for proper design and maintenance of various amenities</li> </ol>
III Year I Semester	CE 304 Design of Concrete Structures I	<p>At the end of the course students shall be able to</p> <ol style="list-style-type: none"> <li>1. Design the beams for flexure in both limit state and working stress method.</li> <li>2. Design the beams for shear and torsion.</li> <li>3. Design of slabs for different types of support conditions.</li> <li>4. Design for columns in limit state method using SP-16</li> <li>5. IS and ACI Standards of approach can be viewed by the student</li> </ol>
III Year I Semester	CE 305 Design of Steel Structures I	<ol style="list-style-type: none"> <li>1. Learn the basic elements of a steel structure</li> <li>2. Learn the fundamentals of structural steel fasteners</li> <li>3. Able to design basic elements of steel structure like tension members, compression members, beams and beam-columns</li> <li>4. Able to design column splices and bases</li> </ol>
III Year I Semester	CE 306 Structural Analysis II	<p>At the end of this course, the student should be able to</p> <ol style="list-style-type: none"> <li>1. Analyze the structures like continuous beams and single bay, storey rigid jointed frames for internal forces using stiffness and flexibility</li> </ol>

		<p>matrix methods. □</p> <ol style="list-style-type: none"> <li>2. Develop a computer program by various software's .</li> <li>3. Behavior of structures beyond yield load, finding shape factors, length of plastic hinge.</li> <li>4. Collapse load analysis □</li> <li>5. Know evaluation of element stiffness matrices and element load vectors for one- and two- dimensional problems of elasticity</li> <li>6. Can obtain global stiffness matrix and nodal load vector</li> </ol>
III Year I Semester	CE 351 Surveying Field Work – II Laboratory	<p>By the end of the course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Gain required excellence in using the Total Station Instrument by avoiding manual errors.</li> <li>2. Every student can meet the requirement of knowing the Total Station instrument which is vital for any construction firm.</li> <li>3. Students can make accurate designs and set out a simple circular curve for roads.</li> <li>4. Not only he/she can work out the experiments inside the institution but also they are trained for the on-site works outside the institution</li> </ol>
III Year I Semester	CE 352 Geotechnical Engineering Laboratory	<p>Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Classify the soil.</li> <li>2. Based on classification plan for suitability of soil for various civil engineering projects.</li> <li>3. Determine engineering properties of soils which are required design of retaining walls, foundations, checking settlements and stability of slopes.</li> </ol>
III Year I Semester	CE 353 Engineering Geology Laboratory	<ol style="list-style-type: none"> <li>1. Students able to understand the importance of geology in civil engineering</li> <li>2. Students are familiar with identifying the geological process of the region related to the civil engineering works</li> <li>3. Students are able to evaluate the formation and properties of the minerals , rocks and soil</li> <li>4. Develops the ability to prepare the geological section and maps and interpret the site conditions</li> </ol>
III Year II Semester	CE 307 Geotechnical Engineering	<ol style="list-style-type: none"> <li>1. Equip the student with knowledge of how to explore the soil,</li> <li>2. Calculation of earth pressures to design retaining walls</li> </ol>

	II	<ol style="list-style-type: none"> <li>3. Checking stability of slopes</li> <li>4. Determination of Allowable bearing pressure so as to determine dimensions of the footings.</li> <li>5. Selection of pile and its capacity</li> </ol>
III Year II Semester	CE 308 Water Resources Engineering II	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Calculate the storage capacity of a reservoir and estimate the life of a reservoir.</li> <li>2. Analyse stability of gravity dam and obtain section of an earth dam based on the locally available materials.</li> <li>3. Suggest a suitable spillway at a dam site and understand the criteria for design of stilling basin for energy dissipation under spillway.</li> <li>4. Design weirs on permeable foundations based on Bligh's creep theory and Khosla's theory.</li> <li>5. Understand the functions and suitable locations of canal outlets, canal falls, canal regulators and cross drainage works.</li> <li>6. Understand the functions of component parts of a hydro electric power scheme and determine load, capacity, and utilization factors for a hydel project</li> </ol>
III Year II Semester	CE 309 Highway Engineering	<ol style="list-style-type: none"> <li>1. For proper planning of a road network by linking of various surveys and to evaluate and develop master plans for a better road network.</li> <li>2. Selecting the appropriate materials for use in different road layers for different types of pavements.</li> <li>3. Perform road pavement design and analysis by various IRC and other methods.</li> <li>4. Interpret geometric design fundamentals, in relation to safety and driver comfort, focusing on horizontal and vertical alignment.</li> <li>5. An ability to develop traffic signals and help to properly regulate the traffic and better use of road network</li> </ol>
III Year II Semester	CE 310 Design of Steel Structures	<p>On completion of the course, the student will able to</p> <ol style="list-style-type: none"> <li>1. Learn the design of welded plate girder and gantry girder</li> <li>2. Able to design welded and bolted</li> </ol>



	II	connections 3. Able to design roof trusses 4. Learn the design of light gauge sections 5. Able to design concrete composite beams
III Year II Semester	CE 311 Environmental Engineering II	At the end of the course the student will be able to: 1. Determine the quantity of drainage and sewage and design sewers along with suitable location of various sewer appurtenances 2. Ascertain the quality and characteristics of wastewater. 3. Design various primary treatment units, biological treatment units. 4. Design anaerobic digester for primary and secondary sludge and to select suitable method for disposal of wet or conditioned sludge 5. Plan plumbing system for various types of residential buildings 6. Design septic tanks and its effluent disposal methods understand the biogas production concepts
III Year II Semester	CE 312 Design of Concrete Structures II	1. Students can handle the isolated design of individual elements independently. 2. Indian Standards of approach can be practiced by the student
III Year II Semester	CE 354 Professional Communication Skills Laboratory	At the end of the course the students will be able to: 1. Develop effective communication and presentation skills. 2. Learn corporate etiquette - organizing and managing professional events. 3. Understands how reading enhances their communicative competency. 4. Conduct effective correspondence and prepare reports which produce results. 5. Develop all-round personalities with a mature outlook to function effectively in different circumstances. 6. Know his/her skills and abilities for better career plans
III Year II Semester	CE 355 Computer Programming in Civil Engineering	By the end of this course students will have the capability/knowledge of 1. 1 Writing programmes for design of various structural elements like beams, steel structural connections, slab base, open

	Laboratory	<p>channel etc using C or C++ programming languages</p> <ol style="list-style-type: none"> <li>2. Writing programmes for determining various properties of soils using C or C++ programming languages</li> <li>3. Writing programmes for solving different problems in surveying</li> </ol>
III Year II Semester	CE 356 Highway Engineering Laboratory	<p>At the end of the laboratory course every student</p> <ol style="list-style-type: none"> <li>1. Know the important parameters for selection of aggregate for different construction components</li> <li>2. Student can evaluate and conduct the required tests on the given aggregate and propose the suitable inference</li> <li>3. Student can evaluate the grade of bitumen by conducting the required tests and propose it for suitable region and place of pavement construction</li> </ol>
IV Year I Semester	CE 401 Bridge Engineering	<ol style="list-style-type: none"> <li>1. Learn about the various investigations to be conducted before constructing a bridge</li> <li>2. Know about various types of RC bridges and IRC loadings</li> <li>3. Able to design slab culvert and T-beam bridge</li> <li>4. Able to design substructure like piers and abutments</li> <li>5. Know various types of bearings and able to design elastomeric bearing</li> <li>6. Know the various types foundations used for bridges and able to design well foundation</li> </ol>
IV Year I Semester	CE 402 Quantity Survey	<p>By the end of this course students will have the capability/knowledge of</p> <ol style="list-style-type: none"> <li>1. Estimating quantities required for different civil engineering works like single storey residential building, BT road, canal etc.</li> <li>2. Cost estimation of different civil engineering works like single storey residential building, BT road, canal etc.</li> <li>3. finding the unit rate of different items of work</li> <li>4. prepare schedule of reinforcement bars</li> <li>5. preparing tender notice and various approvals needed for a project</li> </ol>

		6. Valuation of building and rent fixation
IV Year I Semester	CE 405/A Economics & Management Accounting for Engineers	<ol style="list-style-type: none"> <li>1. The course helps the students to understand the decision making objective of a firm.</li> <li>2. The course helps the students to get knowledge about overall functions of Demand, Supply, Price, Income of the firms.</li> <li>3. The course helps the students to get knowledge about how to use Accounting and Financial concepts in the changing society.</li> <li>4. The course helps to linkage various cost concepts and to understand how to maintain break even scenario for a business.</li> <li>5. The course helps the students to know the overview of Liberalization, Privatization and Globalization and the impact of them on economy</li> </ol>
IV Year I Semester	CE 405/B Advanced Surveying	<ol style="list-style-type: none"> <li>1. Students will be Familiar with Photogrammetry by overlapping Aerial Photographs.</li> <li>2. Understand the importance of Remote sensing and GIS application in civil engineering.</li> <li>3. Students can layout Triangulation figures for large countries</li> </ol>
IV Year I Semester	CE 405/C Remote Sensing & GIS	<p>At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves</li> <li>2. Apply the concepts of satellite and sensor parameters and characteristics of different platforms</li> <li>3. Compute an image visually and digitally with digital image processing techniques.</li> <li>4. Analyze raster and vector data and modelling in GIS</li> <li>5. Understand the importance of remote sensing and GIS application in civil engineering</li> </ol>
IV Year I Semester	CE 405/D Environmental Impact Analysis	<p>At the end of the course the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Review the key concepts of environmental impact assessment and the current legislation covering it</li> <li>2. Understand the Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna and Socio Economics</li> <li>3. Plan options for mitigation of adverse impact</li> </ol>

		<p>on environment</p> <ol style="list-style-type: none"> <li>4. Present and explain the components and decision making processes involved in environmental assessment through various case studies.</li> <li>5. Prepare Environmental Audit report</li> </ol>
IV Year I Semester	CE 406/A Prestressed Concrete	<ol style="list-style-type: none"> <li>1. Learn the basic concept of pre-stressing of concrete and various pre-stressing systems</li> <li>2. Able to analyse and design pre-stressed concrete beams</li> <li>3. Able to estimate the losses in pre-stressing</li> <li>4. Able to design pre-stressed concrete beams including the end block</li> </ol>
IV Year I Semester	CE 406/B Water Resources System Analysis	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand concept of systems approach to water resources planning and management.</li> <li>2. Formulate and solve LP models various water resources optimization problems.</li> <li>3. Develop and solve forward and backward recursive dynamic programming models.</li> <li>4. Apply simulation techniques in water resources problems</li> <li>5. Plan for optimal operation of a single reservoir system.</li> <li>6. Able to develop models for allocation of water resource for optimal crop yields</li> </ol>
IV Year I Semester	CE 406/C Urban Transport Planning	<p>Student will be able to</p> <ol style="list-style-type: none"> <li>1. Validate and source of information that comes from a sequence of travel.</li> <li>2. Forecast models.</li> <li>3. Knowledge of data required for transportation planning.</li> <li>4. Able to make tradeoffs with multiple factors in project planning and design.</li> </ol>
IV Year I Semester	CE 406/D Ground Water Development Management	<p>The student will be able to</p> <ol style="list-style-type: none"> <li>1. Understand the location of ground water and the relationship with the rock type.</li> <li>2. Assess the ground water movement and reservoir parameters</li> <li>3. Use of the different techniques of ground water investigation</li> <li>4. Apply RS &amp; GIS techniques for artificial recharge of groundwater.</li> <li>5. Apply conjunctive use technique for effective management of groundwater</li> </ol>

IV Year I Semester	CE 451 Project Stage I	<ol style="list-style-type: none"> <li>1. Collect and study the literature in the identified area of project work</li> <li>2. Arrive at problem which can be carried out as project work</li> <li>3. Selects a method to solve the problem</li> <li>4. Give a seminar talk</li> </ol>
IV Year I Semester	CE 452 Quantity Surveying & Project Management Laboratory	<p>By the end of this course students will have ability to</p> <ol style="list-style-type: none"> <li>1. Estimate the quantities required for different civil engineering works like single storey residential building, BT road, canal etc.</li> <li>2. Abstract of Cost for different civil engineering works like single storey residential building, BT road, canal etc.</li> <li>3. Prepare schedule of reinforcement bars.</li> <li>4. Scheduling a project □using software packages like Primavera/MS Project etc.</li> <li>5. Analyzing a project and finding critical activities and hence allocate resources as per the schedule.</li> </ol>
IV Year I Semester	CE 453 CAD Lab- Analysis & Design of Structures	<p>By the end of this course students will have the capability/knowledge of</p> <ol style="list-style-type: none"> <li>1. Analysing and designing the structures using computer softwares like STAAD Pro/STRUDS/STRAP/MSEXCEL</li> <li>2. Analysing and designing the structures like beams, frames for different loading combinations of dead, live and earthquake loading using computer software</li> </ol>
IV Year II Semester	CE 407 Construction Technology and Management	<p>Student will be able to :</p> <ol style="list-style-type: none"> <li>1. Planning for any project and its duration.</li> <li>2. Optimization of men, material and project cost.</li> <li>3. Know the importance of machinery and its working conditions.</li> <li>4. Implementation of quality management, safety measures and best utilization of Management</li> <li>5. Information system.</li> <li>6. 5 Assessing project profitability</li> </ol>
IV Year II Semester	CE 408/A Earthquake Resistant Design of Structures	<ol style="list-style-type: none"> <li>1. Learn the fundamentals vibration of single degree freedom systems</li> <li>2. Learn the earthquake ground motion characteristics</li> <li>3. Able to calculate the lateral forces on a building using equivalent static method</li> </ol>

		<ol style="list-style-type: none"> <li>4. Can analyze and design a single storey and single bay RC framed building</li> <li>5. Able to visualize the possible damages in masonry structures and able to strengthen such structures</li> <li>6. Understand the behavior of soil beneath a foundation during an earthquake</li> </ol>
IV Year II Semester	CE 408/B Advanced foundation Engineering	<ol style="list-style-type: none"> <li>1. Equip the student with knowledge of how to determine bearing capacity of shallow foundations in special cases</li> <li>2. Settlement analysis of shallow foundations &amp; assessing allowable bearing capacity of shallow foundations</li> <li>3. Design of sheet pile walls</li> <li>4. Design of coffer dams</li> <li>5. Design of braced cuts</li> </ol>
IV Year II Semester	CE 408/C Disaster Management	<p>On completion of the course, the student will able to</p> <ol style="list-style-type: none"> <li>1. Apply the basic concepts of disaster management</li> <li>2. Analyze and manage disaster situations in India.</li> <li>3. Distinguish problems associated with earthquakes and its effects on urban areas.</li> <li>4. Analyze, manage and communicate information on landslide situations.</li> <li>5. Analyze and manage cyclones in coastal areas</li> </ol>
IV Year II Semester	CE 408/D Fibre Reinforced Concrete	<ol style="list-style-type: none"> <li>1. Understand Interaction between fibres and matrix</li> <li>2. Know basic concepts of fibre reinforced concrete</li> <li>3. Learn mechanical properties of fibre reinforced concrete</li> <li>4. Know the properties of constituent materials</li> <li>5. Learn Mixture Proportioning , Mixing and Casting procedures</li> <li>6. Know Properties of Hardened FRC</li> </ol>
IV Year II Semester	CE 409/A Design & Drawing of Hydraulic Structures	<p>At the end of the course the student will be able to Design and draw the following irrigation structures with the given data:</p> <ol style="list-style-type: none"> <li>1. Irrigation canal</li> <li>2. Notch type canal drop</li> <li>3. Canal regulator</li> <li>4. Vertical drop weir on permeable foundations</li> <li>5. Direct sluice</li> <li>6. Surplus weir of a tank</li> </ol>

		<ul style="list-style-type: none"> <li>7. Type III Aqueduct and</li> <li>8. Ogee spillway profile</li> </ul>
IV Year II Semester	CE 409/B  Pavement Analysis & Design	<p>On completion of the course, the students will be able to:</p> <ul style="list-style-type: none"> <li>1. Identify the pavement components and compare highway and airport pavements</li> <li>2. Calculate and Analyze stresses in flexible and Rigid pavements</li> <li>3. Design the flexible pavement using IRC &amp; AASHO methods</li> <li>4. Design rigid pavements by IRC method and evaluate the pavements</li> </ul>
IV Year II Semester	CE 409/C  Advanced Environmental Engineering	<p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>1. Understand the importance of self-purification and determine the critical D.O. deficit in a polluted stream and degree of treatment required.</li> <li>2. Update his knowledge in biological treatment with new and more advanced treatment methods.</li> <li>3. Suggest suitable methods for treatment and disposal of industrial wastewater of selected industries - Dairy industry, Sugar industry and Pulp &amp; paper industry, based on their characteristics</li> <li>4. Assess global and local implications of air pollution and suggest suitable methods of control of particulate matter and design required stack height based on meteorological conditions.</li> <li>5. Suggest suitable noise control techniques according to the situation and to calculate statistical parameters like <math>L_N</math> and <math>L_{eq}</math>.</li> <li>6. Suggest suitable methods for collection, transport, recovery, reuse and disposal of urban solid waste.</li> </ul>
IV Year II Semester	CE 409/D  Earth Retaining Structures	<ul style="list-style-type: none"> <li>1. Equip the student with knowledge of how to determine lateral earth pressure to design retaining walls</li> <li>2. Design of sheet pile walls</li> <li>3. Design of braced cuts.</li> <li>4. Earth dams stability analysis</li> <li>5. Earth dams protection and construction</li> </ul>
IV Year	CE 410/A  Repair & Rehabilitation of	<p>By the end of this course students will have the capability/knowledge of</p> <ul style="list-style-type: none"> <li>1. Various distress and damages to concrete and</li> </ul>

II Semester	Structures	<ul style="list-style-type: none"> <li>masonry structures</li> <li>2. The importance of maintenance of structures, types and properties of repair materials etc</li> <li>3. Assessing damage to structures and various repair techniques</li> </ul>
IV Year II Semester	CE 410/B Design of Tall Buildings	<p>On completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>1. Assess general considerations and wind effects of tall buildings.</li> <li>2. Analyze and design various lateral systems for steel buildings</li> <li>3. Analyze and design various lateral systems for concrete buildings</li> <li>4. Analyze and design various gravity systems of structural elements</li> <li>5. Implement structural analysis concepts</li> </ul>
IV Year II Semester	CE 410/C Green Buildings	<p>Student will be able to</p> <ul style="list-style-type: none"> <li>1. Describe the green building &amp; sustainable design concepts.</li> <li>2. Comprehend properties of green building construction materials and their qualitative input to design.</li> <li>3. Begin to formulate a personal attitude toward green building design.</li> <li>4. Describe the requirements for LEED</li> </ul>
IV Year II Semester	CE 410/D Ground Improvement Techniques	<ul style="list-style-type: none"> <li>1. Will gain competence in properly devising alternative solutions to difficult and earth construction problems and in evaluating their effectiveness before, during and after construction.</li> <li>2. A study of the many different approaches to the ground modification by Mechanical modification like Dynamic compaction, deep compaction, hydromechanical compaction etc.</li> <li>3. Hydraulic modification like dewatering methods, use of geosynthetics, preloading techniques etc.</li> <li>4. Physical and chemical modification by use of cement, lime, emulsions, industrial wastes etc.</li> <li>5. Modification by inclusions like metallic strips and geotextiles and In-situ Ground reinforcement by ground anchors, rock bolts and soil nailing</li> </ul>
IV Year	CE 454	By the end of this course students will have the capability/knowledge of



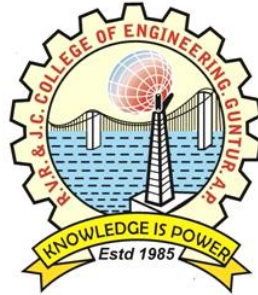
II Semester	Computer Aided Detailing of Structures Laboratory	<ol style="list-style-type: none"> <li>1. Reinforcement and other details of various structural elements like beam, slab, footing, retaining wall etc. Presenting various structural elements details for the purpose of field execution as per code requirements.</li> <li>2. Drawing each and every details of various structural elements using computer software Packages</li> </ol>
IV Year II Semester	CE 455 Project Stage II	<ol style="list-style-type: none"> <li>1. Project work will be carried out</li> <li>2. Appropriate method will be used</li> <li>3. Results will be analyzed and conclusions will be made</li> <li>4. The problem will be designed if it involves design</li> </ol>

# **R. V. R. & J. C. COLLEGE OF ENGINEERING**

(Autonomous)

ACCREDITED BY NBA AND NAAC WITH 'A' GRADE

Chowdavaram, GUNTUR – 522 019



## **COMPUTER SCIENCE & ENGINEERING**

## **I/IV B.Tech I Semester**

### **CS/IT 101 - Differential Equations & Transforms**

#### **Course outcomes:**

1. Understand methods of solving first order differential equations.
2. Able to solve higher order differential equations.
3. Able to solve partial differential equations.
4. Find Fourier transforms.
5. Find Laplace and inverse transforms of a function.

### **CS/CE/ChE/EC/EE/IT/ME 102 Engineering Physics**

#### **Course Outcomes:**

1. Describe the concepts of Ultrasonic waves, production and applications in NDT.
2. Explain the interference in thin films and its application, concept of diffraction and grating, birefringence and production and detection of different polarized lights.
3. Explain the basics of lasers, holography, fibers and their applications.
4. Discuss Schrodinger wave equation and its applications in 1-D with respect to the domain of quantum world.
5. Describe the nature of electromagnetic radiation and matter in terms of the particles.

### **CS/CE/EC/EE/IT/ME 103 Applied Chemistry**

#### **Course Outcomes:**

1. Describe the quality and utility of water in industries.
2. Explain water treatment for drinking purpose.
3. Explain functioning of electrochemical energy systems.
4. Relate corrosion and environment and suggest methods to prevent corrosion.
5. Analyze substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.

### **CS/ChE/EC/IT 104 Environmental Studies**

#### **Course Outcomes:**

1. Define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.
2. Describe and discuss the environmental implications of biologically important materials through the ecosystems.
3. Describe and discuss the environmental pollution implications and watershed management.
4. Discuss the benefits of sustaining each of the following resources - food, health, habitats, energy, water, air, soil and minerals.

5. Understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies.

### **CS/CE/EE/IT/ME 105 Problem Solving with C**

#### **Course Outcomes:**

1. Develop algorithms and flow charts for simple problems.
2. Use suitable control structures for developing code in C.
3. Design modular programs using the concepts of functions and arrays.
4. Design well-structured programs using the concepts of structures and pointers.
5. Develop code for complex applications using file handling features.

### **CS/IT 106 Mechanics for Engineers**

#### **Course Outcomes:**

1. Apply principles of mechanics to determine the resultant of several forces acting on a plane.
2. Determine the axial forces in the members of simple trusses using method of joints.
3. Determine the centroids and center of gravity of mathematically definable areas as well as composite areas of standard geometrical shapes.
4. Analyze the problems involving dry frictional contact and wedge friction
5. Apply dynamic Equilibrium Equation for rigid bodies under rectilinear and curvilinear translation
6. Understand kinematics and kinetics of rotation of a rigid body about a fixed axis.
7. Calculate the moment of inertia of composite areas and material bodies of standard shapes.

### **CS 151 Physics Lab**

#### **Course Outcomes:**

1. Use CRO, signal generator, spectrometer for making measurements.
2. Test the optical components using principles of interference & diffraction.
3. Determine the selectivity parameter in electrical circuits.

### **CS 152 C - Programming Lab**

#### **Course Outcomes:**

1. Write simple programs using C fundamentals and control statements.
2. Implement various menu driven programs using arrays, functions and pointers.
3. Use dynamic memory allocation for efficient memory management.
4. Develop well-structured programs using structures, unions and file handling features.

## **CS 153 Communication Skills Lab**

### **Course Outcomes:**

1. Discuss the IPA phonetics symbols and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.
2. Employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.
3. Use confidently phrases and idioms for effective communication.
4. Develop appropriate speech dynamics in professional situations.
5. Explain the importance of communication skills and social graces for effective communication.

## **I/IV B.Tech II Semester**

### **CS/IT 107 Matrix Algebra & Numerical Analysis**

#### **Course outcomes:**

1. Explain the basic linear algebraic concepts.
2. Evaluate double, triple integrals and the area, volume by double & triple integrals respectively.
3. Solve gradient, divergence, curl and integration of vector function problems.
4. Solve system of equations.
5. Evaluate derivatives and integrals using numerical techniques.

### **CS/ EC/EE/IT 108 Electronic & Electrical Engineering Materials**

#### **Course Outcomes:**

1. Explain the nature of formation of bands in solid and classifying the solids, Importance of Fermi level and law of mass action in semiconductors.
2. Understand theory of P-N junction and the devices.
3. Discuss the importance of polarization and magnetization phenomena and their applications.
4. Describe relevance of superconductivity and its applications.
5. Discuss Nano materials and their characterization principles.

### **CS/CE/EC/EE/IT/ME 109 Chemistry for Engineering Materials**

#### **Course Outcomes:**

1. Explain the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.
2. Describe the usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.
3. Explain composition, quality and uses of various fuels.
4. select appropriate lubricant for a given system, and know the characteristics and utility of refractories.
5. Explain the requirements, applications of liquid crystals and explosives.

## **CS/ChE/EC/IT 110 English for Communication**

### **Course Outcomes:**

1. Use vocabulary contextually.
2. Compose effectively the various forms of professional communication.
3. Apply grammar rules efficiently in spoken and written forms.
4. Discuss and overcome the barriers in communication.
5. Develop professional writing skills.

## **CS/IT 111 Object Oriented Programming**

### **Course Outcomes:**

1. Describe basic Object Oriented features of C++.
2. Apply the concept of encapsulation and compile time polymorphism.
3. Implement the concepts of Inheritance and Runtime polymorphism.
4. Use the concepts of exception handling and Templates.
5. Develop applications using C++ File I/O and other advanced concepts.

## **CS/IT 112 Professional Ethics and Human Values**

### **Course Outcomes:**

1. Comprehend a specific set of behaviors and values the professional interpreter must know and must abide by, including confidentiality, honesty and integrity.
2. Describe how to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
3. Explain the moral requirements of engineering experiments, and apply their knowledge to the solution of practical and useful problems.
4. Describe Lack of communication, prejudice in not asking for clarification, fear of law and plain neglect will lead to the occurrence of many repetitions of past mistakes.
5. Know and respect existing laws pertaining to professional work.

## **CS 154 Chemistry Lab**

### **Course Outcomes:**

1. Explain the knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.
2. Prepare solutions with different concentrations.
3. Analyze water for its hardness, alkalinity, chloride ion content, iron content.
4. Describe the principles behind the development of instruments suitable for chemical analysis.

## **CS 155 Object Oriented Programming Lab**

### **Course Outcomes:**

1. Write programs using basic Object Oriented features of C++.
2. Implement the concepts of Inheritance and Polymorphism.
3. Use the concepts of exception handling and Templates.
4. Develop applications using C++ File I/O and other advanced concepts.

## **CS 156 Engineering Graphics Lab**

### **Course Outcomes:**

1. Explain basic skills in Technical graphic communication.
2. Visualize and communicate with two dimensional as well as three dimensional shapes.
3. Explain the application of Industry standards and best practices applied in Engineering Graphics.
4. Apply the knowledge of development of surfaces in real life situations.
5. Draw simple 2D Engineering Drawings using Auto CAD.

## **II/IV B.Tech – I Semester**

### **CS/IT 201 Probability-Statistics & Random Processes**

#### **Course Outcomes:**

1. Apply knowledge of distribution theory to both software and hardware design problems.
2. Apply various distribution models to design and conduct experiments, as well as to analyze and interpret data.
3. Obtain knowledge to estimate and test different criterion.
4. Test hypotheses and draw inference for engineering problems.
5. Explain various processes and their application in analyzing the data.

### **CS/IT 202 Basic Electrical & Electronics Engineering**

#### **Course Outcomes:**

1. Understand basic elements and laws of electrical circuits.
2. Analyze electrical circuits using different theorems.
3. Know about AC single phase and three phase systems.
4. Know about Various Electronic devices and their operation.
5. Know about Applications of various electronic devices such as Diode and transistor.

### **CS/IT 203 Digital Logic Design**

#### **Course Outcomes**

1. Understand the basic digital logic fundamentals such as numbering system, binary codes.
2. Understand the Boolean algebra concepts which are used to describe mathematical relationship between input and output signals.
3. Understand the design procedure of combinational circuits and design the different types of combinational circuits like Encoders, Decoders, Multiplexers & Demultiplexers.
4. Understand the design procedure of Sequential logic circuits and design the different types of Sequential circuits.
5. Understand the different types of memory elements like RAM, ROM, and PROM.

### **CS/IT 204 Data Structures**

#### **Course Outcomes:**

1. Determine the time complexities of different algorithms.
2. Implement different linked list ADT's and polynomial ADT.
3. Implement stack and its applications.
4. Implement queue ADT and its applications.
5. Analyze different searching, hashing and sorting techniques.
6. Implement various concepts of tree and graph ADT.



## **CS/IT 205 Computer Organization**

### **Course Outcomes:**

1. Explain hardware components and instruction set of a computer system.
2. Demonstrate assembly language programs and instruction execution.
3. Explain the design of control unit and various data transfer schemes.
4. Explain the design of ALU and pipelining operations.
5. Discuss the concepts of memory organization.

## **CS/IT 206\* Discrete Mathematical Structures**

### **Course Outcomes:**

1. Explain set theory notation and fundamentals of first order predicate logic.
2. Apply counting and combinatorics techniques.
3. Solve recurrence relations.
4. Explain Lattice theory concepts.
5. Apply the concepts of graph theory.

## **CS/IT 251 Basic Electrical & Electronics Engineering Lab**

### **Course Outcomes:**

1. Explain working of electronic devices, analyze and design.
2. Calculate parameters from the characteristics like static, dynamic and reverse resistances of PN junction diode.
3. Design Zener voltage regulator to meet the specifications.
4. Verify experimentally popular BJT applications such as Amplification and digital logic.

## **CS 252 Data Structures Lab**

### **Course Outcomes:**

1. Implement linear and non-linear data structures.
2. Choose appropriate data structures for given problem.
3. Develop data structure applications.
4. Implement searching and hashing techniques.
5. Implement different sorting algorithms.

## **CS 253 Professional Communication Skills Lab**

### **Course Outcomes:**

1. Develop effective communication and presentation skills.
2. Practice corporate etiquette - organizing and managing professional events.
3. Describe how reading enhances their communicative competency.
4. Conduct effective correspondence and prepare reports which produce results.
5. Develop all-round personalities with a mature outlook to function effectively in different circumstances.

## II/IV B.Tech - II Semester

### CS/IT 207 Number Theory & Algebra

#### Course Outcomes:

1. Understand the basic number theory concepts.
2. Assess the importance of Congruences and its related theorems.
3. Solve group theoretic problems.
4. Obtain the solution of problems related to polynomial rings and fields.
5. Apply mathematical concepts in relevant engineering applications.

### CS/IT 208 Microprocessors & Interfacing

#### Course Outcomes:

1. Use 8086 microprocessor addressing modes, registers and instruction sets.
2. Debug assembly language programs.
3. Understand the Minimum mode and Maximum mode configurations during Read and Write machine cycles.
4. Understand interrupts and interrupt responses.
5. Understand digital interfacing with 8086.

### CS/IT 209 Theory Of Computation

#### Course Outcomes:

1. Design different types of finite state machines.
2. Transform between equivalent deterministic and Non-deterministic Finite automata, and Regular expressions.
3. Apply pumping lemma for Regular languages and CFL.
4. Construct parse trees for CFG and ambiguous grammars, push-down automata.
5. Design Turing Machines and analyze Undecidability.

### CS/IT 210 Database Management Systems

#### Course Outcomes:

1. Express fundamental concepts of databases.
2. Design relations for Relational databases using conceptual data modelling.
3. Implement formal relational operations in relational algebra and SQL.
4. Apply the normalization process for relational databases.
5. Explain the mechanisms used for the development of multi user database applications.

## **CS/IT 211 Java Programming**

### **Course Outcomes:**

1. Apply the syntax and semantics of java programming language and basic concepts of OOP.
2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
4. Demonstrate how the java program communicates with the console and disk files using the concept of streams.
5. Design event driven GUI and web related applications which mimic the real world scenarios.
6. Develop Interactive programs related to data base connectivity and client server communications.

## **CS/IT 212\* Operating Systems**

### **Course Outcomes:**

1. Describe the structure, operations and services provided by the operating system.
2. Comprehend the features of processes & threads, inter-process communication, multithreading issues and dead lock handling mechanisms.
3. Explain different memory management mechanisms.
4. Explain the function, implementation of I/O, file systems and performance characteristics of mass storage devices.

## **CS 254 Microprocessors & Interfacing Lab**

### **Course Outcomes:**

1. Develop programs on 8086 microprocessor.
2. Interface 8086 microprocessor for various simple applications.

## **CS 255 Database Management Systems Lab**

### **Course Outcomes:**

1. Construct database objects using Structured Query Language.
2. Implement various integrity constraints on database objects.
3. Write both simple and complex SQL queries by utilizing single row and group functions.
4. Develop applications using various features of PL/SQL.

## **CS 256 Java Programming Lab**

### **Course Outcomes:**

1. Develop efficient console applications applying OOP concepts.
2. Develop secure java applications by applying Exception Handling techniques.
3. Demonstrate the use of inter thread communication.
4. Develop interactive programs using awt, swings and event handling techniques.
5. Develop solutions for complex real world problems involving data bases and networking.

## III/IV B.Tech - I Semester

### CS/IT 301 Computer Networks

#### Course Outcomes:

1. Compare ISO reference model with TCP/IP and determine various guided media.
2. Verify the transmission errors using error detection and correction methods.
3. Apply various routing algorithms and compare IPv4.0 and IPv6.0.
4. Contrast various transport layer services and apply different application layer protocols.

### CS/IT 302 Web Technologies

#### Course Outcomes:

1. Create static web pages using XHTML, CSS, and JavaScript.
2. Design dynamic WebPages using client side scripting.
3. Create XML documents and work with web servers to create web applications with ruby on rails platform.
4. Develop server side programs with Java Servlet Technologies.
5. Design Rich Internet Applications with AJAX.

### CS/IT 303 Design & Analysis of Algorithms

#### Course Outcomes:

1. Compute time and space complexity of algorithms.
2. Deduce the recurrence relations that describe the time complexity of recursively-defined algorithms, and solve recurrence relations.
3. Design algorithms using divide and conquer, greedy, and dynamic programming strategies and recite algorithms that employ these strategies.
4. Design algorithms using backtracking and branch and bound strategies and recite algorithms that employ these strategies.
5. Express the fundamental concepts of classification of algorithms.

### CS/IT 304 Unix Programming

#### Course Outcomes:

1. Apply UNIX commands for solving problems.
2. Write shell scripts for solving problems.
3. Develop file and system management applications using UNIX system calls.
4. Implement client/server communication using IPC mechanisms.
5. Implement I/O and memory management programs.

## **CS/IT 305\* Compiler Design**

### **Course Outcomes:**

1. Explain the phases of a compiler.
2. Implement different Parsing mechanisms.
3. Create symbol tables and specify various intermediate code forms for compiler construction
4. Design code generator through optimized intermediate code forms.
5. Apply code optimization techniques and runtime allocation strategies.

## **CS/IT 306\* Software Engineering**

### **Course Outcomes:**

1. Recognize the importance of software engineering processes and process models.
2. Identify Software Requirements Specification (SRS) needed to build a working software component.
3. Design a Software model and Architecture for a given problem.
4. Distinguish various testing strategies and Software quality.
5. Develop software components as per the requirements of various stakeholders for a software project.

## **CS 351 Web Technologies Lab**

### **Course Outcomes:**

1. Create static web pages using XHTML, CSS, and JavaScript.
2. Design dynamic WebPages using client side scripting.
3. Create XML documents and work with web servers to create web applications with ruby on rails platform.
4. Develop server side programs with Java Servlet Technologies.
5. Design Rich Internet Applications with AJAX.

## **CS 352 Design & Analysis of Algorithms Lab**

### **Course Outcomes:**

1. Analyze the efficiency and correctness of algorithms.
2. Implement algorithms using various design strategies.
3. Choose appropriate algorithmic design technique to solve a given problem.

## **CS 353 Unix Programming Lab**

### **Course outcomes:**

1. Execute UNIX commands and utilities.
2. Implement shell scripts for solving system related problems.
3. Write programs to perform file and process management using system calls.
4. Write programs to provide Inter-process communication using various IPC mechanisms.

## **III/IV B.Tech - II Semester**

### **CS/IT 307 Network Programming**

#### **Course Outcomes:**

1. Explain the basics of network programming.
2. Implement client/server applications using elementary socket functions.
3. Develop concurrent client/server programs using multiplexing and threads.
4. Daemonize various client/server processes.
5. Compare different TCP client/server design alternatives.

### **CS/IT 308 Data Engineering**

#### **Course Outcomes:**

1. Explain the fundamental concepts of data warehousing and mining.
2. Extract association rules from transactional databases.
3. Demonstrate different classification techniques.
4. Apply various clustering and outlier detection techniques.

### **CS/IT 309 Object Oriented Analysis & Design**

#### **Course Outcomes:**

1. Construct the requirements model for an Information system.
2. Specify the dynamic behavior of the system.
3. Specify the control and operation specifications of an information system.
4. Design and model a system using design patterns.
5. Implement and manage a software project using Object Oriented modeling concepts.

### **CS/IT 310 Cryptography & Network Security**

#### **Course Outcomes:**

1. Identify common network security vulnerabilities/attacks, classical and symmetric encryption schemes.
2. Compare various Cryptographic Techniques.
3. Design secure applications.
4. Analyze the IP security header formats and know the applications like Kerberos, PGP.
5. Explain the concepts of Firewalls configuration, Web security mechanisms and Intrusion detection techniques.

### **CS/IT 311\*(A) (Elective-I) Artificial Intelligence**

#### **Course Outcomes:**

1. Explain the fundamental concepts of artificial intelligence.
2. Apply problem solving techniques for solving simple AI problems.
3. Explain knowledge representation issues.
4. Represent the given natural language sentences using appropriate knowledge representation structures.
5. Discuss various planning and game playing techniques.
6. Explain how to develop an expert systems for given knowledge base.

## **CS/IT 311\*(B) (Elective-I) Principles of Programming Languages**

### **Course Outcomes:**

1. Describe syntax and semantics of programming languages.
2. Explain data, data types, and basic statements of programming languages.
3. Design and implement subprogram constructs.
4. Design object - oriented, concurrency, and constructs.
5. Design exception & event handling programming.

## **CS 311\*(C) (Elective-I) Software Testing Methodologies**

### **Course Outcomes:**

1. Apply software testing knowledge and engineering methods.
2. Design and conduct a software test process for a software testing project.
3. Identify the needs of software test automation, and define and develop a test tool to support test automation.
4. identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
5. use various communication methods and skills to communicate with their team mates to conduct their practice-oriented software testing projects.
6. Discuss contemporary issues in software testing, such as component-based software testing problems.
7. use software testing methods and modern software testing tools for their testing projects.

## **CS 311\*(D) (Elective-I) Multimedia Computing**

### **Course Outcomes:**

1. Explain various multimedia software tools & multimedia authoring tools.
2. Handle the Graphics/Image data types and popular file formats on a computer system.
3. Evaluate the use of various coding techniques implemented in different applications.
4. Describe the Quality of Services (Qos) in Multimedia networks.
5. Discuss Multimedia Database and Image Database applications.

## **CS/IT 312\*(A) (Elective-II) Embedded Systems**

### **Course Outcomes:**

1. Explain the role of basic hardware components in embedded systems.
2. Choose appropriate embedded software architecture.
3. Utilize suitable RTOS services like semaphores, message queues, mail boxes, pipes, etc. for solving problems.
4. Explain embedded software design principles.
5. Choose hardware and software tools for building and debugging embedded systems.



### **CS/IT 312\*(B) (Elective-II) Advanced Databases**

#### **Course Outcomes:**

1. Explain database system architecture, catalog and distributed databases.
2. Demonstrate the Distributed design principles on transaction management.
3. Discuss the concepts of Distributed Relational Database system, ORDBMS and Object DBMSs.
4. Classify the emerging database technologies and applications.

### **CS 312\*(C) (Elective-II) Advanced Data Structures**

#### **Course Outcomes:**

1. Implement hashing techniques, dictionary and skip list ADTs for solving a given problem.
2. Describe the need for randomizing data structures and algorithms.
3. Implement the operations of binary search, AVL, red black, splay and 2-3 trees.
4. Develop applications by using text processing.
5. Explain the concepts of computational geometry.

### **CS 312\*(D) (Elective-II) Advanced Computer Architecture**

#### **Course Outcomes:**

1. Explain the advanced concepts of computer architecture.
2. Analyze the Instruction Level Parallelism with software and Dynamic Approaches.
3. Discuss the performance of advanced Memory and I/O concepts.
4. Analyze modern design structures of Pipelined and Multiprocessors systems.

### **CS 354 Network Programming Lab**

#### **Course Outcomes:**

1. Implement iterative and concurrent servers using TCP/UDP protocols.
2. Design network applications using multiple threads.
3. Implement client/server programming using signals.
4. Design various daemon processes.

### **CS 355 Data Engineering Lab**

#### **Course Outcomes:**

1. Compute cuboids of a given data cube using SQL.
2. Implement OLAP operations using SQL.
3. Model ETL solutions using data warehousing tool.
4. Write high level language programs to implement data pre-processing and mining techniques.
5. Apply data mining techniques on data sets using a data mining tool.

## **CS 356 OOAD Lab**

### **Course Outcomes:**

1. Develop a software model for a given problem.
2. Develop UML models using the phases of the Rational Unified Process CASE tool.
3. Analyze interactions among analysis classes for developing the class model and identify the dynamic behavior of the system.
4. Identify the functionality of each UML model in developing and deploying object-oriented software.
5. Ability to work in Software team and construct Analysis & Design models for a given problem.

## IV/IV B.Tech - I Semester

<b>CS/IT 401</b>	<b>Distributed Systems</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Outcomes:

1. Describe the basic principles of distributed systems
2. Explain communication models, role of threads and need for code migration in distributed systems
3. Explain the concepts and implementation of naming system in distributed systems
4. Identify the need for synchronization, consistency models required for distributed systems
5. Summarize the techniques used for making distributed systems fault tolerant
6. Explain file based and web based paradigms of distributed systems

<b>CS/IT 402</b>	<b>Web Services</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>1</b>	<b>0</b>	<b>3</b>

### Course Outcomes:

1. Design dynamic web pages with JSP.
2. Develop DOM and SAX parsers.
3. Create Enterprise Java Beans.
4. Use Java Mail, RMI and Corba in real time web applications.
5. Create and consume Web Services.

<b>CS 404(A)</b>	<b>Java Programming (Open Elective)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Outcomes:

1. Use the syntax and semantics of java programming language and basic concepts of OOP
2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages
3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
4. demonstrate how the java program communicates with the console and disk files using the concept of streams.
5. Design event driven GUI and web related applications which mimic the real word scenarios.

<b>CS 404(B)</b>	<b>Database Management Systems (Open Elective)</b>	<b>L T P C</b>
		<b>4 0 0 3</b>

**Course Outcomes:**

1. Understand basic concepts and use of various database systems.
2. Enforce integrity constraints to maintain validity & accuracy.
3. Write relational expressions for the queries.
4. Design and develop a database using normalization theory.
5. Use different concurrency control and recovery techniques.

<b>CS 405*</b>	<b>Wireless Networks</b>	<b>L T P C</b>
		<b>4 0 0 3</b>

**Course Outcomes:**

1. Discuss the wireless transmission technologies and media access control mechanisms.
2. Explain various 2G, 3G technologies and broadcast communication systems.
3. Describe the mobile IP and wireless LAN protocols.
4. Discuss the mobile transport layer protocols and wireless application protocols.

<b>CS/IT 406*(A)</b>	<b>Open Source Systems</b>	<b>L T P C</b>
<b>(Elective-IV)</b>		<b>4 1 0 3</b>

**Course Outcomes:**

1. Develop web applications using Apache, PHP, and MySQL and apply the OOP concepts.
2. Create database driven web applications.
3. Create powerful web applications using Ajax.
4. Create images at the web server.
5. Manipulate XML documents using PHP and Create RSS.

<b>CS/IT 406*(B)</b>	<b>.NET Technologies</b>	<b>L T P C</b>
<b>(Elective-IV)</b>		<b>4 1 0 3</b>

**Course Outcomes:**

1. Explain the basic concepts of C# programming.
2. Apply advanced concepts of C# programming for developing console applications.
3. Develop windows, web applications and web services.
4. Develop database driven applications using XML and LINQ.
5. Develop windows, web applications and web services.

**CS 406\*(C)**  
**(Elective-IV)**

**Cyber Security**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Analyze the Information Security Assets and Threats.
2. Identify the various security standards and policies to be maintained by the organization.
3. Design and Implement Security Performance Metrics & Configuration reviews.
4. Apply vulnerability assessment tools and security auditing techniques.

**CS 406\*(D)**  
**(Elective-IV)**

**Data Analytics**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Describe how to use R interactive environment for data analysis.
2. Explain the packages available and basics of R programming.
3. Apply the data management and graphical representation tools of R programming
4. Identify class labels for given data using statistical models of R programming.
5. Analyse the data using cluster analysis and classification models of R programming.

**CS 451**

**Term Paper**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

1. Select a research problem from reputed international research journals.
2. Identify the limitations of existing and merits of alternative solutions to the selected problem.
3. Present the selected problem as a member or a leader in a team.
4. Prepare a report as per the standard format.

## IV/IV B.Tech - II Semester

<b>CS/IT 407</b>	<b>Industrial Engineering &amp; Management</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Outcomes:

1. Describe the inference of organization structure and performance of people working in organizations and to develop themselves as individual entrepreneurs for the society.
2. Explain about time value of money in the changing society and to get awareness about the calculation of several assets for tax purpose.
3. Link corporate vision, mission, strategies, and policies to human resource management to acquire competitive advantage and to frame strategies to develop talent and to retaining talent.
4. Use right sort of material at a right time for delivering the right product.
5. Discuss the customer perception, how to make him buy the products and retain the customer in a business.

<b>CS 408</b>	<b>Internet Of Things</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Outcomes:

1. Discuss the application areas of IOT.
2. Explain the revolution of internet in Mobile Devices, Cloud & Sensor Networks.
3. Describe building blocks of Internet of Things and characteristics.
4. Interface Raspberry Pi kit to various devices.
5. Program IOT Devices.

<b>CS/IT 409*(A)</b> <b>(Elective-V)</b>	<b>Parallel Algorithms</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Outcomes:

1. Describe massive parallelism on large-scale and model parallel programs for Selection and merging.
2. Analyze and model parallel programs sorting and searching.
3. Analyze and model parallel programs for permutation, Combination and Matrix.
4. Analyze and model parallel programs for Graph algorithms and applications.
5. Analyze and model parallel programs for Computing Prefix Sums and Applications.

<b>CS/IT 409*(B)</b>	<b>Digital Image Processing</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>(Elective-V)</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Describe the fundamentals of digital image processing.
2. Apply techniques of smoothening, sharpening, and filtering in spatial and frequency domain.
3. Use restoration techniques.
4. Develop image compression techniques using standard algorithms to meet design specifications.
5. Apply Morphological processing and Image segmentation techniques for practical applications.

<b>CS 409*(C)</b>	<b>ARM Processor</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>(Elective-V)</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Explain the programming model of ARM processor.
2. Use the Instruction set of ARM processor.
3. Use the Thumb Instruction set of ARM processor.
4. Use the Embedded c programming for ARM processor.
5. Program the peripherals of ARM-MCU using C.

<b>CS 409*(D)</b>	<b>Big Data Analytics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>(Elective-V)</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Explain the characteristics of Big Data.
2. Explain the distributed storage and computation capabilities of Hadoop.
3. Describe how MapReduce works.
4. Process Big Data using MapReduce jobs.
5. Use the tool Hive for data warehousing on data stored in HDFS.
6. Use the Column oriented database HBase to provide input to/ output from MapReduce jobs.

<b>CS/IT 410*(A)</b> <b>(Elective-VI)</b>	<b>Machine Learning</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Choose appropriate learning technique using domain knowledge.
2. Apply effectively neural networks and genetic algorithms for appropriate applications.
3. Apply Bayesian techniques and derive effectively learning rules.
4. Choose and differentiate reinforcement and analytical learning techniques.

<b>CS/IT 410*(B)</b> <b>(Elective-VI)</b>	<b>Semantic Web</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Explain semantic web technologies.
2. Write RDF for semantic web-systems.
3. Analyze Semantic web structures by using OWL and Inference rules.
4. Develop Semantic Web applications.
5. Use Ontologies in Semantic Web-system.

<b>CS 410*(C)</b> <b>(Elective-VI)</b>	<b>Secure Software Engineering</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course outcomes:**

1. Identify advantages and disadvantages in secure software code.
2. Implement a software program with in-built security code.
3. Design a secure software component for a project.
4. Analyze and learn various security issues related to software program or code.
5. Possess knowledge on security threats coding practices and secure programming.

<b>CS 410*(D)</b> <b>(Elective-VI)</b>	<b>Cloud Computing</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

1. Explain different Cloud Deploy & Service Models.
2. Analyze the integrated enterprise cloud environments.
3. Design the Cloud Virtual Machines Migration and cloud enhancing service.
4. Analyze secure distributed data storage and work flow engines for clouds.
5. Describe the data security, CaaS and SLA Management.



**CS 454**

**Internet Of Things Lab**

**L T P C**

**0 0 3 2**

**Course Outcomes:**

1. Explain the application areas of IOT.
2. Discuss the building blocks of Internet of Things and characteristics.
3. Explain enabling technologies, Embedded Devices and communication protocols for Hands on activities.
4. Write programs using Python for processing Internet of Things

**CS 455**

**Project Work**

**L T P C**

**0 0 6 1**

**Course Outcomes:**

1. Mention the merits and demerits of solutions for the problem studied and propose alternative approaches.
2. Apply the knowledge of domain, basic, engineering and management sciences considering feasibility, legal and ethical issues to solve the identified problem.
3. Identify required data structures and design suitable algorithms for solving a problem using latest tools and technologies.
4. Analyze the results and develop valid conclusions.
5. Communicate the identified solution in both written and oral form.
6. Function effectively as a member or leader in a team.

**R.V.R. & J. C. COLLEGE OF ENGINEERING (Autonomous)**  
**Chandramoulipuram, Chowdavaram, Guntur - 522019**  
**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**



**COURSE OUTCOMES OF SUBJECTS UNDER R-16(AUTONOMOUS)**

**CURRICULUM**

<b>Course Code</b>	<b>Course Title</b>	<b>CO'S</b>	<b>Description of CO</b> Upon completion of the course the student will be able to:
EE101	Differential equations and statistics	CO1	CO1: Understand methods of solving first order differential equations.
		CO2	CO2: Understand some physical applications of first order differential equations
		CO3	CO3: Solve higher order differential equations
		CO4	CO4: To solve partial differential equations
		CO5	CO5: Understand the relation between two variables by Curve fitting.
EE102	Engineering Physics	CO1	CO1: Understand the concepts of Ultrasonic waves, production and applications in NDT
		CO2	CO2: Understand the interference in thin films and its application, Concept of diffraction and grating, birefringence and production and detection of different polarized lights.
		CO3	CO3: acquire Knowledge on basics of lasers, holography, fibers and their applications.
		CO4	CO4: Understand Schrodinger wave equation and its applications in 1-D with respect to the domain of quantum world.
		CO5	CO5: Describe the nature of electromagnetic radiation and matter in terms of the particles.
EE103	Applied Chemistry	CO1	CO1: Acquire knowledge on quality and utility water, useful in studying public health engineering.
		CO2	CO2: Gain knowledge on water treatment for drinking purpose
		CO3	CO3: Understand functioning of electrochemical energy systems.
		CO4	CO4: relate corrosion and environment and suggest methods to prevent corrosion.
		CO5	CO5: Analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.
EE104	English for communication	CO1	CO1: Use vocabulary contextually
		CO2	CO2: Compose effectively the various forms of professional communication
		CO3	CO3: Apply grammar rules efficiently in spoken and written forms
		CO4	CO4: Understand and overcome the barriers in communication
		CO5	CO5: Develop professional writing.
EE105	Problem solving with C	CO1	CO1: Develop algorithms and flow charts for simple problems
		CO2	CO2: Use suitable control structures for developing code in C
		CO3	CO3: Design modular programs using the concepts of functions and arrays.

		CO4	CO4: Design well-structured programs using the concepts of structures and pointers
		CO5	CO5: Develop code for complex applications using file handling features
EE 106	Professional Ethics & Human values	CO1	Comprehend a specific set of behaviours and values the professional interpreter must know and must abide by, including confidentiality, honesty and integrity.
		CO2	Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work
		CO3	Understand the moral requirements of engineering experiments, and have the ability to apply their knowledge to the solution of practical and useful problems;
		CO4	Understand Lack of communication, prejudice in not asking for clarification, fear of law and plain neglect will lead to the occurrence of many repetitions of past mistakes.
		CO5	Know and respect existing laws pertaining to professional work. The students can speak out against abuses in these areas affecting the public interest.
EE151	Chemistry Lab	CO1	CO1:Acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.
		CO2	CO2: Prepare solutions with different concentrations.
		CO3	CO3: Analyze water for its hardness, alkalinity, chloride ion content, iron content.
		CO4	CO4: Understand the principles behind the development of instruments suitable for chemical analysis.
EE152	C-Programming Lab	CO1	CO1:Develop various menu driven programs like generation of electricity bill, evaluation of series etc.
		CO2	CO2:Write C programs using 1D, 2D and Multi Dimensional arrays.
		CO3	CO3: Write C programs to develop various applications using structures, unions and Files.
		CO4	CO4: Develop 'C' programs for various applications.
EE153	Workshop Practice Lab	CO1	CO1: To familiarize with_ The Basics of tools and equipment used in Carpentry, Tin Smithy, Welding and House Wiring.
		CO2	CO2: The production of simple models in the above four trades
EE107	Calculus and Numerical Methods	CO1	1. understand the basic linear algebraic concepts.
		CO2	2. evaluate double, triple integrals and the area, volume by double & triple integrals respectively.
		CO3	3. solve gradient, divergence, curl and integration of vector function problems.
		CO4	4. solve system of equations.
		CO5	5. evaluate derivatives and integrals using numerical techniques.
EE108	Electronic and Electrical Engineer	CO1	1. understand the nature of formation of bands in solid and classifying the solids , Importance of Fermi level and law of mass action in semiconductors.
		CO2	2. understand theory of P-N junction and the devices.

	ring Materials	CO3	3. acquire knowledge on Importance of polarization and magnetization phenomena and their applications.
		CO4	4. acquire knowledge on Relevance of superconductivity and its applications.
		CO5	5. acquire knowledge on Nano material and their characterization principles.
EE109	Chemistry of Engineering Materials	CO1	1. know the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.
		CO2	2. know usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.
		CO3	3. acquire knowledge on composition, quality and uses of various fuels.
		CO4	4. be capable of selecting appropriate lubricant for a given system, and know the characteristics and utility of refractories.
		CO5	5. acquire knowledge on the requirements, applications of liquid crystals and explosives.
EE110	Environmental Studies	CO1	CO1: Define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.
		CO2	CO2: Describe and discuss the environmental implications of the cycles of biologically important materials through the eco system.
		CO3	CO3: Discuss the benefits of sustaining each of the following resources; food, health, habitats, energy, water, air, soil and minerals
		CO4	CO4: Understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies
EE111	Mechanics for Engineers (EE)	CO1	1. Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle, unknown forces and moments acting on a rigid body.
		CO2	2. Determine the centroids and center of gravity of standard shapes and composite areas. Apply the basic concepts of dry friction on inclined planes and wedges.
		CO3	3. Calculate the moment of inertia of various standard sections by method integration and moment of inertia of composite areas.
		CO4	4. Determine velocity and acceleration of particles under rectilinear and curvilinear translation.
		CO5	5. Apply dynamic equilibrium equations for analyzing the rigid bodies under rectilinear and curvilinear translation. Apply equations of motion for analyzing the rigid body rotating about a fixed axis.
EE112	Introduction to Electrical Engineering	CO1	1. Understand the basic electrical circuits
		CO2	2. Basic knowledge about the Magnetic circuits
		CO3	3. Basic knowledge about the capacitors
		CO4	4. Gain knowledge about phase and phase relationship of basic electrical elements
		CO5	5. Gain knowledge about resonance.
EE154	Physics Lab	CO1	1. Use CRO, signal generator, spectrometer for making measurements.
		CO2	2. Test the optical components using principles of interference & diffraction.

		CO3	3. Determine the selectivity parameter in electrical circuits.
EE155	Communication Skills Lab	CO1	1. know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.
		CO2	2. employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.
		CO3	3. use confidently phrases and idioms for effective communication.
		CO4	4. develop appropriate speech dynamics in professional situations.
		CO5	5. focus on communication skills and social graces necessary for effective communication.
EE156	Engineering Graphics Lab	CO1	1. acquire basic skills in Technical graphic communication
		CO2	2. visualize and communicate with 2D as well as three dimensional shapes.
		CO3	3. understands the application of Industry standards and best practices applied in Engineering Graphics
		CO4	4. apply the knowledge of development of surfaces in real life situations
		CO5	5. draw simple 2D Engineering Drawings using Auto CAD.
EE201	Transformation Techniques	CO1	1. Find Fourier series.
		CO2	2. Find Fourier integrals.
		CO3	3. Find Fourier transforms.
		CO4	4. Find Laplace and inverse transforms of a function.
		CO5	5. Find solution of differential equations using Laplace transforms.
EE202	Electronics Devices & Circuits	CO1	1. Understand semiconductor basics like semiconductor material, its types, concepts of Drift current, diffusion current.
		CO2	2. Understand the principle of operation and characteristics of Diode, Tunnel Diode and Rectifiers.
		CO3	3. Design various Equipment which are used in the construction and operation of electronic devices.
		CO4	4. Know about biasing and thermal stabilization of transistor. Understand the operation and characteristics of JFET.
		CO5	5. Understand the operation and characteristics of JFET.
EE203	Digital Logic Design	CO1	1. Understand basic theorems in Boolean algebra and their relevance to digital logic design.
		CO2	2. Get knowledge of Boolean functions minimization methods of Karnaugh Maps and The Quine-McCluskey methods.
		CO3	3. Know the operation and design procedure of combinational circuits.
		CO4	4. Understand the operation and design procedure of sequential circuits.
		CO5	5. Comprehend the operation and design methodology for synchronous sequential circuits and Algorithmic StateMachines.
EE204	Network Theory	CO1	1. Gain knowledge about methods of analyzing the circuits
		CO2	2. Implement the network theorems to the electrical circuits
		CO3	3. Analyse the balanced and unbalanced three phase systems.
		CO4	4. Gain knowledge about the graphical representation of electrical circuits
		CO5	5. Analyze electrical signals using Fourier series and response of circuits using PSPICE

EE205	DC Machines	CO1	1. Get an idea of magnetic circuits and their applications ,to get the knowledge of different properties magnetic materials and get knowledge of electro mechanical energy conversion
		CO2	2. To gain the knowledge of working principle, construction, types of D.C generators, get an idea of armature reaction and commutation.
		CO3	3. Get the complete idea of characteristics of D.C generators and their applications, to gain knowledge of principle of D.C motors and torque equations.
		CO4	4. Get the complete idea of characteristics of D.C motors and their applications, gain the knowledge of speed control of D.C motors and necessity of starters.
		CO5	5. Get the knowledge of testing of D.C motors and calculation of efficiency.
EE206	Mechanical Technology	CO1	1. Understand the concepts of mechanical elements in Thermal and Hydro-electric power plants.
		CO2	2. Connect the course content to real time applications in various electrical power engineering applications.
		CO3	3. Acquire the knowledge about basic manufacturing processes.
		CO4	4. Acquire the knowledge about belt and gear drives for power transmission.
		CO5	5. Have clear idea about the working of power plants, refrigeration, air conditioning and IC engines.
EE251	Networks & DC Machines Lab	CO1	1. Design circuits for DC and AC analysis with theorems.
		CO2	2. Predetermine performance of DC machine.
		CO3	3. Determine performance of DC machines by direct tests.
		CO4	4. Develop programs for circuit analysis using PSPICE.
EE252	Electronic devices Lab	CO1	1. Obtain the characteristics of devices like p-n Junction diode, zener diode, BJT in CE, CB configurations, JFET, UJT, Design the self bias circuit.
		CO2	2. Design the Zener voltage regulator to meet the specifications.
		CO3	3. Design Combinational logic circuits such as adders, subtractors, Code converters, decoders, multiplexers.
		CO4	4. Design Sequential logic circuits such as flip-flops, shift registers, synchronous and asynchronous counters.
EE253	Mechanical Technology Lab	CO1	1. Know the importance of flash and fire point of fuel for storing and transporting the fuels.
		CO2	2. Understand the importance of viscosity of lubricating oil.(cooling and reducing the friction between sliding parts).
		CO3	3. Know the importance of calorific value of gaseous fuels.
		CO4	4. Know how mechanical efficiency and brake thermal efficiency changes with change of the load at constant speed.(both Petrol and Diesel engines)
		CO5	5. Implement techniques and methods for performing different lathe operations and producing different shapes of moldings.
EE207	Complex and Numeric	CO1	1. Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.
		CO2	2. Evaluate complex line integrals.

	al Analysis	CO3	3. Find singularities of complex functions and determine the values of integrals using residues.
		CO4	4. Find numerical solution of ordinary differential equations.
		CO5	5. Find numerical solution of partial differential equations.
EE208	Electronic Circuits Analysis	CO1	1. analyze linear analog electronic circuits involving Bipolar Junction (BJT) and Field Effect (FET) transistors at both low and high frequencies.
		CO2	2. analyze frequency response of transistor amplifier circuits.
		CO3	3. understand four feedback topologies and their practical circuits.
		CO4	4. analyze RC,LC and Crystal Oscillators.
		CO5	5. analyze and design the Power amplifiers.
EE209	Network Analysis & Synthesis	CO1	1. Understand the concept of steady state, transient analysis for different circuits with DC and sinusoidal input.
		CO2	2. Gain knowledge about two port network parameters and interrelations of two port networks.
		CO3	3. Understand the concept of pole, zero and determine the responses of different circuits for pulse and impulse excitations.
		CO4	4. Gain knowledge about the coupled circuits and filters
		CO5	5. Understand the concept of Hurwitz polynomial, synthesis of different networks.
EE210	AC Machines	CO1	1. Get an idea of a transformer and their applications, to get the knowledge of different types of losses and testing of transformers and to solve the problems related to transformers.
		CO2	2. To gain the knowledge of different types of connections like star-delta, 3-ph to 2-ph and get the knowledge of parallel operation and load sharing.
		CO3	3. Get the complete idea of poly phase induction motor and its testing and to draw Equivalent circuit.
		CO4	4. Get an idea to draw the circle diagram and to get an idea about starters, speed control and also get an idea about the induction generator and its applications.
		CO5	5. Get the knowledge of 1-ph induction motors and their characteristics and their applications.
EE211	DATA STRUCTURES USING C++	CO1	1. understand C++ fundamentals and various function modifiers, create and manipulate classes and objects.
		CO2	2. make use of the concept Inheritance and its types and efficiently develop reusable and extensible programs.
		CO3	3. apply the concept of templates for generic programming.
		CO4	4. write programs for various data structures and their applications.
		CO5	5. compare complexities of different sorting and searching techniques..
EE212	Electromagnetic Field Theory	CO1	1. Understand concepts of fields.
		CO2	2. Solve electrostatic field problems.
		CO3	3. Understand electric and magnetic properties of material media and how these properties can be exploited in engineering applications.
		CO4	4. Solve various magneto static field problems.

		CO5	5. Understand the concepts of Maxwell's equations and their usage.
EE254	AC Machine s Lab	CO1	1. Understand the testing of transformers.
		CO2	2. Operate the transformers in parallel.
		CO3	3. Provide supply in industries when 2-phase is required like furnaces by using Scott connection.
		CO4	4. Analyze the performance characteristics of Induction motors.
		CO5	5. Draw the equivalent circuits of the transformers and Induction motors.
		CO6	6. Asses the performance of the given transformers and Induction motors.
EE255	Data Structur es Lab	CO1	1. implement basic Object Oriented features of C++.
		CO2	2. implement the concepts of encapsulation and compile time polymorphism.
		CO3	3. implement the concepts of Inheritance, Runtime polymorphism and Templates.
		CO4	4. implement Lists, Stacks and Queue ADTs.
		CO5	5. implement BST ADT and different sorting algorithms.
EE256	Professi onal Commu nication Skills Lab	CO1	1. develop effective communication and presentation skills.
		CO2	2. learn corporate etiquette - organizing and managing professional events.
		CO3	3. understand how reading enhances their communicative competency.
		CO4	4. conduct effective correspondence and prepare reports which produce results.
		CO5	5. develop all-round personalities with a mature outlook to function effectively in different circumstances.
EE301	Pulse and Digital Circuits	CO1	1. understand and analyze the responses of first order RC low pass and high pass filters for standard inputs.
		CO2	2. understand the transfer characteristics of clipping circuits and the response of clamping circuits for sinusoidal and square wave signals.
		CO3	3. understand the operation, analysis and design of multivibrators using BJTs
		CO4	4. understand the operation of Miller and Bootstrap sweep circuits.
		CO5	5. understand the operation of TTL, ECL, NMOS and CMOS logic families
EE302	Micropr ocessors & Micro controll ers	CO1	1. understand architecture and programming model of 8086 microprocessor.
		CO2	2. develop the assembly language programs for different problems using 8086.
		CO3	3. understand 8086 system connections and Timings, Digital Interfacing.
		CO4	4. understand Analog interfacing with 8086 and different programmable peripheral devices.
		CO5	5. understand the architecture of 8051 microcontroller.
EE303	Linear Control Systems	CO1	1. Understand the concepts of continuous time linear control systems
		CO2	2. Assess the stability of feedback control system with classical approach
		CO3	3. Design simple control systems and modify the parameters to meet specific requirements
		CO4	4. Understand the modeling and analysis of linear control systems using state space approach



		CO5	5. Connect the course content to real time applications in various electrical and electronics engineering applications, pursue advanced courses in control systems and get solutions for problems related to control systems in competitive examinations.
EE304	Synchronous & Special Machines	CO1	1. Understand the Construction, Working principle of operation of three phase Synchronous Generator and analyze the methods of determining the Voltage Regulation.
		CO2	2. Understand the specifications of synchronous generators and are able to solve problems involving synchronous machines operating alone or in parallel.
		CO3	3. Comprehend the Three phase synchronous Motor operation, Characteristics, Performance and Applications.
		CO4	4. Gain knowledge in principle of working, specifications and applications of universal motor and single phase ac series motor.
		CO5	5. Gain knowledge in principle of operation, Construction and characteristics of Single Phase Synchronous Motors, Stepper Motors and Liner Induction Motor
EE305	Generation of Electric Power	CO1	1. To know various factors associated with power plants, power plant economics.
		CO2	2. To know about factors affecting selection of type of power generating station & tariff structure.
		CO3	3. To make the student to understand various types of electrical power generation in detail.
		CO4	4. To understand the significance of non conventional energy resources, power generation using solar, wind, tidal, geo thermal and fuel cells.
EE306	Transmission & Distribution	CO1	1. Understand the types of conductors used for electrical system and classification of transmission lines and Get solutions for problems related to inductance and capacitance.
		CO2	2. Analyze the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of conductor materials.
		CO3	3. Classify the types of insulators, testing of insulators and calculation of string efficiency.
		CO4	4. Understand the types of cables and theory of underground cables.
		CO5	Classify the types of arrestors and substations, understand substation layout and equipment
EE351	Synchronous & Special Machines Lab	CO1	1. Calculate the regulation of alternators by various methods.
		CO2	2. Synchronize the alternators with infinite buses bars and calculate different parameters.
		CO3	3. Know the performance of special motors.
		CO4	4. Know the performance of synchronous motors.
EE352	Electronic Circuits Lab	CO1	1. Design the linear and Non-linear wave shaping circuits using active and passive components.
		CO2	2. Analyze the frequency response and to determine the various parameters of the single-stage and two-stage amplifiers.

		CO3	3. Persist practical knowledge on the applications of IC's and OP-AMPs.
		CO4	4. Design the power amplifiers, oscillators and feedback amplifiers.
EE353	Microprocessors & Microcontrollers Lab	CO1	1. Gain the logical development of programs on the 8086 microprocessor and 8051 microcontroller.
		CO2	2. Understand how to interface 8086 microprocessor to external world.
EE307	Linear ICs & Applications	CO1	1. Understand the basics of linear integrated circuits and operational amplifiers with applications.
		CO2	2. design wave shaping circuits
		CO3	3. design simple filter circuits & Oscillators for particular application
		CO4	4. understand analog to digital converters (ADC), and digital to analog converters (DAC)
		CO5	5. gain knowledge in designing a stable voltage regulator and understands the applications of PLL and special ICs.
EE308	Power System Analysis & Stability	CO1	1. Draw one line diagrams and understanding of solving per unit computations.
		CO2	2. Identify operation of grid connected synchronous machine and selection of capacity of protective devices upon conducting fault analysis.
		CO3	3. Assess stability of power system network.
		CO4	4. Get solutions for problems related to power systems in competitive examinations.
		CO5	5. Connect the course content to real time applications in various electrical and electronics engineering applications.
EE309	Power Electronics	CO1	1. Compare characteristics of switching devices
		CO2	2. Evaluate the performance of rectifiers
		CO3	3. Analyze DC-AC Inverters
		CO4	4. Analyze DC-DC converter with given characteristics
		CO5	Analyze and evaluate the operation of Cycloconverters and AC Voltage Controllers
EE310	Electrical Measurements & Instrumentation	CO1	1. Analyze types of instruments and principle of operation of various analog and digital instruments used in laboratories and field practice.
		CO2	2. Choose or design various circuits including magnetic materials for a variety of applications in electrical industry.
		CO3	3. Understand the operation and maintenance of CTs and PTs.
		CO4	4. Measure the various parameters over a wide range in electrical and electronics field like resistance, inductance, and capacitance by selecting appropriate technique
		CO5	5. Identify and operate various digital instruments, oscilloscopes, transducers, thermocouples etc. used in latest equipment, industries and advanced laboratories.
EE311/A	High Voltage Engineering	CO1	1. Understand the concepts of break down mechanism in gases.
		CO2	2. Gain the knowledge on how to generate of high AC, and DC voltages.
		CO3	3. Facilitate the students about the concepts of Generation of high Impulse voltage and currents.

	(Elective-I)	CO4	4. Understand various methods to measure the different high voltages and currents in high voltage laboratory and in field.
		CO5	5. Understand various methods to test the different high voltage equipment that are used in power system network.
EE311/C	Digital signal processing (Elective-I)	CO1	1. Get familiarity with discrete time signal processing and characterization of random signals filter design techniques.
		CO2	2. Learn how to calculate the discrete Fourier series, Fourier transform for discrete time systems and discrete Fourier transform using FFT algorithms.
		CO3	3. Learn the theory of modern digital signal processing and digital filter design, including window's techniques involving digital filter design.
		CO4	4. Connect the course content to real time applications in various electrical and electronics engineering applications.
		CO5	5. Expertise the fundamental principles, techniques of digital signal processing for understanding, designing new digital signal processing systems and for continued learning.
EE312/A	Electrical Machine Design (Elective-II)	CO1	1. Understand the basic concepts of electrical machine design and the principles of computerized design of electrical machines
		CO2	2. Understand the specifications and design of main dimensions of transformer, cooling systems
		CO3	3. Comprehend the design of dc machine and performance calculations
		CO4	4. Gain knowledge on design of induction motor stator & rotor
		CO5	5. Gain knowledge on design of synchronous machine (both. Salient pole & non-salient pole)
EE312/C	Renewable Energy Resources (Elective-II)	CO1	1. Know the national scene of energy production, utilization, consumption and energy storage systems.
		CO2	2. Understand about the basics of solar energy, collectors & generation of electricity from solar energy & photovoltaic's.
		CO3	3. Understand the assessment of wind energy potential, wind turbines and wind generators.
		CO4	4. Know about ocean energy, temperature differences & principles, extraction of energy from waves.
		CO5	5. Understand about geothermal, types & how biogas is produced & digester for power generation.
EE354	Electrical Measurements & Instrumentation Lab	CO1	1. Measure various electrical engineering parameters and quantities used in engineering practice.
		CO2	2. Calibrate the operation of Energy meter
		CO3	3. Calibrate LVDT for measuring distance
		CO4	4. Understand the dielectric strength transformer oil by using testing kit
		CO5	5. Measure three phase power, frequency and core losses
EE355	Control Systems Lab	CO1	1. Gain knowledge on servo mechanism of motors and derive transfer function of dc generator and motors.
		CO2	2. Understand the time response of second order system with proportional, integral and derivative controllers

		CO3	3. Gain the knowledge on advanced controllers such as stepper motor controller and programmable logic controllers.
		CO4	4. Understand lag & lead networks.
		CO5	5. Know the frequency response of first and second order systems.
EE356	Electrical Workshop Practice Lab	CO1	1. Understand and study of electrical equipment like fan, refrigerator etc.
		CO2	2. Study and understand the faults by using fault analyzer.
		CO3	3. Study about substations layout and Transformers.
		CO4	4. Identify the parts in ceiling fans and fluorescent lamp etc.
		CO5	5. Understand earthing method and estimation of industrial hall wiring.
EE401	Switchgear & Protection	CO1	1. Get an idea of zones of protection and working principle of various types of electromagnetic relays.
		CO2	2. Get the knowledge on distance protection and understand the concept of arc quenching phenomenon in circuit breaker
		CO3	3. Understand the working principle of various circuit breakers with their specifications and applications.
		CO4	4. Get the knowledge of differential protection of various power system network elements and to understand the concept of grounding, soil resistivity and earth resistance.
		CO5	5. Gain the knowledge and working principle of static relays and their applications.
EE402	Computer Applications to Power systems	CO1	1. Acquire the knowledge of analyzing power system network to get the primitive data with and without mutual coupling
		CO2	2. Acquire knowledge to write performance equations and able to develop network matrices.
		CO3	3. Able to represent a three phase network for balanced and unbalanced excitations, short circuit studies.
		CO4	4. Able to design a power plant with different load flows.
		CO5	5. Able to develop an algorithm for transient stability study and able to write state equations for turbine and speed governor controls.
EE403	MOOC S (Massive Open Online CourseS)	CO1	
		CO2	
		CO3	
		CO4	
		CO5	
EE404/A	Non-conventional Energy Sources Elective -III (OPEN)	CO1	1. Know the national scene of energy production, utilization, consumption and energy storage systems.
		CO2	2. Understand about the basics of solar energy, collectors & generation of electricity from solar energy & photovoltaics.
		CO3	3. Understand the assessment of wind energy potential, wind turbines and wind generators.
		CO4	4. Know about ocean energy, temperature differences & principles, extraction of energy from waves.

		CO5	5. Understand about geothermal, types & how biogas is produced & digester for power generation.
EE404/B	Utilization of Electrical Energy Elective - III (OPEN)	CO1	Have an overall idea of different types of lamps & lighting schemes.
		CO2	2. Know about the different types electric heating methods.
		CO3	3. Know the designing of heat elements such as furnaces and ovens.
		CO4	4. Know how to utilize the electrical energy for production of heat and welding process.
		CO5	5. Gain knowledge on principles and characteristics of storage batteries.
EE 405	Industrial Management	CO1	1. understand the customer perception, making him to buy the products and retaining the customer in a business.
		CO2	2. get knowledge about time value of money in the changing society and to get awareness about the calculation of several assets for tax purpose.
		CO3	3. linkage corporate vision, mission, strategies, and policies to human resource management to acquire competitive advantage and to frame strategies to develop talent and to retaining talent.
		CO4	4. become aware of the inference of organization structure and performance of people working in organizations and to develop themselves as individual entrepreneurs for the society.
		CO5	5. get awareness of managing the projects in various organizations by using different techniques.
EE406/A	Industrial Drives (Elective-IV)	CO1	1. Understand various drive mechanisms and closed loop control strategies of drives
		CO2	2. Apply power electronic converters (AC to DC ) to control the speed of DC motors
		CO3	3. Apply power electronic converters (DC to DC ) to control the speed of DC motors
		CO4	4. Apply power electronic converters to control the speed of induction motors
		CO5	5. Apply power electronic converters to control the speed of synchronous motors and understand the methods for energy conservation
EE406/B	Power Plant Instrumentation (Elective-IV)	CO1	1. Different equipment used in Power plants along with their control schematics
		CO2	2. Control loops of different circuit schemes
		CO3	3. Instrumentation in air fuel circuitry
		CO4	4. Computer based power plant control
		CO5	5. Turbine monitoring and control
EE451	Mini Project / Term Paper	CO1	1. Get practical exposure in the field of Electrical & Electronics Engineering
		CO2	2. Identify the topic for project work in prior in term paper along with his group
		CO3	3. Understand the problem and its analysis
		CO4	4. Know the latest computational tools available
		CO5	5. Get the solution for the engineering problems

EE452	Power Electronics Lab	CO1	1. Acquire knowledge on various power electronic devices
		CO2	2. Knowledge on various power electronic converters, design and applications.
		CO3	3. Able to design required drive circuits for project work.
EE453	Power systems Lab	CO1	1. Select and design protective devices for various equipment used in Electrical Industry.
		CO2	2. Determine impedances of various rotating machines.
		CO3	3. Design capacitors to improve power factor practically.
		CO4	4. Determine parameters of transmission line, loading capability, compensation equipment required in practical transmission network.
		CO5	5. Analyze the performance of insulators and cables by High voltage testing.
EE407	Utilization of Electrical Power	CO1	1. Choose a right and efficient drive for a particular application
		CO2	2. Understand various types of traction systems & mechanics of train movement
		CO3	3. Calculate SEC for a given train service and control methods of traction motors
		CO4	4. Understand various types of Heating, Welding systems
		CO5	5. Design Illumination systems for various applications
EE408	Power System Operation & Control	CO1	1. Know the importance of economic operation of power systems.
		CO2	2. Know the importance of single area and two area AGC.
		CO3	3. Know the importance of voltage control of distribution systems.
		CO4	4. Control the voltage and reactive power in practical case also.
		CO5	5. Solve the Power management problems in industries and utilities with the help of computers applications in power system.
EE409/A	HVDC Transmission (Elective - V)	CO1	1. Understand the importance of HVDC Links and converters
		CO2	2. Analyze converter configurations used in HVDC transmission and list the performance metrics
		CO3	3. Get an idea about converter faults and protection schemes
		CO4	4. Get an idea about control of converters and HVDC system
		CO5	5. Understand existence of harmonics in HVDC system and design of filter circuits
EE409/B	Electrical Distribution Systems (Elective - V)	CO1	1. Understand the concepts of distribution system Planning.
		CO2	2. Assess the design of new distribution system Planning.
		CO3	3. Design simple distribution system, sub transmission lines, primary feeder and Secondary feeders.
		CO4	4. Connect the course content to real time applications in various electrical and electronics engineering applications.
		CO5	5. Get solutions for problems related to voltage drop and power loss calculations and understand applications of capacitors in distribution systems.
EE410/A	FACTS Controllers	CO1	1. Understand the importance of FACTS controllers in transmission system to enhance the system performance, control strategies for different types of converters for static compensation.

	(Electric - VI)	CO2	2. To understand the objectives of shunt and series compensators and their types, comparison of transient and dynamic stability performance of different controllers.
		CO3	3. Importance of static voltage and phase angle regulators towards active, reactive power flow control and improvement of transient stability.
		CO4	4. To understand the concept of UPFC and IPFC, control strategies for controlling P and Q.
		CO5	5. To know the design and operational aspects of special purpose FACTS devices like TCBR, NGH-SSR damping scheme.
EE410/B	Industry Open Slot	CO1	1. Understand the current needs of the industry
		CO2	2. Engage in lifelong learning
		CO3	3. Use techniques, skills, and modern engineering tools
		CO4	4. Analyse and solve the problems of the society
EE454	Simulation of Electrical Systems Lab	CO1	1. Simulate different power electronic circuits using PSPICE.
		CO2	2. Simulate different control systems problems using MATLAB.
		CO3	3. Understand analysis of RLC circuits using EMTP.
		CO4	4. Determine steady state stability analysis, short circuit studies and relay co-ordination of power systems using MIPOWER.
		CO5	5. Exhibit expertise in usage of modern tools.
EE455	Project work	CO1	1. Research and development procedures
		CO2	2. Latest developments in the selected areas, software development
		CO3	3. Development of a prototype solution to industrial/ theoretical problems
		CO4	4. Publish paper in National or International conferences
		CO5	5. Function effectively on teams to accomplish a common goal

## Course Outcomes of all subjects as per Autonomous syllabus(R16)

S. No	Sub Code (R16)	SUBJECT NAME	COs	CO Text
1	EC101	Mathematics - I	C101.1	Understand methods of solving first order differential equations
			C101.2	Understand some physical applications of first order differential equations
			C101.3	Solve higher order differential equations.
			C101.4	Solve partial differential equations
			C101.5	Understand the relation between two variables by Curve fitting
2	EC102	Engineering physics	C102.1	Understand the concepts of Ultrasonic waves, production and applications in NDT
			C102.2	Understand the interference in thin films and its application, Concept of diffraction and grating, birefringence and production and detection of different polarized lights.
			C102.3	Acquire Knowledge on basics of lasers, holography, fibers and their applications
			C102.4	Understand Schrodinger wave equation and its applications in 1-D with respect to the domain of quantum world.
			C102.5	Describe the nature of electromagnetic radiation and matter in terms of the particles.
3	EC103	Applied chemistry	C103.1	Acquire knowledge on quality and utility of water in industries.
			C103.2	Gain knowledge on water treatment for drinking purpose.
			C103.3	Understand functioning of electrochemical energy systems
			C103.4	Relate corrosion and environment and suggest methods to prevent corrosion.
			C103.5	Analyze substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.
4	EC104	Environmental studies	C104.1	Define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.
			C104.2	Describe and discuss the environmental implications of biologically important materials through the ecosystems.
			C104.3	describe and discuss the environmental pollution implications and watershed management
			C104.4	Discuss the benefits of sustaining each of the following resources - food, health, habitats, energy, water, air, soil and minerals.



			C104.5	Understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies.
5	EC105	Elements of mechanical Engineering	C105.1	Understand different coplanar forces and determine the resultant forces. Simplify a system of forces and couples applied to a rigid body into a single resultant force and couple.
			C105.2	Know about basic fabrication processes like welding, casting and their working.
			C105.3	Know how the power is transmitted through belt and gear drives, estimate the tensions, power transmitted, length of the belt required etc. Know the various manufacturing process like foundry, welding, brazing , soldering, milling and drilling etc.,
			C105.4	know the basic concepts of thermodynamics, efficiencies and performance of 2-stroke and 4 stroke IC Engines
			C105.5	Understand working principles of Babcock and Wilcox boilers, different mountings and accessories used in the boilers. They able to know basic working of refrigerator and air conditioning.
6	EC106	Economics for Engineers	C106.1	Understand the decision making objective of a firm.
			C106.2	Get knowledge about overall functions of Demand, Supply, Price, Income of the firms.
			C106.3	linkage various cost concepts and to understand how to maintain break even scenario for a business
			C106.4	Get knowledge about time value of money in and how to use Accounting concepts in the changing society.
			C106.5	Know the overview of Liberalization, Privatization and Globalization and the impact of them on economy.
7	EC151	PHYSICS LAB	C151.1	Use CRO, signal generator, spectrometer for making measurements.
			C151.2	Test the optical components using principles of interference & diffraction.
			C151.3	Determine the selectivity parameter in electrical circuits.
8	EC152	ENGINEERING GRAPHICS LAB	C152.1	Acquire basic skills in Technical graphic communication
			C152.2	Visualize and communicate with 2D as well as three dimensional shapes
			C152.3	Understands the application of Industry standards and best practices applied in Engineering Graphics
			C152.4	Apply the knowledge of development of surfaces in real life situations
9	EC153	COMMUNICATION SKILLS LAB	C153.1	Know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.
			C153.2	Employ different skills, inferring lexical and contextual meaning and attempt comprehension passages
			C153.3	Use confidently phrases and idioms for effective

				communication.
			C153.4	Develop appropriate speech dynamics in professional situations.
10	EC107	CALCULUS AND NUMERICAL METHODS	C107.1	Understand the basic linear algebraic concepts.
			C107.2	Evaluate double, triple integrals and the area, volume by double & triple integrals respectively.
			C107.3	Solve gradient, divergence, curl and integration of vector function problems.
			C107.4	Solve system of equations.
			C107.5	Evaluate derivatives and integrals using numerical techniques.
11	EC108	ELECTRONIC AND ELECTRICAL ENGINEERING MATERIALS	C108.1	Understand the nature of formation of bands in solid and classifying the solids, Importance of Fermi level and law of mass action in semiconductors.
			C108.2	Understand theory of P-N junction and the devices
			C108.3	Acquire knowledge on Importance of polarization and magnetization phenomena and their applications.
			C108.4	acquire knowledge on Relevance of superconductivity and its applications
			C108.5	Acquire knowledge on Nano material and their characterization principles.
12	EC109	CHEMISTRY OF ENGINEERING MATERIALS	C109.1	Know the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.
			C109.2	would be able to know usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.
			C109.3	Would acquire knowledge on composition, quality and uses of various fuels.
			C109.4	would be capable of selecting appropriate lubricant for a given system, and know the characteristics and utility of refractories
			C109.5	Acquire knowledge on the requirements, applications of liquid crystals and explosives.
13	EC110	ENGLISH FOR COMMUNICATION	C110.1	Use vocabulary contextually.
			C110.2	Compose effectively the various forms of professional communication.
			C110.3	Apply grammar rules efficiently in spoken and written forms.
			C110.4	Understand and overcome the barriers in communication.

			C110.5	Develop professional writing.
14	EC111	PROBLEM SOLVING WITH C	C111.1	Develop algorithms and flow charts for simple problems.
			C111.2	Use suitable control structures for developing code in C
			C111.3	Design modular programs using the concepts of functions and arrays
			C111.4	Design well-structured programs using the concepts of structures and pointers
			C111.5	Develop code for complex applications using file handling features.
15	EC112	PROFESSIONAL ETHICS AND HUMAN VALUES	C112.1	Comprehend a specific set of behaviors and values the professional interpreter must know and must abide by, including confidentiality, honesty and integrity.
			C112.2	Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work
			C112.3	Understand the moral requirements of engineering experiments, and have the ability to apply their knowledge to the solution of practical and useful problems
			C112.4	Understand Lack of communication, prejudice in not asking for clarification, fear of law and plain neglect will lead to the occurrence of many repetitions of past mistakes
			C112.5	Know and respect existing laws pertaining to professional work. The students can speak out against abuses in these areas affecting the public interest
16	EC154	CHEMISTRY LAB	C154.1	Acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.
			C154.2	Prepare solutions with different concentrations.
			C154.3	Analyze water for its hardness, alkalinity, chloride ion content, iron content
			C154.4	Understand the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments.
17	EC155	C PROGRAMMING LAB	C155.1	Develop various menu driven programs like generation of electricity bill, evaluation of series etc.
			C155.2	Write C programs using 1D, 2D and Multi-Dimensional arrays
			C155.3	Write C programs to develop various applications using structures, unions and Files.
			C155.4	Develop 'C' programs for various applications.
18	EC156	ELECTRONICS ENGINEERING	C156.1	Identify the active and passive electronic components.

		G WORKSHOP		
			C156.2	get hands-on assembling, testing, assembling, dismantling, fabrication and repairing systems by making use of the various tools and instruments
19	EC201	TRANSFORM ATION TECHNIQUES	C201.1	Find Fourier series.
			C201.2	Find Fourier integrals.
			C201.3	Find Fourier transforms
			C201.4	Find Laplace and inverse transforms of a function.
			C201.5	Find solution of differential equations using Laplace transforms.
20	EC202	ELECTRONIC DEVICES AND CIRCUITS	C202.1	acquire knowledge in i.PN junction diode current components and characteristics ii.Zener diode and its electrical characteristics iii.Rectifiers and capacitors filters iv.working and characteristics of BJT,JFET,MOS capacitor and MOSFET
			C202.2	Develop technical skills in analyzing the rectifiers, filters and transistor biasing circuits for the given set of specifications.
			C202.3	Design and develop different biasing techniques such as fixed bias, collector to base bias and self-bias for the given specifications of BJT
			C202.4	Apply course knowledge and evaluate numerical and analytical problems in PN junction diode,zener diode voltage regulator, rectifiers, filters, BJT,JFET and MOSFET.
			C202.5	Select and identify the appropriate mode of operation for modeling the behaviour of PN junction diode,zener diode, BJT, JFET and MOSFET.
21	EC203	DIGITAL LOGIC DESIGN	C203.1	demonstrate the knowledge in properties and postulates of Boolean algebra, minimization of switching functions using map method and tabular method, combinational and sequential circuits ,realization of Boolean functions using PLDs.
			C203.2	Analyze combinational and sequential circuits
			C203.3	Design and develop various combinational, sequential circuits and PLDs
			C203.4	Solve problems and arrive at solutions pertaining to Digital Logic Design.
			C203.5	Apply minimization techniques to asynchronous designs and suggest appropriate design for engineering solutions.
22	EC204	CIRCUIT THEORY	C204.1	Apply the knowledge of basic circuit laws and simplify the dc and ac networks using reduction techniques.
			C204.2	Analyze the dc and ac circuits using mesh and nodal analysis and network simplification theorems and analyze the series and parallel resonant circuits.

			C204.3	Infer and evaluate transient response, steady state response of series, parallel and compound circuits.
			C204.4	develop Laplace transformed network for steady state and transient analysis
			C204.5	Analyze dc and ac Circuits and time domain response using P-Spice.
23	EC205	DATA STRUCTURE S THROUGH C++	C205.1	Understand C++ fundamentals and various function modifiers, create and manipulate classes and objects.
			C205.2	Make use of the concept Inheritance and its types and efficiently develop reusable and extensible programs.
			C205.3	Apply the concept of templates for generic programming.
			C205.4	Write programs for various data structures and their applications.
			C205.5	Compare complexities of different sorting and searching techniques
24	EC-206	SIGNALS AND SYSTEMS	C206.1	Demonstrate knowledge in representation of Fourier series, Fourier transform, Convolution and correlation of signals and properties of LTI systems.
			C206.2	analyze various continuous and discrete time signals and systems in time and frequency domains
			C206.3	Describe various types of noise and their sources.
			C206.4	Apply the concepts and properties of random variables to real time applications.
			C206.5	Apply the concepts and properties of random process to real time applications.
25	EC-251	ELECTRONIC DEVICES LAB	C251.1	Obtain the characteristics of devices like p-n Junction diode, Zener diode, BJT in CE, CB configurations, JFET.
			C251.2	Calculate the parameters from the characteristics like static, dynamic and reverse resistances of p-n junction diode, h-parameters of BJT.
			C251.3	design a circuit to achieve the specified operating point
			C251.4	measure the amplitude and frequency of given waveform using CRO.
26	EC-252	DIGITAL LOGIC DESIGN LAB	C252.1	demonstrate the fundamental knowledge in logic gates, combinationak and sequential circuits and to identify various digital ICs.
			C252.2	communicate effectively about the design of basic combinational circuits and verify their functionality.
			C252.3	design the basic sequential circuits.
			C252.4	design counters and shift registers and verify their functionality with truth tables.
27	EC-253	DATA STRUCTURE S THROUGH C++ LAB	C253.1	implement basic Object Oriented features of C++

			C253.2	implement the concepts of encapsulation and compile time polymorphism
			C253.3	implement the concepts of Inheritance, Runtime polymorphism and Templates
			C253.4	implement Lists, Stacks and Queue ADTs.
			C253.5	implement BST ADT and different sorting algorithms.
28	EC207	COMPLEX AND NUMERICAL ANALYSIS	C207.1	Apply knowledge in Cauchy – Riemann equations and Harmonic functions to problems on electro- magnetic fields, Orthogonal system
			C207.2	evaluate complex line integrals.
			C207.3	Evaluate singularities of complex functions and determine values of integrals using Residues.
			C207.4	Find numerical solution of Ordinary differential equations.
			C207.5	Find numerical solution of Partial differential equations
29	EC208	ELECTRONIC CIRCUIT ANALYSIS	C208.1	Demonstrate knowledge in i.single stage BJT and MOSFET amplifiers. ii.feedback amplifiers and oscillators. iii.powerr amplifiers. iv.biasing of integrated circuits and active loads.
			C208.2	Analyze the electronic circuits BJT, MOSFET amplifiers, Oscillators and power amplifiers for the given set of specifications.
			C208.3	Design and develop electronic circuits such as voltage amplifiers,oscillators, power amplifiers and current mirrors for the given specifications.
			C208.4	Apply course knowledge and evaluate problems pertaining to electronic circuits such as BJT amplifiers, MOSFET amplifiers, feedback amplifiers, oscillators, power amplifiers and current sources to provide valid conclusions.
			C208.5	Select and identify the appropriate frequency region of operation for understanding the frequency response. Amplification factors and impedance matching properties of electronic circuits.
30	EC209	COMPUTER ORGANISATION	C209.1	demonstrate knowledge on Computer Arithmetic units, Register Transfer and Computer Instructions, Design of Control Unit,Input Output Organization and Memory system ,Pipelining and Multiprocessing
			C209.2	. understand the basic structure of computer and in detail the operation of the arithmetic unit including the algorithms and implementation of fixed-point and floating-point arithmetic
			C209.3	. investigate the performance of memory and pipelined processors,analyze the concept of pipelining,understand and analyze various issues related to memory hierarchy.
			C209.4	eveluate various modes of data transfer between CPU and I/O devices

			C209.5	examine various inter connection structures of multi processors
31	EC210	ANALOG COMMUNICATION	C210.1	demonstrate fundamental knowledge in i.elements of analog communication ii.generation and detection of AM, PM, FM and pulse modulated signals iii.effect of noise on AM and FM transmission iv.TDM and FDM systems v.radio transmitters and receivers
			C210.2	analyse different types of analog modulation systems and calculate total power, bandwidth of AM ,PM and FM.
			C210.3	design an efficient transmitter and receiver based on SNR,Bandwidth and equipment complexities
			C210.4	formulate and solve specific problems in analog communication systems
			C210.5	analyze the impact of noise on the performance of receiver.
32	EC211	ELECTROMAGNETIC FIELDS & TRANSMISSION LINES	C211.1	demonstrate knowledge in electrostatic fields , steady magnetic fields, electromagnetic wave propagation and transmission lines.
			C211.2	analyze different applications of gauss's law, ampere's law, electric and magnetic boundary conditions in different mediums,reflection of electromagnetic waves in free space and in transmission lines
			C211.3	develop the solutions for complex engineering problems of propagation parameters of electromagnetic waves propagating in free space and transmission lines.
			C211.4	evaluate potential in electric and magnetic fields.
			C211.5	design and analyze appropriate techniques in transmission line parameters to deliver maximum energy at load.
33	EC212	ELECTRICAL ENGINEERING AND MEASUREMENTS	C212.1	analyze the importance of Electric & Magnetic fields in DC machines.
			C212.2	know the selection of AC machines, Transformers, Induction Machines and their utilization in different applications
			C212.3	know types of instruments and principle of operation of various analog and measure various parameters like resistance, inductance, and capacitance.
			C212.4	measure the various parameters using Cathode Ray Oscilloscope
			C212.5	know about various transducers and understand the applications of transducers.
34	EC254	SIGNALS & SYSTEMS LAB	C254.1	understanding the generation of unit step, impulse, ramp and sinusoidal sequences.
			C254.2	analyze the discrete time sequence using sampling theorem.

			C254.3	design and implement LPF and HPF filters.
			C254.4	evaluating different transform techniques
35	EC255	ELECTRONIC CIRCUITS LAB	C255.1	find Band Width, input impedance and output impedances of CE (Common Emitter), CS (CommonSource), and RC coupled amplifiers.
			C255.2	find the frequency response of voltage shunt amplifiers
			C255.3	design RC phase Shift oscillators, Class A power amplifier Colpitts oscillators Class B Complementary symmetry power amplifier.
36	EC256	PROFESSIONAL COMMUNICATION SKILLS LAB	C256.1	Students will improve their speaking ability in English both in terms of fluency and comprehensibility
			C256.2	Learn corporate etiquette - organizing and managing professional events.
			C256.3	Understand how reading enhances their communicative competency.
			C256.4	Students will develop their ability as critical readers and writers
			C256.5	Develop all-round personalities with a mature outlook to function effectively in different circumstances
37	EC301	PULSE AND DIGITAL CIRCUITS	C301.1	i.obtain responses of HP & LP RC circuits for different input ii.understand and analyze clipping and clamping operations iii.multi vibrators iv.methods of generating time base waveform v.classification of ICs logic families and interfacing between different logic families
			C301.2	analyze the performance of linear and non linear wave shaping circuits.
			C301.3	design and develop different multivibrator circuits, sweep circuit clipper and clamper circuits
			C301.4	solve engineering problems pertaining to pulse and digital circuits.
			C301.5	assess cost effective digital ICs to meet design constraints to address societal needs
38	EC302	MICROPROCESSORS & MICROCONTROLLERS	C302.1	demonstrate knowledge in internal hardware details of intel 8086, 8051 and programmable devices like 8255, 8251, 8259, 8254 and interfacing various peripherals to build standalone systems
			C302.2	critically analyze the requirements to meet the specifications of microprocessors and microcontrollers based systems
			C302.3	exhibit programming skills , choose suitable hardware and program the devices to solve engineering problems
			C302.4	design a system microprocessor and microcontroller based systems to meet desired needs within realistic constraints such as economic, environmental, health care and safety



			C302.5	apply concepts of microprocessors and microcontrollers for solving societal problems
39	EC303	LINEAR IC'S AND ITS APPLICATIONS	C303.1	analyze circuits with op amp using resistive feedback
			C303.2	design filters using op amps and static limitations of op amp.
			C303.3	understand dynamic limitations of op amp and stabilizing the circuits with op amps.
			C303.4	Understand the behavior of non linear circuits and signal generators using op amps
			C303.5	understand A-D and D-A conversion techniques and the operation of nonlinear amplifiers
40	EC304	DIGITAL COMMUNICATIONS	C304.1	i.elements of digital communication systems ii.digitization's techniques such as PCM,DPCM, DM &ADM iii.error probability and detection of baseband and band pass modulated signals iv.measure of digital information v.source and error control coding techniques
			C304.2	analyze different types of digital modulation schemes based on bit error probability.
			C304.3	select appropriate coding technique based on the requires transmission rate and channel capacity available
			C304.4	solve problems using different coding techniques to improve error performance in digital communication system.
			C304.5	apply the knowledge to meet the responsibilities related to professional engineering practice
41	EC305	CONTROL ENGINEERING	C305.1	understand the use of transfer function and impulse response functions to find the response of control systems.
			C305.2	understand the transient and steady state responses of first and second order systems with the help of time domain specifications.
			C305.3	understand role of the root locus plotting techniques in the analysis of control systems
			C305.4	understand the concepts required to plot bode diagrams and polar plots to do the stability analysis of control systems
			C305.5	understand the advantage of representing control systems in state space
42	EC306	ANTENNAS AND WAVE PROPAGATION	C306.1	explain the radiation mechanism of EM waves by antennas and their radiation patterns.
			C306.2	analyze the power radiated by different antennas an their radiation characteristics.
			C306.3	interpret the relationships between antenna parameters.
			C306.4	categorize and design of different antennas ,their relationships and antenna arrays.

			C306.5	classify and analyze different types of antennas and wave propagation mechanism
43	EC351	MICROPROCESSORS & MICROCONTROLLERS LAB	C351.1	develop programs for various problems. using 8086 microprocessor.
			C351.2	understand interfacing 8086 microprocessor to external world.
			C351.3	develop programs for various applications using 8051 microcontroller.
44	EC352	ANALOG COMMUNICATION LAB	C352.1	design and analyze the modulation and demodulation for different analog techniques like AM, FM, PM.
			C352.2	conduct and verify the frequency responses of pre-emphasis and de-emphasis circuits.
45	EC353	CIRCUIT SIMULATION LAB	C353.1	write a netlist from the given circuit, simulate it and observe the transient & frequency response plots.
			C353.2	verify characteristics of rectifiers circuits.
			C353.3	obtain frequency response of various amplifiers
			C353.4	simulate LC oscillators, RC oscillator and analog modulation techniques.
46	EC307	HDL PROGRAMMING	C307.1	demonstrate knowledge on HDL design flow, digital circuits design, switch de-bouncing, metastability, memory devices applications
			C307.2	design and develop the combinational and sequential circuits using behavioral modeling
			C307.3	solving algorithmic state machines using hardware description language
			C307.4	analyze the process of synthesizing the combinational and sequential descriptions
			C307.5	memorizing the advantages of programmable logic devices and their description in Verilog
47	EC308	GRAPHICAL SYSTEM DESIGN	C308.1	apply knowledge to understand various controls & indicators, arrays, strings, loops, clusters and various debugging tools in LabVIEW.
			C308.2	implement VI's using arrays, strings, loops and clusters.
			C308.3	design complex VI's using sub VI
			C308.4	analyze the data flow for advanced LabVIEW structures
			C308.5	describe the DAQ interface for real time applications.
48	EC309	COMPUTER NETWORKS	C309.1	summarize and contrast: i. functionalities of various OSI & TCP/IP layers ii. datalink and MAC protocols iii. routing protocols iv. congestion control algorithms v. TCP, UDP
			C309.2	discover the issues related to data link, medium access and transport layers by using channel allocation and

				connection management schemes
			C309.3	choose and justify various addresses for networking requirements
			C309.4	identify network standards - 802.3 and 802.11 for developing computer networks
			C309.5	determine impact of wired and wireless networks in the context of legal ,safety and societal issues
49	EC310	DIGITAL SIGNAL PROCESSING	C310.1	use concepts of complex quantities, discrete Fourier transforms, z-transforms to analyze the operations on discrete signals and acquire comprehensive knowledge of discrete-time signal and frequency transform methods,i.e., Discrete Fourier Transform (DFT) and Fast Fourier Transform(FFT) .
			C310.2	apply the Z-transform to analyze the digital filters to compute magnitude and phase response and analyze the stability of the system
			C310.3	perform discrete Fourier transform using standard transforms and properties and also acquire knowledge of computing DFT efficiently by using decimation in time and decimation in frequency algorithms
			C310.4	design, implementation, analysis of IIR & FIR digital filters for processing of discrete time signals.
			C310.5	assess the techniques ,skills and modern engineering tools for analysis of discrete signals and perform the digital filtering in engineering practice
50	EC311A	TV ENGINEERING	C311A.1	understand the fundamentals of television
			C311A.2	know the detailed functionality of monochrome TV transmitters and receivers
			C311A.3	know the types of camera tubes and essentials of colour television
			C311A.4	know the colour TV display tubes and colour TV systems.
			C311A.5	understand various advanced colour TV technologies
51	EC311B	EMC / EMI	C311B.1	To know about the history of EMI and their sources.
			C311B.2	learn about various types of Noise sources
			C311B.3	know about various methods for suppression of EMI.
			C311B.4	know about shielding Effectiveness and its determination.
			C311B.5	know about the design of simple circuits for EMC
52	EC311C	BIOMEDICAL INSTRUMENTATION	C311C.1	understand about Bio-signals and their characteristics, biological parameters and relationship between them
			C311C.2	understand about the principles involved in acquiring different bio-signals.

			C311C.3	understand about Anatomy of the nervous system-neuronal communication
			C311C.4	understand or become aware of different Therapeutic equipment.
			C311C.5	understand about Modern medical imaging systems-Radiography.
53	EC311D	TELECOMMUNICATION SWITCHING SYSTEM	C311D.1	. demonstrate knowledge in switching system, subscriber loop systems, transmission plan, data communication protocols and networks, multiplexing technology, ISDN and DSL in home networking
			C311D.2	evaluate the digital signal path in Time and Space in Traffic load switching systems
			C311D.3	understand the concept of Data Link Protocols in Networks
			C311D.4	analyze the concept of Multiplexing techniques
			C311D.5	evaluate the inherent facilities within the system to test some of the ISDN and digital switch Functions
54	EC312A	OPERATING SYSTEMS	C312A.1	understand the structures of an operating system and design issues associated with operating systems.
			C312A.2	understand various process management concepts, scheduling and multithreading concepts.
			C312A.3	understand the concept of synchronization and deadlocks.
			C312A.4	understand the memory management including virtual memory
			C312A.5	understand issues related to file system interface and implementation and disk management.
55	EC312B	NEURAL NETWORKS	C312B.1	understand the fundamentals such as neural networks, learning laws and their applications
			C312B.2	understand how to train the neural networks to solve linear separability with perceptions and also to understand support vector classification.
			C312B.3	understand how to train Back propagation algorithm and setting the parameter values.
			C312B.4	understand about the clustering process using neural networks such as counter propagation networks and Adaptive Resonance Theory.
			C312B.5	apply the principles of Artificial Neural Networks in the fields of image processing, pattern recognition.
56	EC312C	FUZZY LOGIC	C312C.1	understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
			C312C.2	understand the basic features of membership functions, fuzzification process and defuzzification process.
			C312C.3	design fuzzy rule based system.
			C312C.4	know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process.
			C312C.5	gain the knowledge about fuzzy C-Means clustering.

57	EC312D	SPREAD SPECTRUM COMMUNICATIONS	C312D.1	understand the various methods of spreading the spectrum and generation of codes
			C312D.2	understand the working of loops to track codes and synchronization techniques.
			C312D.3	understand the CDMA principles and various schemes for multi-user detection
			C312D.4	calculate the performance of spread spectrum systems in jamming environment with forward error correction.
			C312D.5	understand the principles and architecture of software defined radio.
58	EC354	DIGITAL COMMUNICATION LAB	C354.1	Demonstrate the knowledge in Various Waveform Coding Techniques like PCM, DPCM, DM and different Digital Modulation Techniques.
			C354.2	Analyze various Analog to Digital Conversion Techniques and Digital Modulation Techniques in time domain and perform their detection.
			C354.3	Use Scilab software for design and implementation of Line Codes, ASK, PSK, FSK, PCM.
			C354.4	Use Scilab software for design and implementation of Different Source Coding Techniques Like Huffman Coding and Channel Capacity Theorem and Convolution Encoder.
59	EC355	HDL PROGRAMMING LAB	C355.1	demonstrate knowledge on combinational circuits , sequential circuits, counters and state machines
			C355.2	design and develop the combinational and sequential circuits and all basic logic gates.
			C355.3	solving Mealy and Moore state machines, counters, adders, booth multiplier, shift registers, traffic light controller
			C355.4	analyze the simulation results for all logic circuits.
60	EC356	PULSE CIRCUITS & ICS LAB	C356.1	construct the applications including clipping, clamping and RC high filter & low pass filters.
			C356.2	develop the applications that include multivibrators
			C356.3	develop high voltage and low voltage regulators for various applications using IC 723
			C356.4	design the applications using IC566(VCO) and IC565(PLL)
61	EC401	MICROWAVE ENGINEERING	C401.1	analyze the wave propagation in TE, TM or TEM modes, in structures such as rectangular waveguides
			C401.2	design various microwave components such as power dividers, hybrid junctions, microwave solid state diodes, ferrite devices and microwave amplifier
			C401.3	. demonstrate various perceive operating principles of basic passive and active microwave devices
			C401.4	perform analysis mathematically the operation and working of the various tubes

			C401.5	demonstrate various microwave bench setup for measuring various parameters
62	EC402	VLSI DESIGN	C402.1	demonstrate knowledge in i.fabrication process ii.implementaton of digital circuits using CMOS iii.design of high speed digital circuits iv.designing memories
			C402.2	analyze i.various CMOS circuit implementation interms of delays ii.performance of IC at system level physical design
			C402.3	design of various combinational circuits using CMOS
			C402.4	apply the concept of CMOS to real time applications
			C402.5	exhibit programming skills,choose suitable hardware and program the devices to solve engineering problems.
63	EC404A	BASIC SURVEYING	C404A.1	know about the various surveying instruments.
			C404A.2	determine the relative positions of a point on the existing ground by conducting the survey.
			C404A.3	use all basic surveying instruments
			C404A.4	operate Total Station instrument.
			C404A.5	take the levels of existing ground and to determine the reduced levels.
64	EC404B	BUILDING MATERIALS & ESTIMATION	C404B.1	familiar with various building materials
			C404B.2	know about various building elements and their specifications
			C404B.3	familiar with types of masonry works and bonds used in construction
			C404B.4	understand building plan and have knowledge about building rules, bye-laws and building elements
			C404B.5	know about Valuation of building and rent fixation.
65	EC404A	ENERGY ENGINEERING	C404A.1	understand the importance of environment and conservation of natural resources.
			C404A.2	succeed in the competitive exams of energy industry.
			C404A.3	utilize the non-conventional energies in place of conventional energies and its manufacture.
			C404A.4	utilize the non- conventional energies in place of conventional energies and its manufacture
			C404A.5	maintain the sustainability in the environment.
66	ChE404 B	BIO-FUELS	C404B.1	describe the functional principle of biofuel technologies in small and large scale
			C404B.2	describe the main steps and components in bioethanol, biodiesel and biogas production
			C404B.3	Participate actively in teamwork and work with case related problem solving

			C404B.4	work with professional problem solving in an industrial environment
			C404B.5	work in other fields of engineering.
67	CS404A	JAVA PROGRAMMING	C404A.1	use the syntax and semantics of java programming language and basic concepts of OOP
			C404A.2	develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
			C404A.3	apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
			C404A.4	demonstrate how the java program communicates with the console and disk files using the concept of streams.
			C404A.5	design event driven GUI and web related applications which mimic the real word scenarios
68	CS404B	DATABASE MANAGEMENT SYSTEMS	C404B.1	understand basic concepts and use of various database systems.
			C404B.2	enforce integrity constraints to maintain validity & accuracy.
			C404B.3	write relational expressions for the queries.
			C404B.4	design and develop a database using normalization theory
			C404B.5	use different concurrency control and Recovery technique
69	EC404A	APPLIED ELECTRONICS	C404A.1	understand the working, types and applications of microphones and loudspeakers.
			C404A.2	understand the features of commercial, theatre sound recording and color TV standards
			C404A.3	understand the working of various electronic systems, telecommunication and switching systems.
			C404A.4	understand the working of various applications like digital clocks, fiber optics, microprocessor and mobile radio systems.
			C404A.5	understand consumer electronic equipment and systems like washing machines.
70	EC404B	BASIC COMMUNICATION	C404B.1	understand transmission of analog signals using amplitude modulation
			C404B.2	understand the transmission of digital signals through PCM, PAM, PPM and DELTA Modulation techniques
			C404B.3	know about various Broad band communication systems
			C404B.4	know about the monochrome and color Television fundamentals.
			C404B.5	know about Optical communication systems.
71	EE404A	NON-CONVENTIONAL ENERGY SOURCES	C404A.1	know the national scene of energy production, utilization, consumption and energy storage systems

			C404A.2	understand about the basics of solar energy, collectors & generation of electricity from solar energy & photovoltaics
			C404A.3	understand the assessment of wind energy potential, wind turbines and wind generators.
			C404A.4	know about ocean energy, temperature differences & principles, extraction of energy from waves.
			C404A.5	understand about geothermal, types & how biogas is produced & digester for power generation.
72	EE404B	UTILIZATION OF ELECTRICAL ENERGY	C404B.1	get overall idea for the different types of lamps & lighting schemes.
			C404B.2	Know about the different types electric heating methods.
			C404B.3	know the designing of heat elements such as furnaces and ovens
			C404B.4	Know how to utilize the electrical energy for production of heat and welding process.
			C404B.5	gain knowledge on principles and characteristics of storage batteries
73	IT404A	SOFTWARE ENGINEERING	C404A.1	identify, formulate, and solve Software Engineering problems
			C404A.2	Elicit, analyze and specify software requirements for various stakeholders.
			C404A.3	Familiar with Design, development, deployment and maintenance of a software project.
			C404A.4	familiar with Architecture design and User Interface design
			C404A.5	Apply software engineering paradigms to web apps.
74	IT404B	WEB TECHNOLOGIES	C404B.1	Apply technologies to develop web documents.
			C404B.2	design web pages with css and apply scripting to web documents
			C404B.3	Create dynamic web pages with javascript.
			C404B.4	Create valid and well-formed xml documents.
			C404B.5	Write server side scripts with php and database access.
75	ME404A	ROBOTICS	C404A.1	Understand basic components of robotics, classification of robots and their applications.
			C404A.2	Know on types of robot grippers, their usage and design considerations.
			C404A.3	Understand about various types of sensory devices their working and applications.
			C404A.4	Apply basic transformations related to the movement of manipulator.
			C404A.5	Design a robot mechanism to meet kinematics requirements and to write simple programs.



76	ME404B	OPERATIONS RESEARCH	C404B.1	recognize the importance and value of Operations Research and linear programming in solving practical problems in industry
			C404B.2	Interpret the transportation models' solutions and infer solutions to the real-world problems
			C404B.3	Recognize and solve game theory and assignment problems.
			C404B.4	gain knowledge of drawing project networks for quantitative analysis of projects
			C404B.5	Know when simulation and dynamic programming can be applied in real world problems.
77	EC-405	INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP	C405.1	Understand the customer perception, making him to buy the products and retaining the customer in a business.
			C405.2	Get knowledge about time value of money in the changing society and to get awareness about the calculation of several assets for tax purpose.
			C405.3	Linkage corporate vision, mission, strategies, and policies to human resource management to acquire competitive advantage and to frame strategies to develop talent and to retaining talent.
			C405.4	Become aware of the inference of organization structure and performance of people working in organizations and to develop themselves as individual entrepreneurs for the society.
			C405.5	Get awareness of managing the projects in various organizations by using different techniques.
78	EC-406A	DIGITAL IMAGE PROCESSING	C406A.1	Apply knowledge on various image processing concepts such as enhancement, restoration, segmentation and color image processing.
			C406A.2	Implement various filtering techniques for image enhancement , restoration, segmentation and color image processing.
			C406A.3	Analyze contrast enhancement, histogram processing and various thresholding techniques.
			C406A.4	Compare and contrast different compression techniques for grayscale and color images.
			C406A.5	Develop algorithms for various applications of image processing in industry and medicine
79	EC-406B	FUNDAMENTALS OF GLOBAL POSITIONING SYSTEM	C406B.1	Understand history of GPS and new trends in the GPS.
			C406B.2	Calculate GPS satellite orbit positions and velocities.
			C406B.3	Define the fundamental working principle of GPS and outline its development.
			C406B.4	Describe global satellite navigation systems, satellite orbital characteristics, and satellite signal structure.

			C406B.5	Define coordinates systems likely to be encountered by GPS users and calculate and discuss GPS coordinates.
80	EC-406C	ADVANCED DIGITAL SIGNAL PROCESSING	C406C.1	Design multistage decimator and interpolator.
			C406C.2	Design multirate filter banks.
			C406C.3	Estimate power spectrum using non-parametric techniques.
			C406C.4	Realize digital filters using lattice structures.
			C406C.5	Estimate power spectrum using parametric techniques.
81	EC-406D	SMART ANTENNAS	C406D.1	understand the various antenna parameters
			C406D.2	Demonstrate basic understanding of smart antennas for broad frequency range.
			C406D.3	Demonstrate basic understanding of wire and aperture antennas.
			C406D.4	Analyze the broadband antennas for different applications.
			C406D.5	Interpret the different microstrip antennas for smart antenna applications.
82	EC-451	MINI PROJECT / TERM PAPER	C451.1	Work with others and on one's own to pursue a goal.
			C451.2	apply Engineering knowledge and Gain project management skill
			C451.3	Develop skill at conveying activities and achievements.
			C451.4	decide and agree with peers to carryout work towards a goal
			C451.5	sustain diverse acts with partners to complete a good project
83	EC-452	GRAPHICAL SYSTEM DESIGN LAB	C452.1	Demonstrate knowledge in various aspects of my DAQ and my RIO interfaces
			C452.2	Analyze various LabVIEW programming alternatives, interfacing methods & usage of various resources like LCD, seven segment display and stepper motor
			C452.3	Design and develop LabVIEW based systems to solve engineering and societal problems.
			C452.4	Working individually and in a group to develop LabVIEW based systems
84	EC-453	DIGITAL SIGNAL PROCESSING LAB	C453.1	Analyze different modulation techniques.
			C453.2	Analyze the generation of waveforms in myDAQ.

			C453.3	Analyze the design process of IIR & FIR filter.
85	EC-407	MOBILE AND CELLULAR COMMUNICATIONS	C407.1	demonstrate knowledge on : cellular concepts like frequency reuse, fading, equalization, GSM ,CDMA
			C407.2	demonstrate knowledge hand-off and interference and apply the concept to calculate link budget using path loss model
			C407.3	demonstrate knowledge equalization and different diversity techniques
			C407.4	apply the concept of GSM in real time applications.
			C407.5	compare different multiple access techniques in mobile communication
86	EC-408	OPTICAL COMMUNICATIONS	C408.1	Apply knowledge to understand about theory of light, losses in fibers, fiber optic components, optical sources & detectors, optical transmitter & receiver configuration and optical networks
			C408.2	Describe the principle of optical Sources ,detectors and optical amplifier
			C408.3	Discuss WDM and the optical networks like SONET/SDH
			C408.4	Analyze the characteristics of fiber optical receiver, computing probability of error and dispersions
			C408.5	Design a fiber optic link based on budgets and to assess the different losses in fibers
87	EC-409A	SATELLITE COMMUNICATION	C409A.1	demonstrate knowledge in basic concepts of satellite communication and global positioning systems
			C409A.2	perform analysis of complex engineering problems pertaining of satellite systems
			C409A.3	design and develop satellite links and communication systems.
			C409A.4	solve engineering problems with feasible and economical solutions in satellite communications
			C409A.5	demonstrate various multiple access techniques satellite navigation system.
88	EC-409B	EMBEDDED SYSTEMS	C409B.1	i.outline the knowledge on Processor ,IC and Design Technologies ii.state machines and models iii.memories iv.communication interfaces and RTOs v.design process models
			C409B.2	discover various problems in optimization of custom single purpose processor and synchronization among processes and scheduling algorithms.
			C409B.3	distinguish i.different models ii.different memories iii.S.P.P and G.P.P iv.priority inversion and inheritance protocols v.embedded and real time and hand held operating systems
			C409B.4	design and choose embedded system to suit a particular application .

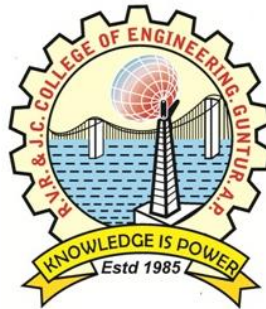
			C409B.5	decide and conclude suitable hardware and software components of a system that work together to solve engineering problems to show a specific behaviour.
89	EC-409C	DSP PROCESSORS	C409C.1	understand DSP processor and its features and applications and to understand data representation in DSP Processors.
			C409C.2	understand DSP processor addressing modes, registers.
			C409C.3	understand DSP processor instructions.
			C409C.4	understand programming concept of DSP Processors.
			C409C.5	understand different adaptive filters and code optimization techniques.
90	EC-409D	RF SYSTEM DESIGN	C409D.1	understand the role of CMOS devices physics and noise sources in the design of RF systems.
			C409D.2	understand the design intricacies of high frequency and low noise amplifiers.
			C409D.3	determine the stability using gain and phase margins and root locus techniques, and linearizing techniques for power amplifiers.
			C409D.4	understand the working of PLLs and frequency synthesizers.
			C409D.5	understand the principles of designing oscillators and mixers in RF systems.
91	EC-410A	WIRELESS AD HOC NETWORKS	C410A.1	analyze MAC protocols for Ad Hoc Wireless Networks.
			C410A.2	analyze Routing protocols for Ad Hoc Wireless Networks
			C410A.3	understand the need for Energy Management in Ad Hoc Wireless Networks .
			C410A.4	understand the issues and challenges in Wireless Network security
			C410A.5	understand the issues of routing in WSN
92	EC-410B	REAL TIME OPERATING SYSTEM	C410D.1	present the mathematical model of the system and to develop real time algorithm for task scheduling.
			C410D.2	understand capabilities Handling Resource Sharing and dependencies among Real-time Tasks.
			C410D.3	generate a high-level analysis for Scheduling Real-time tasks in multiprocessor and distributed systems.
			C410D.4	understand the working of real time operating systems and real time database.
			C410D.5	understand the fault tolerance techniques, evaluation of reliability.
93	EC-410C	SPEECH PROCESSING	C410C.1	understand the mechanism of human speech production and digital models of speech signals.
			C410C.2	apply standard digital signal processing tools to analyze speech signals in terms of their Time and frequency domain representations.

			C401C.3	understand Linear Predictive analysis of speech signal and different pitch period estimation methods.
			C410C.4	understand the Homomorphic processing of speech signal and applications of speech processing, including speech enhancement.
			C410C.5	understand the applications of speech processing including speaker recognition and speech recognition.
94	EC-410D	RADAR & NAVIGATION AL AIDS	C410D.1	analyze various types of radar equipments.
			C410D.2	demonstrate the operation of moving target indicator and tracking radar
			C410D.3	. analyze the features of radar receiver's components and their usage in aerospace guidance
			C410D.4	summarize noise jamming and different electronic warfare techniques
			C410D.5	categorize different navigational aids.
95	EC454	MICROWAVE & OPTICAL COMMUNICATION LAB	C454.1	understand the concepts of transmission of microwaves.
			C454.2	understand the concepts of fiber optic communication.
96	EC455	PROJECT AND VIVA - VOCE	C455.1	work with others and on one's own to pursue a goal
			C455.2	apply Engineering knowledge and Gain project management skill.
			C455.3	develop skill at conveying activities and achievements
			C455.4	decide and agree with peers to carryout work towards a goal.
			C455.5	sustain diverse acts with partners to complete a good project.

**R. V. R. & J. C. COLLEGE OF ENGINEERING**  
(Autonomous)

**DEPARTMENT OF INFORMATION TECHNOLOGY**

ACCREDITED BY NBA AND NAAC WITH 'A' GRADE  
Chowdavaram, GUNTUR – 522 019



**INFORMATION TECHNOLOGY**

# Course Outcomes for R16 syllabus

I Year I Semester

## IT/CS 101 DIFFERENTIAL EQUATIONS & TRANSFORMS

### Course Outcomes (COs)

After completion of the course the students will be able to:

IT101.1	Know methods of solving first order differential equations.
IT101.2	Solve higher order differential equations.
IT101.3	Solve partial differential equations.
IT101.4	Find Fourier transforms.
IT101.5	Find Laplace and inverse transforms of a function.

## IT 102 ENGINEERING PHYSICS

### Course Outcomes (COs)

After completion of the course the students will be able to

IT102.1	Know the Concepts of Ultrasonic waves, production, applications in NDT, Physical optics, devices and applications.
IT102.2	Acquire Knowledge on latest inventions like lasers, holography, fibers and their applications.
IT102.3	Introduce the student to the domain of quantum world by Schrodinger wave equation and its applications in 1-D.
IT102.4	Describe the principles of quantum physics.
IT102.5	Describe the nature of electromagnetic radiation and matter in terms of the particles.

## IT103 Applied Chemistry

### Course Outcomes (COs)

After completion of the course the students will be able to

IT103.1	Students acquire knowledge on quality and utility of water in industries.
IT103.2	Students gain knowledge on water treatment for drinking purpose.
IT103.3	Able to understand functioning of electrochemical energy systems.
IT103.4	Students can relate corrosion and environment and suggest methods to prevent corrosion.
IT103.5	Can analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.

## **IT 104 ENVIRONMENTAL STUDIES**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT104.1</b>	Define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.
<b>IT104.2</b>	Describe and discuss the environmental implications of biologically important materials through the ecosystems.
<b>IT104.3</b>	Discuss the benefits of sustaining each of the following resources - food, health, habitats, energy, water, air, soil and minerals
<b>IT104.4</b>	Know the causes, effects and controlling measures of different types of environmental pollutions with some case studies.
<b>IT104.5</b>	Know the global issues like Global warming, Acid rains, Climate change, depletion of resources etc. and develop suitable technologies for the welfare of mankind.

## **IT 105 PROBLEM SOLVING WITH C**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT105.1</b>	Develop algorithms and flow charts for simple problems.
<b>IT105.2</b>	Use suitable control structures for developing code in C.
<b>IT105.3</b>	Design modular programs using the concepts of functions and arrays.
<b>IT105.4</b>	Design well-structured programs using the concepts of structures and pointers.
<b>IT105.5</b>	Develop code for complex applications using file handling features.

## **IT106 MECHANICS FOR ENGINEERS**

### **Course Outcomes (COs)**

After completion of the course, the students will be able to

<b>IT106.1</b>	Apply principles of mechanics to determine the resultant of several forces acting on a plane.
<b>IT106.2</b>	Determine the axial forces in the members of simple trusses using method of joints.
<b>IT106.3</b>	Determine the centroids and center of gravity of mathematically definable areas as well as composite areas of standard geometrical shapes.
<b>IT106.4</b>	Analyze the problems involving dry frictional contact and wedge friction
<b>IT106.5</b>	Calculate the moment of inertia of composite areas and material bodies of standard shapes.



## IT 151 PHYSICS LABORATORY

### Course Outcomes (COs)

After completion of the course, the students will be able to

IT151.1	Use CRO, signal generator, spectrometer for making measurements.
IT151.2	Test the optical components using principles of interference & diffraction.
IT151.3	Determination of the selectivity parameter in electrical circuits.
IT151.4	Use CRO, signal generator, spectrometer for making measurements.
IT151.5	

## IT 152 C-PROGRAMMING LAB

### Course Outcomes (COs)

After completion of the course, the students will be able to

IT152.1	write simple programs using C fundamentals and control statements.
IT152.2	develop various menu driven programs using concepts of control statements, arrays, functions and pointers.
IT152.3	use dynamic memory allocation for efficient memory management.
IT152.4	develop well-structured programs using the concepts of structures, unions and file handling features.
IT152.5	design applications using C.

## IT 153 COMMUNICATION SKILLS LAB

### Course Outcomes (COs)

After completion of the course, the students will be able to

IT153.1	know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.
IT153.2	employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.
IT153.3	use confidently phrases and idioms for effective communication.
IT153.4	develop appropriate speech dynamics in professional situations.
IT153.5	focus on communication skills and social graces necessary for effective communication

## I Year II Semester

### IT 107 MATRIX ALGEBRA & NUMERICAL ANALYSIS

#### Course Outcomes (COs)

After completion of the course, the students will be able to understand

IT107.1	Know the basic linear algebraic concepts.
IT107.2	Evaluate double, triple integrals and the area, volume by double & triple integrals respectively.
IT107.3	Solve gradient, divergence, curl and integration of vector function problems.
IT107.4	Solve system of equations.
IT107.5	Evaluate derivatives and integrals using numerical techniques

### IT108 ELECTRONIC AND ELECTRICAL ENGINEERING MATERIALS

#### Course Outcomes (COs)

After completion of the course the students will be able to

IT108.1	know the nature of formation of bands in solid and classifying the solids, Importance of Fermi level and law of mass action in semiconductors.
IT108.2	know the theory of P-N junction and the devices based on it.
IT108.3	know the importance of polarization and magnetization phenomena and their applications
IT108.4	know the relevance of superconductivity and its applications
IT108.5	know nano material and their characterization principles

### IT 109 CHEMISTRY FOR ENGINEERING MATERIALS

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT109.1	Students know the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.
IT109.2	Students would be able to know usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.
IT109.3	Would acquire knowledge on composition, quality and uses of various fuels.
IT109.4	Would be capable of selecting appropriate lubricant for a given system, and know the characteristics and utility of refractories.
IT109.5	Students acquire knowledge on the requirements, applications of liquid crystals and explosives.

## **IT 110 ENGLISH FOR COMMUNICATION**

### **Course-Outcomes-(COs)**

Upon successful completion of this course, students will be able to:

<b>IT110.1</b>	Use vocabulary contextually.
<b>IT110.2</b>	Compose effectively the various forms of professional communication.
<b>IT110.3</b>	Apply grammar rules efficiently in spoken and written forms.
<b>IT110.4</b>	Know and overcome the barriers in communication.
<b>IT110.5</b>	Develop professional writing.

## **IT 111 OBJECT ORIENTED PROGRAMMING**

### **Course Outcomes (COs)**

After completion of the course, student's posses:

<b>IT111.1</b>	Apply basic Object Oriented features of C++.
<b>IT111.2</b>	Apply the concept of encapsulation and compile time polymorphism.
<b>IT111.3</b>	Implement the concepts of Inheritance and Runtime polymorphism.
<b>IT111.4</b>	Implement the concepts of exception handling and Templates.
<b>IT111.5</b>	Develop applications using C++ File I/O and other advanced concepts.

## **IT 112 PROFESSIONAL ETHICS & HUMAN VALUES**

### **Course Outcomes (COs)**

After completion of the course, student's possess:

<b>IT112.1</b>	Comprehend a specific set of behavior and values the professional interpreter must know and must abide by, including confidentiality, honesty and integrity.
<b>IT112.2</b>	Achieve the highest quality, effectiveness and dignity in both the process and products of professional work
<b>IT112.3</b>	Amplement the moral requirements of engineering experiments, and have the ability to apply their knowledge to the solution of practical and useful problems;
<b>IT112.4</b>	Protect the safety, health and welfare of the public interest.
<b>IT112.5</b>	Know and respect existing laws pertaining to professional work.

## IT 154 CHEMISTRY LABORATORY

### Course Outcomes (COs)

After completion of the course, student's posses:

IT154.1	acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.
IT154.2	prepare solutions with different concentrations.
IT154.3	analyse water for its hardness, alkalinity, chloride ion content, iron content.
IT154.4	know the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments.

## IT 155 OBJECT ORIENTED PROGRAMMING LAB

### Course Outcomes (COs)

After completion of the course, student's posses:

IT155.1	write programs using basic Object Oriented features of C++.
IT155.2	apply the concept of encapsulation and compile time polymorphism.
IT155.3	implement the concepts of Inheritance and Runtime polymorphism.
IT155.4	implement the concepts of exception handling and Templates.
IT155.5	develop applications using C++ File I/O and other advanced concepts.

## IT 156 ENGINEERING GRAPHICS LAB

### Course Outcomes (COs)

After completion of the course, student's posses:

IT156.1	acquire basic skills in Technical graphic communication.
IT156.2	visualize and communicate with 2D as well as three dimensional shapes.
IT156.3	know the application of Industry standards and best practices applied in engineering graphics.
IT156.4	apply the knowledge of development of surfaces in real life situations.
IT156.5	familiarize with modern CAD system using Auto CAD.

## II Year I Semester

### IT201 PROBABILITY-STATISTICS & RANDOM PROCESSES

#### Course Outcomes (COs)

After completion of the course, student's posses:

IT201.1	Apply knowledge of distribution theory to both software and hardware design problems
IT201.2	Apply various distribution models to design and conduct experiments, as well as to analyze and interpret data.
IT201.3	Obtain knowledge to estimate and test different criterion.
IT201.4	Test hypotheses and draw inference for engineering problems.
IT201.5	Know various processes and their application in analyzing the data.

### IT 202 BASIC ELECTRICAL & ELECTRONICS ENGINEERING

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT202.1	Know basic elements and laws of electrical circuits.
IT202.2	Analyze electrical circuits using different theorems.
IT202.3	Know about AC single phase and three phase systems.
IT202.4	Know about Various Electronic devices and their operation.
IT202.5	Know about Applications of various electronic devices such as Diode and transistor.

### IT 203 DIGITAL LOGIC DESIGN

#### Course Outcomes (COs)

At the end of the course, the student will be able to

IT203.1	Know the basic digital logic fundamentals such as numbering systems, binary codes.
IT203.2	Know the Boolean algebra concepts which are used to describe mathematical relationship between input and output signals.
IT203.3	Design combinational circuits.
IT203.4	Design Sequential logic circuits.
IT203.5	Familiarize with memory elements like RAM, ROM, and PROM.

## IT 204 DATA STRUCTURES

### Course Outcomes (COs)

At the end of the course, the student will be able to

<b>IT204.1</b>	Determine the time complexities of different algorithms, and implement ADT's of different types of linked lists and applications.
<b>IT204.2</b>	Implement stack and queue ADT's using arrays and linked lists and their applications.
<b>IT204.3</b>	Implement searching and hashing techniques.
<b>IT204.4</b>	Implement BST ADT and the constructions of Expression tree, AVL tree, and B-Tree.
<b>IT204.4</b>	Implement and analyze different sorting algorithms and Graph traversal methods.

## IT 205 COMPUTER ORGANIZATION

### Course Outcomes (COs)

After completion of the course, student's possess:

<b>IT205.1</b>	Familiarize with hardware components of a computer system and various instructions.
<b>IT205.2</b>	Familiarize with Assembly language programs and instruction execution.
<b>IT205.3</b>	Know the design of control unit and various data transfer schemes.
<b>IT205.4</b>	Know the design of ALU and pipelining operations.
<b>IT205.5</b>	Familiarize with memory hierarchy.

## IT 206 DISCRETE MATHEMATICAL STRUCTURES

### Course Outcomes (COs)

At the end of the course, the student will be able to

<b>IT206.1</b>	Apply Propositional logic and first order logic to solve problems.
<b>IT206.2</b>	Apply basic counting techniques to solve combinatorial problems.
<b>IT206.3</b>	Formulate and solve recurrence relations.
<b>IT206.4</b>	know binary relations on sets and use directed graphs for representing relations
<b>IT206.5</b>	Formulate and solve graph problems.

**IT 251 BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB**  
**Course Outcomes (COs)**

At the end of the course, the student will be able to

<b>IT251.1</b>	know working of electronic devices, analyze and design.
<b>IT251.2</b>	calculate the parameters from the characteristics like static, dynamic and reverse resistances of PN junction diode.
<b>IT251.3</b>	design the Zener voltage regulator to meet the Specifications.
<b>IT251.4</b>	verify experimentally popular BJT applications such as Amplification and digital logic.

**IT 252 DATASTRUCTURES LAB**  
**Course Outcomes (COs)**

At the end of the course, the student will be able to

<b>IT252.1</b>	different types of linked list ADT's, and applications.
<b>IT252.2</b>	stack and queue ADT's using arrays and linked lists and applications.
<b>IT252.3</b>	searching, hashing techniques.
<b>IT252.4</b>	BST ADT and Expression tree.
<b>IT252.5</b>	different sorting algorithms.

**IT 253 PROFESSIONAL COMMUNICATION SKILLS LAB**  
**Course Outcomes (COs)**

At the end of the course, the student will be able to

<b>IT253.1</b>	develop effective communication and presentation skills.
<b>IT253.2</b>	learn corporate etiquette - organizing and managing professional events.
<b>IT253.3</b>	understand how reading enhances their communicative competency.
<b>IT253.4</b>	conduct effective correspondence and prepare reports which produce results.
<b>IT253.5</b>	develop all-round personalities with a mature outlook to function effectively in different circumstances.

## II Year II Semester

### IT 207 NUMBER THEORY AND ALGEBRA

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT207.1	Know the basic number theory concepts.
IT207.2	Assess the importance of congruences and its related theorems.
IT207.3	Solve group theoretic problems.
IT207.4	Obtain the solution of problems related to polynomial rings and fields.
IT207.5	Apply mathematical concepts in relevant engineering applications.

### IT 208 MICROPROCESSORS AND INTERFACING

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT208.1	Students will be able to use 8086 microprocessor addressing modes, registers and instruction sets.
IT208.2	Students will be able to debug their assembly language programs.
IT208.3	Students will be able to understand the Minimum mode and Maximum mode configurations during Read and Write machine cycles.
IT208.4	Students will be able to understand interrupts and interrupt responses.
IT208.5	Students will be able to understand digital interfacing with 8086.

### IT 209 THEORY OF COMPUTATION

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT209.1	Design finite state machines.
IT209.2	Design $\epsilon$ -NFA, conversion between Finite automata and Regular expressions.
IT209.3	Apply pumping lemma for Regular languages, construct parse trees for CFG and ambiguous grammars.
IT209.4	Construct push-down automata and apply pumping lemma for CFL.
T209.5	Design Turing Machines and analyse Undecidability.



## IT/CS 210 DATABASE MANAGEMENT SYSTEMS

### Course Outcomes (COs)

At the end of the course the students will understand

<b>IT210.1</b>	Familiarize with fundamental concepts of database and various database architectures.
<b>IT210.2</b>	Design relations for Relational databases using conceptual data modelling.
<b>IT210.3</b>	Implement formal relational operations in relational algebra and SQL.
<b>IT210.4</b>	Identify the normalization process for relational databases
<b>IT210.5</b>	Use mechanisms for the development of multi user database applications.

## IT 211 JAVA PROGRAMMING

### Course Outcomes (COs)

At the end of the course the students will understand

<b>IT211.1</b>	Familiarize with the syntax and semantics of Java programming language.
<b>IT211.2</b>	Develop simple Java applications.
<b>IT211.3</b>	Implement multitasking, File management, and web applications.
<b>IT211.4</b>	Design and implement GUI applications with Java AWT and Swing components.
<b>IT211.5</b>	Develop applications using JDBC and socket API.

## IT 212 OPERATING SYSTEMS

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT212.1</b>	Familiarize with different types of operating systems and services.
<b>IT212.2</b>	Familiarize with process management, multithreading mechanisms.
<b>IT212.3</b>	Familiarize with deadlock and I/O systems
<b>IT212.4</b>	Familiarize with different memory management mechanisms
<b>IT212.5</b>	Familiarize with I/O Management, Secondary storage management and file management of various operating systems.

## **IT 254 MICROPROCESSORS & INTERFACING LAB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT254.1</b>	develop the microprocessor based programs for various problems
<b>IT254.2</b>	gain the logical development programs on the 8086 microprocessor
<b>IT254.3</b>	microprocessor based programs for various applications
<b>IT254.4</b>	to interface 8086 microprocessor for various simple applications

## **IT 255 DATABASE MANAGEMENT SYSTEMS LAB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT255.1</b>	populate and query a database using SQL DDL and DML commands.
<b>IT255.2</b>	declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
<b>IT255.3</b>	manipulate Database with basic and complex queries.
<b>IT255.4</b>	implement programs using PL/SQL stored procedures, stored functions, cursors and packages.
<b>IT255.5</b>	implement schema for RDBMS using schema builder, oracle forms by form builder and reports with query builder.

## **IT 256 JAVA PROGRAMMING LAB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT256.1</b>	familiar with the syntax and semantics of java programming language.
<b>IT256.2</b>	develop secure java applications.
<b>IT256.3</b>	construct simple Java user interfaces.
<b>IT256.4</b>	develop event driven GUI and web based applications.
<b>IT256.5</b>	develop the applications to interact with Database and Networking.

### III Year I Semester

## IT 301 COMPUTER NETWORKS

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT301.1</b>	Know various network architectures and functionality of physical layer.
<b>IT301.2</b>	Familiarize with data link layer protocols and Collision-Free Protocols
<b>IT301.3</b>	Apply different routing, congestion control algorithms with QoS techniques.
<b>IT301.4</b>	know various internet protocols, design issues and elements of transport layer.
<b>IT301.5</b>	Recognize transport layer protocols and various application layer protocols.

## IT 302 WEB TECHNOLOGIES

### Course Outcomes (COs)

At the end of the course the students will be able to design and develop

<b>IT302.1</b>	create static web pages using XHTML, CSS, and JavaScript.
<b>IT302.2</b>	design dynamic Web Pages using client side scripting
<b>IT302.3</b>	create XML documents and work with web servers to create web applications with ruby on rails platform.
<b>IT302.4</b>	write server side programs with Java Servlet Technologies.
<b>IT302.5</b>	design Rich Internet Applications with AJAX

## IT 303 DESIGN& ANALYSIS OF ALGORITHMS

### Course Outcomes (COs)

At the end of the course the students will be able to design and develop

<b>IT303.1</b>	Compute time and space complexity of algorithms.
<b>IT303.2</b>	Deduce the recurrence relations that describe the time complexity of recursively-defined algorithms, and solve recurrence relations.
<b>IT303.3</b>	Design algorithms using divide and conquer, greedy, and dynamic programming strategies and recite algorithms that employ these strategies.
<b>IT303.4</b>	Design algorithms using backtracking and branch and bound strategies and recite algorithms that employ these strategies.
<b>IT303.5</b>	Know the fundamental concepts of classification of algorithms.

## IT/CS 304 UNIX PROGRAMMING

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT304.1</b>	Use UNIX commands for solving problems and work with AWK programming.
<b>IT304.2</b>	Write shell scripts for solving problems that can't be solved by simple commands.
<b>IT304.3</b>	Use system calls for system programming.
<b>IT304.4</b>	Implement client/server communication using IPC mechanisms.
<b>IT304.5</b>	Use resources of computers effectively and efficiently.

## IT/CS 305 COMPILER DESIGN

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT305.1</b>	familiarize with phases of compiler and Lexical analysis.
<b>IT305.2</b>	implement Parsers.
<b>IT305.3</b>	create symbol tables and specify various intermediate code forms for compiler construction
<b>IT305.4</b>	design code generator through optimized intermediate code forms.
<b>IT305.5</b>	specify the various code optimization methods and runtime allocation strategies.

## IT 306 SOFTWARE ENGINEERING

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT306.1</b>	Identify, formulate, and solve real world problems
<b>IT306.2</b>	Elicit, analyze and specify software requirements from various stakeholders
<b>IT306.3</b>	Participate in design, development, deployment and maintenance of software projects
<b>IT306.4</b>	Test and assess the quality of the systems build
<b>IT306.5</b>	Evaluate the impact of potential solutions to complex problems in a global society.

## IT 351 WEB TECHNOLOGIES LAB

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT351.1</b>	Create static web pages using XHTML, CSS, and JavaScript.
<b>IT351.2</b>	Design dynamic webpages using client side scripting.
<b>IT351.3</b>	Create XML documents and work with web servers to create web applications with ruby on rails platform.
<b>IT351.4</b>	Write server side programs with Java Servlet Technologies.
<b>IT351.5</b>	Design Rich Internet Applications with AJAX.

## IT 352 DESIGN & ANALYSIS OF ALGORITHMS LAB

### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT352.1</b>	Analyze the efficiency and correctness of algorithms.
<b>IT352.2</b>	Implement algorithms using various design strategies.
<b>IT352.3</b>	Choose appropriate algorithmic design technique to solve a given problem.

## IT 353 UNIX PROGRAMMING LAB

### Course Outcomes (COs)

At the end of the course, the student will be able to

<b>IT353.1</b>	use UNIX commands for solving problems and write AWK programmes.
<b>IT353.2</b>	write shell scripts for solving problems
<b>IT353.3</b>	use file and process management system calls for system programming.
<b>IT353.4</b>	implement signal handling mechanisms.
<b>IT353.5</b>	implement client/server communication using IPC mechanisms.

### III Year II Semester

#### IT 307 NETWORK PROGRAMMING

##### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT307.1</b>	familiarize the basics of network programming.
<b>IT307.2</b>	implement client/server applications using elementary socket functions.
<b>IT307.3</b>	develop concurrent client/server programs using multiplexing system calls.
<b>IT307.4</b>	write client/Server program using threads and compare different TCP client/server design alternatives.
<b>IT307.5</b>	

#### IT/CS 308 DATA ENGINEERING

##### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT308.1</b>	apply fundamental concepts for the construction of Data Warehouse.
<b>IT308.2</b>	familiarize with Data Mining concepts.
<b>IT308.3</b>	extract association rules from transactional databases.
<b>IT308.4</b>	demonstrate different classification techniques and data mining concepts on complex data objects.
<b>IT308.5</b>	implement various clustering techniques.

#### IT 309 OBJECT ORIENTED ANALYSIS AND DESIGN

##### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT309.1</b>	construct the requirements model for an Information system.
<b>IT309.2</b>	formulate a behavioral model and specify the dynamic behavior of the system.
<b>IT309.3</b>	specify the control and operation specifications of an information system.
<b>IT309.4</b>	develop a design model using design patterns.
<b>IT309.5</b>	implement and manage a software project.

## **IT 310 CRYPTOGRAPHY & NETWORK SECURITY**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT310.1</b>	identify common network security vulnerabilities/attacks, classical and symmetric encryption schemes.
<b>IT310.2</b>	analyze the concepts of public key encryption and key management schemes.
<b>IT310.3</b>	design MAC and Hashing techniques needed for authentication.
<b>IT310.4</b>	analyze the IP security header formats and know the applications like kerberos , PGP.
<b>IT310.5</b>	know the concept of Firewalls configuration, Web security mechanisms and Intrusion detection techniques.

## **IT 311 (A) ARTIFICIAL INTELLIGENCE**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT311(A).1</b>	know fundamental concepts of artificial intelligence, agents, and their environments.
<b>IT311(A).2</b>	apply problem solving techniques for solving search problems.
<b>IT311(A).3</b>	Know search-based techniques and solve constraint satisfaction problems.
<b>IT311(A).5</b>	Know different classical planning methods and represent predicate/ proposition logic and infer new knowledge.
<b>IT311(A).5</b>	know various planning techniques.

## **IT/CS 311(B) PRINCIPLES OF PROGRAMMING LANGUAGES**

### **Course Outcomes (COs)**

<b>IT311(B).1</b>	know the syntax and semantics of various programming languages.
<b>IT311(B).2</b>	describe the usage of data types and statement-level control structural in various languages.
<b>IT311(B).3</b>	familiarize the concepts like sub programs and implementation of sub programs.
<b>IT311(B).4</b>	familiarize the concepts like, Support for Object-Oriented programming and Concurrency in various languages.
<b>IT311(B).5</b>	apply the Exception Handling and Event Handling concepts related to JAVA.

## **IT 311(C) MULTIMEDIA SYSTEMS**

### **Course Outcomes (COs)**

At the end of the course, the students will be able to

<b>IT311(C).1</b>	develop and handle the Graphics/Image file formats for a computer/smart phones.
<b>IT311(C).2</b>	modify and edit various color images, color models.
<b>IT311(C).3</b>	use various lossy and lossless compression techniques.
<b>IT311(C).4</b>	know various image and video standard formats.
<b>IT311(C).5</b>	apply Multimedia data communication.

## **IT 311(D) MOBILE COMPUTING**

### **Course Outcomes (COs)**

At the end of the course, the students will be able to

<b>IT311(D).1</b>	Know the architecture and design considerations for mobile computing.
<b>IT311(D).2</b>	recognize the upcoming technologies in mobile computing.
<b>IT311(D).3</b>	identify the communication architecture for the applications.
<b>IT311(D).4</b>	familiarize with different messaging technologies.
<b>IT311(D).5</b>	identify the operating system suitable for the device and the services.

## **IT 312(A) EMBEDDED SYSTEMS**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT312(A).1</b>	familiarize with embedded system concepts, hardware and software.
<b>IT312(A).2</b>	familiarize with the embedded system architecture and interrupt handling.
<b>IT312(A).3</b>	familiarize with solutions for shared data problems.
<b>IT312(A).4</b>	familiarize with Memory management techniques and RTOS concepts.
<b>IT312(A).5</b>	familiarize with system environment for development of Embedded system

## **IT 312(B) ADVANCED DATABASE MANAGEMENT SYSTEMS**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT312(B).1</b>	know System Architecture and Catalog.
<b>IT312(B).2</b>	use Distributed database Concepts.
<b>IT312(B).3</b>	design Distributed Relational Database system, ORDBMS and Object DBMSs concepts.
<b>IT312(B).4</b>	use the solutions related to advanced database concepts.
<b>IT312(B).5</b>	familiarize with mobile databases.



**IT 312(C) GRAPH THEORY**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT312(C).1</b>	know the basics of Graph Theory.
<b>IT312(C).2</b>	apply Graph Theory for solving Problems.
<b>IT312(C).3</b>	know sets and graph coloring problems.
<b>IT312(C).4</b>	know the planar and directed graphs.
<b>IT312(C).5</b>	apply Graph Theory for solving Network applications.

**IT 312(D) INDUSTRY RELATED SUBJECT (Mobile application Development)**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT312(D).1</b>	Install the required tools for Android programming.
<b>IT312(D).2</b>	Design User Interfaces with Android Programming.
<b>IT312(D).3</b>	Design User Interfaces using views with Android Programming.
<b>IT312(D).4</b>	Understand Data Persistence.
<b>IT312(D).5</b>	Understand Messaging and Networking with Android.

**IT 354 NETWORK PROGRAMMING LAB**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT354.1</b>	design a client/server programs using TCP sockets for given application.
<b>IT354.2</b>	design a client/server programs using UDP sockets for given application.
<b>IT354.3</b>	handle different signals in socket programming.
<b>IT354.4</b>	design and implement multithreaded server for a given application.
<b>IT354.5</b>	design a client/server using TCP sockets for file transfer.

**IT 355 DATA ENGINEERING LAB**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT355.1</b>	apply fundamental concepts for the construction of Data Warehouse.
<b>IT355.2</b>	familiarize with Data Mining concepts. use preprocessing techniques.
<b>IT355.3</b>	extract association rules from transactional databases
<b>IT355.4</b>	implement various clustering techniques
<b>IT355.5</b>	demonstrate different classification techniques and data mining concepts on complete data objects.

**IT 356 OBJECT ORIENTED ANALYSIS AND DESIGN LAB**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT356.1</b>	know the importance of systems analysis and design in solving computer Based problems.
<b>IT356.2</b>	develop UML models which are used during the phases of the Rational Unified Process.
<b>IT356.3</b>	analyze interactions among analysis classes for developing the class model and identify the dynamic behaviour of the system.
<b>IT356.4</b>	identify the functionality of each UML model in developing and deploying object-oriented software.

## IV Year I Semester

### 401 DISTRIBUTED SYSTEMS

#### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT401.1</b>	know the basic issues and communication mechanisms in distributed systems.
<b>IT401.2</b>	design the communication models in distributed systems.
<b>IT401.3</b>	acquaint with naming and synchronization of distributed applications.
<b>IT401.4</b>	know recovery from faults.
<b>IT401.5</b>	familiarize with distributed file based and web based paradigms.

### IT402 WEB SERVICES

#### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT402.1</b>	design dynamic web pages with JSP.
<b>IT402.2</b>	develop DOM and SAX parsers.
<b>IT402.3</b>	create Enterprise Java Beans.
<b>IT402.4</b>	use Java Mail, RMI and Corba in real time web applications.
<b>IT402.5</b>	create and consume Web Services.

### IT404 WEB Technologies

**(OPEN ELECTIVE offered by department to other department students)**

#### Course Outcomes (COs)

At the end of the course the students will be able to

<b>IT402.1</b>	apply technologies to develop web documents.
<b>IT402.2</b>	design web pages with CSS and apply scripting to web documents.
<b>IT402.3</b>	create dynamic web pages with java script.
<b>IT402.4</b>	create valid and well-formed xml documents.
<b>IT402.5</b>	write server side scripts with php and database access.

## **IT 405 INTERACTIVE COMPUTER GRAPHICS**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT405.1</b>	know the functions and operations of display hardware and associated devices.
<b>IT405.2</b>	draw lines, circles, and ellipse and implement polygon fill algorithms and 2D transformations.
<b>IT405.3</b>	implement 2D clipping and projections and Know 3D concepts.
<b>IT405.4</b>	implement 3D representations and transformations.
<b>IT405.5</b>	implement 3D clipping and projections

## **IT 406 (A) OPEN SOURCE SYSTEMS**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT406(A).1</b>	develop web applications using Apache, PHP, and MySQL and apply the OOP concepts.
<b>IT406(A).2</b>	create database driven web applications.
<b>IT406(A).3</b>	create powerful web applications using Ajax.
<b>IT406(A).4</b>	create images at the web server.
<b>IT406(A).5</b>	manipulate XML documents using PHP and CreateRSS.

## **IT 406(B) .NET TECHNOLOGIES**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT406(B).1</b>	apply basic concepts of C# programming.
<b>IT406(B).2</b>	apply advanced concepts of C# programming.
<b>IT406(B).3</b>	develop and deploy windows applications.
<b>IT406(B).4</b>	develop and deploy web applications and web services using ASP.NET.
<b>IT406(B).5</b>	develop database driven applications using XML and LINQ.

## **IT 406(C) PROGRAMMING WITH PYTHON**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT406(C).1</b>	describe various types of data, and control structures in python.
<b>IT406(C).2</b>	use procedure oriented features of python.
<b>IT406(C).3</b>	develop applications using various functions with python modules.
<b>IT406(C).4</b>	construct applications for manipulating files.
<b>IT406(C).5</b>	implement applications using object oriented programming features in python.

## **IT 406(D) INTERNET OF THINGS**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT406(D).1</b>	know the vision and the Market perspective of IoT.
<b>IT406(D).2</b>	use of Devices, Gateways and Data Management in IoT.
<b>IT406(D).3</b>	build state of the art architecture in IoT.
<b>IT406(D).4</b>	develop various Application of IoT in Real World.
<b>IT406(D).5</b>	develop various applications for Commercial Building Automation.

## **IT 451 MINI PROJECT /TERM PAPER**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT451.1</b>	identify a technical problem and mingle with the latest developments in the selected area.
<b>IT451.2</b>	develop/study a prototype.
<b>IT451.3</b>	develop solution to the selected problem.
<b>IT451.4</b>	prepare a technical report.
<b>IT451.5</b>	

## **IT 452 WEB SERVICES LAB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT452.1</b>	design dynamic web pages with JSP.
<b>IT452.2</b>	develop DOM and SAX parsers.
<b>IT452.3</b>	create Enterprise Java Beans.
<b>IT452.4</b>	use Java Mail, RMI and Corba in real time web applications.
<b>IT452.5</b>	create and consume Web Services.

## **IT 453 (A) OPEN SOURCE SYSTEMS LAB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT453(A).1</b>	develop web applications using Apache, PHP, and MySQL and apply the OOP concepts.
<b>IT453(A).2</b>	create database driven web applications.
<b>IT453(A).3</b>	create powerful web applications using Ajax.
<b>IT453(A).4</b>	create images at the web server.
<b>IT453(A).5</b>	Manipulate XML documents using PHP and Create RSS.

**IT 453 (B) .NET TECHNOLOGIES LAB**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT453(B).1</b>	apply basic concepts of C# programming.
<b>IT453(B).2</b>	apply advanced concepts of C# programming.
<b>IT453(B).3</b>	develop and deploy windows applications.
<b>IT453(B).4</b>	develop and deploy web applications and web services using ASP.NET.
<b>IT453(B).5</b>	develop database driven applications using XML and LINQ.

**IT 453 (C) PROGRAMMING WITH PYTHON LAB**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT453(C).1</b>	apply procedure oriented features of Python
<b>IT453(C).2</b>	apply Object oriented programming features of Python
<b>IT453(C).3</b>	develop applications for manipulating files
<b>IT453(C).4</b>	implement graphical windows using turtle graphics
<b>IT453(C).5</b>	develop programs using recursion

**IT 453 ( D ) INTERNET OF THINGS LAB**  
**Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT453(D).1</b>	build state of the art architecture in IoT.
<b>IT453(D).2</b>	develop various Application of IoT in Real World.

## IV Year II Semester

### IT 407 INDUSTRIAL ENGINEERING & MANAGEMENT

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT407.1	Know General Management Concepts and Forms of Business Organization.
IT407.2	Familiarize with Financial Management, economic evaluation and depreciation.
IT407.3	Know Human Resource Management.
IT407.4	Identify Material Management.
IT407.5	Familiarize with Marketing Management

### IT 408 DISTRIBUTED AND CLOUD COMPUTING

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT408.1	address the core issues of distributed and cloud computing.
IT408.2	know the concepts of massive parallelism.
IT408.3	know the virtualization issues related to the clusters and data centers.
IT408.4	provide appropriate cloud computing solutions and recommendations according to the applications used.
IT408.5	familiarize with enabling technologies of Internet of Things.

### IT 409 (A) PARALLEL ALGORITHMS

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT409(A).1	know massive parallelism on large-scale and model parallel programs for Selection and merging.
IT409(A).2	analyze and model parallel programs sorting and searching.
IT409(A).3	analyze and model parallel programs for permutation, Combination and Matrix .
IT409(A).4	analyze and model parallel programs for Graph algorithms and applications.
IT409(A).5	analyze and model parallel programs for Computing Prefix Sums and Applications.

### IT 409 (B) DIGITAL IMAGE PROCESSING

#### Course Outcomes (COs)

At the end of the course the students will be able to

IT409(B).1	familiarize with fundamentals of digital image processing.
IT409(B).2	apply techniques of smoothening and sharpening in spatial and frequency domain.
IT409(B).3	use restoration techniques.
IT409(B).4	develop image compression techniques using standard algorithms to meet design specifications.
IT409(B).5	know Morphological processing and Image segmentation techniques.

## **IT 409(C) NATURAL LANGUAGE PROCESSING**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT409(C).1</b>	know the applications of natural language processing.
<b>IT409(C).2</b>	know the structural components of sentences for a given Grammar.
<b>IT409(C).3</b>	represents context-independent meaning of a sentence.
<b>IT409(C).4</b>	link logical forms with syntactic structures for semantic interpretation of the sentence.
<b>IT409(C).5</b>	generate contextual representation.

## **IT 409 (D) CYBER SECURITY**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT409(D).1</b>	identify common security vulnerabilities/attacks, principles and concepts, Data protection and content analysis techniques.
<b>IT409(D).2</b>	know polices, laws & regulations and counter measures.
<b>IT409(D).3</b>	know the concepts of security frameworks, security policy objectives and security documentation.
<b>IT409(D).4</b>	analyze copyright & Trademarks, cyber user issues and conflict issues.
<b>IT409(D).5</b>	analyze risk management in various sectors and data backup procedures.

## **IT 410 (A) MACHINE LEARNING**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT410(A).1</b>	know learning system using concept learning.
<b>IT410(A).2</b>	solve Machine Learning problems using decision tree.
<b>IT410(A).3</b>	develop solutions to machine learning problems using neural network models
<b>IT410(A).4</b>	solve machine learning problems using Bayesian.
<b>IT410(A).5</b>	apply instance based learning techniques to solve different problems.

## **IT 410 (B) SEMANTIC WEB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT410(B).1</b>	familiarize with Semantic Web technologies.
<b>IT410(B).2</b>	write RDF for Semantic Web-systems.
<b>IT410(B).3</b>	analyze Semantic web structures by using OWL and Inference rules.
<b>IT410(B).4</b>	develop Semantic Web applications.
<b>IT410(B).5</b>	use Ontologies in Semantic Web-system.



## **IT 410(C) BIG DATA ANALYTICS**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT410(C).1</b>	know key issues in big data management and its associated applications.
<b>IT410(C).2</b>	apply fundamental enabling techniques and scalable algorithms in big data analytics.
<b>IT410(C).3</b>	Interpret models for similarity and distance measures.
<b>IT410(C).4</b>	familiarize with mining data stream models.
<b>IT410(C).5</b>	apply big data analytics in various applications.

## **IT 410(D) Industry Related subject ( Block chain Technologies)**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT410(D).1</b>	Discuss the block chain technology in decentralized paradigm.
<b>IT410(D).2</b>	Explore cryptography and trading Applications along with their implementation strategies.
<b>IT410(D).3</b>	Discuss the implementation of smart contract and Ethereum platform.
<b>IT410(D).4</b>	Explain the importance and applications of Hyper ledger.

## **IT 454 DISTRIBUTED AND CLOUD COMPUTING LAB**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT454.1</b>	know the basic foundation that is needed to develop HADOOP and Map Reduce.
<b>IT454.2</b>	familiarize with the Map Reduce Application.
<b>IT454.3</b>	use analytics in HADOOP.
<b>IT454.4</b>	create AWS issues.
<b>IT454.5</b>	

## **IT 455 PROJECT WORK**

### **Course Outcomes (COs)**

At the end of the course the students will be able to

<b>IT454.1</b>	work in a team to select a problem for project work.
<b>IT454.2</b>	review and evaluate the available literature on the chosen problem.
<b>IT454.3</b>	formulate the methodology to solve the identified problem.
<b>IT454.4</b>	apply the principles, tools and techniques to solve the problem.
<b>IT454.5</b>	prepare and present project report.

# **R.V.R. & J.C. College of Engineering**

## **DEPARTMENT OF MECHANICAL ENGINEERING**

### **2.6.1**

#### **Program Outcomes (PO)**

Engineering Graduates will be able to:

**PO 1: Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO 2: Problem analysis:** Identify formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO 3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO 4: Conduct Investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO 5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including predication and modeling to complex engineering activities with an understanding of the limitations.

**PO 6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO 7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO 9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO 10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.

### Program Specific Outcomes (PSO)

The Program "Mechanical Engineering" curriculum must prepare the students

PSO 1: An ability to utilize their knowledge in engineering, basic sciences and mathematics on an applied basis.

PSO 2: An ability to apply learned principles to the analysis, design development and implementation of more advanced mechanical systems or processes.

### Cos

COURSE	COURSE OUTCOMES On completion of these courses, the students will have/be able to:
ME 101	a. Understand methods of solving first order differential equations. b. Understand some physical applications of first order differential equations. c. To solve higher order differential equations d. To solve partial differential equations e. To understand the relation between two variables by Curve fitting
ME 102	a. understand the concepts of Ultrasonic waves, production and applications in NDT. b. understand the interference in thin films and its application, Concept of diffraction and grating, birefringence and production and detection of different polarized lights. c. acquire Knowledge on basics of lasers, holography, fibers and their applications. d. understand Schrodinger wave equation and its applications in 1-D with respect to the domain of quantum world. describe the nature of electromagnetic radiation and matter in terms of the particles
ME 103	a. Students acquire knowledge on quality and utility of water in industries. b. Students gain knowledge on water treatment for drinking purpose. c. Able to understand functioning of electrochemical energy systems. d. Students can relate corrosion and environment and suggest methods to prevent corrosion. e. Can analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.
ME 104	a. use vocabulary contextually. b. compose effectively the various forms of professional communication. c. apply grammar rules efficiently in spoken and written forms.

	<ul style="list-style-type: none"> <li>d. understand and overcome the barriers in communication.</li> <li>e. develop professional writing.</li> </ul>
<b>ME 105</b>	<ul style="list-style-type: none"> <li>a. Develop algorithms and flow charts for simple problems.</li> <li>b. Use suitable control structures for developing code in C.</li> <li>c. Design modular programs using the concepts of functions and arrays.</li> <li>d. Design well-structured programs using the concepts of structures and pointers.</li> <li>e. Develop code for complex applications using file handling features.</li> </ul>
<b>ME 106</b>	<ul style="list-style-type: none"> <li>a. Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle.</li> <li>b. Apply the equilibrium equations to determine unknown forces and moments acting on a rigid body and also analyse the trusses using method of joints and method of sections</li> <li>c. Analyse the force system in space using vector notation and apply the basic concepts of dry friction on inclined planes and wedges.</li> <li>d. Determine the centriods and center of gravity of mathematically definable areas as well as composite areas of standard geometrical shapes.</li> <li>e. Apply principle of virtual work for equilibrium of ideal systems and calculate the moment of inertia of various shapes by integration and moment of inertia of composite areas.</li> </ul>
<b>ME 151</b>	<ul style="list-style-type: none"> <li>a. Students acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.</li> <li>b. Students can prepare solutions with different concentrations.</li> <li>c. Students can analyze water for its hardness, alkalinity, chloride ion content, iron content.</li> <li>d. Students understand the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments.</li> </ul>
<b>ME 152</b>	<ul style="list-style-type: none"> <li>a. The ability to develop various menu driven programs like generation of electricity bill, evaluation of series etc.</li> <li>b. The practical knowledge to write C programs using 1D, 2D and Multi-Dimensional arrays.</li> <li>c. Able to write C programs to develop various applications using structures, unions and Files.</li> <li>d. Thorough practical knowledge to develop 'C' programs for various applications.</li> </ul>
<b>ME 153</b>	<ul style="list-style-type: none"> <li>a. Acquire basic skills in technical graphic communication and also get thorough knowledge of various geometrical elements used in Engineering practice.</li> <li>b. Be able to use the instruments required for Drawing.</li> <li>c. Be able to dimension, print letters which can be understood globally.</li> <li>d. Gather good knowledge in various kinds of scales and their practical usage.</li> <li>e. Understand the Projections of points, lines and planes and their representation and dimensioning.</li> </ul>
<b>ME 107</b>	<ul style="list-style-type: none"> <li>a. Understand the basic linear algebraic concepts.</li> <li>b. Evaluate double, triple integrals and the area, volume by double &amp; triple integrals respectively.</li> <li>c. Solve gradient, divergence, curl and integration of vector function problems.</li> </ul>

	<p>d. Solve system of equations.</p> <p>e. Evaluate derivatives and integrals using numerical techniques.</p>
<b>ME 108</b>	<p>a. X-ray Characterizing the crystals and effects of defects on properties of the solid</p> <p>b. Acquire Knowledge on Ceramics and Composites</p> <p>c. Significance of Bio and Shape memory alloys in present day technology</p> <p>d. Importance of polarization and magnetization phenomena and their applications</p> <p>e. Relevance of superconductivity and nano materials.</p>
<b>ME 109</b>	<p>a. Students know the formation of polymers and the utility of conducting polymers in electronics, electrical and other fields.</p> <p>b. Students would be able to know usage of plastics and elastomers in day-to-day life and in fields like automobile, electronics, etc.</p> <p>c. Would acquire knowledge on composition, quality and uses of various fuels.</p> <p>d. Would be capable of selecting appropriate lubricant for a given system, and know the characteristics and utility of refractories.</p> <p>e. Students acquire knowledge on the requirements, applications of liquid crystals and explosives.</p>
<b>ME 110</b>	<p>a. To define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.</p> <p>b. To describe and discuss the environmental implications of biologically important materials through the ecosystems.</p> <p>c. To describe and discuss the environmental pollution implications and watershed management</p> <p>d. To discuss the benefits of sustaining each of the following resources - food, health, habitats, energy, water, air, soil and minerals.</p> <p>e. To understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies.</p>
<b>ME 111</b>	<p>a. Be able to visualize and communicate with two dimensional as well as three dimensional shapes.</p> <p>b. Understand the application of industry standards and best practices applied in Engineering drawing.</p> <p>c. Be able to apply the knowledge of development of surfaces in real life situations.</p> <p>d. Get insight into the concepts of projection, representation and dimensioning of three dimensional objects like Prisms, Cylinders, Pyramids, Cones.</p> <p>e. Thoroughly understand the concept of isometric &amp; orthographic projections which will be useful for the visualization of any object. This subject also paves the way for learning Auto Cad, CAD / CAM, CATIA and Pro E which are advanced software packages needed for every mechanical engineer.</p>
<b>ME 112</b>	<p>Determine velocity and acceleration of a particle under rectilinear and curvilinear translation</p> <p>b. Apply dynamic Equilibrium Equation for rigid bodies under rectilinear and curvilinear translation in the fields of Railways, Ships, guns, automobiles, Aircrafts, guns, rockets etc.,</p> <p>c. Determine the mass moments of inertia and radius of gyration of mathematically definable material bodies of standard shapes.</p>

	<p>d. Understand kinematics and kinetics of rotation of a rigid body about a fixed axis.</p> <p>e. Understand the concept of relative velocity, instantaneous centre and dynamic equilibrium of rolling bodies in plane motion.</p> <p>f. Determine velocity and acceleration of a particle under simple harmonic motion, understand the mechanical vibrations related terms.</p>
<b>ME 154</b>	<p>a. Use CRO, signal generator, spectrometer for making measurements.</p> <p>b. Test the optical components using principles of interference &amp; diffraction.</p> <p>c. Determination of the selectivity parameter in electrical circuits.</p>
<b>ME 155</b>	<p>a. Know the IPA phonetics symbols, and their relation to pronunciation; recognize the difference among the native, regional and neutral accent of English.</p> <p>b. Employ different skills, inferring lexical and contextual meaning and attempt comprehension passages.</p> <p>c. Use confidently phrases and idioms for effective communication.</p> <p>d. Develop appropriate speech dynamics in professional situations.</p> <p>e. Focus on communication skills and social graces necessary for effective communication.</p>
<b>ME 156</b>	<p>a. To familiarize with the basics of tools and equipment used in Carpentry, Tin Smithy, Welding and House Wiring.</p> <p>b. The production of simple models in the above four trades</p>
<b>ME 201</b>	<p>a. Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.</p> <p>b. Evaluate complex line integrals.</p> <p>c. Find singularities of complex functions and determine the values of integrals using residues.</p> <p>d. Find numerical solution of ordinary differential equations.</p> <p>e. Find numerical solution of partial differential equations.</p>
<b>ME 202</b>	<p>a. Estimate stresses in structural members subjected to tension, compression and torsion and bending using fundamental concepts of stress, strain and elastic behavior.</p> <p>b. Compute thermal stresses, strains and work due to strain energy in various structural members.</p> <p>c. Calculate torsional stresses in structural members subjected to twisting loads.</p> <p>d. Draw shear force and bending moment diagrams and compute bending and shear stresses in beams under different loading conditions.</p> <p>e. Apply graphical and analytical methods to determine principal stresses and strain and locate principal planes.</p>
<b>ME 203</b>	<p>a. The concepts of network elements, various conventions, network theories based on DC and based on AC.</p> <p>b. Construction, Operation, characteristics and applications of DC Machines.</p> <p>c. Construction and Operation of 1-phase transformer and 3-phase induction motors.</p> <p>d. Construction, Operation of 1-phase induction motors and its starting methods and alternators.</p> <p>e. Measurement of electrical quantities with Measuring Instruments and Utilization of Electrical Energy.</p>

<p style="text-align: center;"><b>ME 204</b></p>	<ul style="list-style-type: none"> <li>a. Students can analyze and synthesize various thermodynamic systems, processes and cycles.</li> <li>b. Students can evaluate work transfers for various non flow processes and able to apply the SFEE to various engineering applications.</li> <li>c. Students can able to determine the efficiency of heat engine and COP of refrigerator and heat pump.</li> <li>d. Students can evaluate the entropy changes for various non flow processes and can apply principle of increase of entropy for various engineering applications.</li> <li>e. Students can evaluate the availability of the energy supplied and find out various losses (Irreversibilities) of the systems.</li> <li>f. Students can evaluate the air standard efficiency and MEP of Otto, Diesel and Dual Cycles and Brayton cycle.</li> </ul>
<p style="text-align: center;"><b>ME 205</b></p>	<ul style="list-style-type: none"> <li>a. Students can understand various mechanisms and terminology used in kinematics.</li> <li>b. Students can analyze the mechanisms and machines regarding velocities and accelerations.</li> <li>c. Students can understand the concepts of synthesis in respect of CAM systems.</li> <li>d. Students can understand the Gear terminology and able to analyze the spur gear trains.</li> <li>e. To understand and analyze the concept of gear trains.</li> </ul>
<p style="text-align: center;"><b>ME 206</b></p>	<ul style="list-style-type: none"> <li>a. The student will be able to determine the static forces on any surface or body, analyze the stability of a floating body.</li> <li>b. The student will be able to use continuity, momentum and energy principles to analyze fluid flow problems.</li> <li>c. The student will be able to use applications of Bernoulli's equation to various flow measuring devices.</li> <li>d. To determine loss of head due to friction in flow through pipes.</li> <li>e. To apply HGL, TEL &amp; maximum power transmission through pipes which is useful for water distribution pipe lines in towns and hydraulic power stations.</li> <li>f. The student will be able to learn the working principles water turbines and pumps.</li> </ul>
<p style="text-align: center;"><b>ME 251</b></p>	<p style="text-align: center;"><b>FM LAB</b></p> <ul style="list-style-type: none"> <li>a. Apply fundamental knowledge of fluid mechanics in solving problems and making design of pressure-pipe in Mechanical and environmental engineering</li> <li>b. Understand the basics of hydraulic machinery and their operation design in water systems.</li> <li>c. Conduct experiments in flow measurement, hydraulic machinery and interpreting data from experiments, as well as documenting them in engineering reports</li> </ul> <p style="text-align: center;"><b>SM LAB</b></p> <ul style="list-style-type: none"> <li>a. Ability to design and conduct experiments, acquire data, analyze and interpret data</li> <li>b. Physical insight into the behaviour materials and structural elements, including distribution of stresses and strains, deformations and failure</li> </ul>

	<p>modes</p> <p>c. Write individual and group reports: present objectives, describe test procedures and results, synthesize and discuss the test results, present conclusions.</p>
<b>ME 252</b>	<p>a. The functionalities of various machine elements such as vices, bearings, screw jacks, shafts, fasteners, keys, cotters, pins, etc., and their assemblies.</p> <p>b. The students will be able to draw full and half sectional views of machine parts and their assemblies both manually and by using software packages such as AUTOCAD.</p>
<b>ME 253</b>	<p>a. Develop effective communication and presentation skills.</p> <p>b. Learn corporate etiquette - organizing and managing professional events.</p> <p>c. Understand how reading enhances their communicative competency.</p> <p>d. Conduct effective correspondence and prepare reports which produce results.</p> <p>e. Develop all-round personalities with a mature outlook to function effectively in different circumstances.</p>
<b>ME 207</b>	<p>a. Find Fourier series.</p> <p>b. Find Fourier transforms.</p> <p>c. Find Laplace and inverse transforms of a function.</p> <p>d. Apply knowledge of distribution theory to various data.</p> <p>e. Test hypotheses and draw inference for engineering problems</p>
<b>ME 208</b>	<p>a. Estimate beam deflections using various approaches like integration methods, moment area method and energy methods.</p> <p>b. Determine the critical loads in columns with different support conditions using Euler's and Rankine's theories.</p> <p>c. Analyze fixed beams, continuous beams and curved beams of various cross sections by adopting various theories such as Clayperon's theory, winkler-bach theory...etc.</p> <p>d. Analyse and design thin and thick pressure vessels as well as compound cylinders.</p> <p>e. Calculate the shear centre for various sections and centrifugal stresses in case of rings and discs.</p>
<b>ME 209</b>	<p>a. Choose proper pattern material and able to design a pattern</p> <p>b. Choose proper constituents and prepare sand molds</p> <p>c. Control various casting defects.</p> <p>d. Choose proper welding processes for the given application Control various welding defects.</p> <p>e. Choose proper metal working processes for the given application</p>
<b>ME 210</b>	<p>a. The student will be able to have clear idea about the properties of steam, the use of steam tables, use of Mollier chart and evaluate steam properties and able to understand the working of boilers, mountings and accessories.</p> <p>b. Able to understand the Ranking cycle, Reheat and Regeneration cycles applicable for steam power plants.</p> <p>c. Able to understand the working of steam nozzles, steam condensers.</p> <p>d. Able to understand the working principles of impulse and reaction steam turbines and evaluate their efficiencies.</p> <p>e. Able to grasp thorough knowledge of refrigeration and Air Conditioning principles and systems.</p> <p>f. Able to understand about psychrometric properties, processes and</p>



	g. Psychrometric chart and Summer air conditioning system working.
<b>ME 211</b>	<ul style="list-style-type: none"> <li>a. Gains the knowledge about the material properties and testing methods.</li> <li>b. Differentiates various phase diagrams in a binary systems. Possess basic principles of ternary diagrams.</li> <li>c. Gains the knowledge of phase transformation and able to compare the mechanism of both Martensitic and Bainitic phase transformations.</li> <li>d. Recognizes the purpose of heat treatment and various heat treatment processes.</li> <li>e. Familiar with Cast Iron, Steel, Copper, Aluminium and Nano materials in terms of its uses and applications</li> <li>f. Gains knowledge in composite and ceramic materials and its applications</li> <li>g. Familiar in powder metallurgy concepts, advantages, limitations and its wide applications.</li> </ul>
<b>ME 212</b>	<ul style="list-style-type: none"> <li>a. Understanding construction operation and characteristics of semiconductor devices like diode, BJT, JFET &amp; MOSFET.</li> <li>b. Understand operation, characteristics &amp; applications of op-amps.</li> <li>c. Simplify Boolean functions using K maps and understand the operation.</li> <li>d. Design procedure of simple combinational logic &amp; Sequential logic circuits.</li> <li>e. Understand the architecture of 8051 microcontroller.</li> </ul>
<b>ME 254</b>	a. Implementation of techniques and methods for performing different lathe operations, fitting operations and producing castings of different shapes.
<b>ME 255</b>	<ul style="list-style-type: none"> <li>a. Able to write programmes for mechanical engineering applications.</li> <li>b. Abe to know the graphic commands and the students shall be in a position to write code for simulation of mechanisms.</li> <li>c. Able to use software package like TORA to obtain results for operation research applications.</li> </ul>
<b>ME 256</b>	<p><b>ELECTRICAL LAB</b> Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>g. Student will be able to understand, how to start a DC motor and how to control the speed of DC motor.</li> <li>h. Students will have hands on practice in measuring various parameter and understanding the concepts in the operation of DC motor, DC generator,</li> <li>i. Student will be able to analyze the factors that influence various processes in a DC machinery</li> <li>j. Knows the Speed &amp; Temperature control of stepper motor using controllers.</li> <li>k. Knows the Temperature control using controllers.</li> </ul> <p><b>ELECTRONICS LAB</b> By the end of course the student is exposed to analysis and design of</p> <ul style="list-style-type: none"> <li>a. By the end of course the student is exposed to analysis and design of various circuit elements and circuit designs.</li> <li>b. Student should understand the outcomes of digital circuits and design.</li> </ul>
<b>ME 301</b>	a. Able to comprehend a specific set of behaviors and values the professional must know and must abide by, including confidentiality, accuracy and integrity.

	<ul style="list-style-type: none"> <li>b. Strive to achieve the highest quality, effectiveness and dignity in professional work.</li> <li>c. Able to know about ethical theories and the role of engineer as an experimenters</li> <li>d. Protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest.</li> <li>e. Know and respect existing laws pertaining to professional work.</li> </ul>
<b>ME 302</b>	<ul style="list-style-type: none"> <li>a. This course provides the knowledge to design simple mechanical components subjected to static loads and their failure and concept of factor of safety in design of simple mechanical parts</li> <li>b. To apply knowledge in designing mechanical components subjected to stress concentration combined static &amp; variable loads by applying Soderberg, Goodman &amp; Gerber's Equations.</li> <li>c. The student will be able to design power screws like screw jack subjected to various stresses.</li> <li>d. To design riveted joints, including boiler joint and lozenge joint subjected to internal pressure, axial loads &amp; eccentric loads.</li> <li>e. Develop and use appropriate analytical models and software for design, modeling, and analysis.</li> </ul>
<b>ME 303</b>	<ul style="list-style-type: none"> <li>a. Know the importance of basic parameters cutting speed, feed and depth of cut which dictates the machining process.</li> <li>b. Gain the knowledge of operating the machines and their mechanisms.</li> <li>c. Learn the various forces acting on machining process which provides the basic information regarding the rigidity, capacity of the machining process.</li> <li>d. To learn the best practices of milling operations</li> <li>e. To get familiar with the nomenclature of tool and the parameters in the selection of tools</li> </ul>
<b>ME 304</b>	<ul style="list-style-type: none"> <li>a. The students are expected to understand the various components, principle of operation, working of different types of I.C engines.</li> <li>b. Able to know the variables affecting the performance of IC engines and methods to improve the performance.</li> <li>c. Able to understand the Working of different types of compressors.</li> <li>d. Able to know the classification of Gas turbines and working principles of Gas turbines and methods to improve the performance of the plant.</li> <li>e. Also able to know the working principles of various jet propulsion systems like Turbo jet, Turbo prop, Ramjet and Pulse jet and Rocket propulsions systems.</li> </ul>
<b>ME 305</b>	<ul style="list-style-type: none"> <li>a. Recognize the importance and value of Operations Research and linear programming in solving practical problems in industry</li> <li>b. Interpret the transportation models' solutions and infer solutions to the real-world problems.</li> <li>c. Recognize and solve assignment and dynamic programming problems.</li> <li>d. Gain knowledge in fundamentals of queuing theory and theory of games.</li> <li>e. To Know when simulation and dynamic programming can be applied in real world problems</li> </ul>
<b>ME 306</b>	<ul style="list-style-type: none"> <li>a. Unbalance in rotating machinery</li> <li>b. Estimation of Inertia forces in a crank-slider mechanism</li> <li>c. State of balance of typical multi-cylinder engines</li> <li>d. Sources, effects, types of vibration and elimination.</li> </ul>

	e. Dynamic stability of structures
<b>ME 351</b>	<ul style="list-style-type: none"> <li>a. Students can themselves operate on the machine and produce the given components comfortably.</li> <li>b. Students should be well aware about the range of speeds, feed and depth of cut while operating various mechanisms.</li> <li>c. Students distinguish various machine tool operations.</li> <li>d. Students learn chip formation process, chip removal processes.</li> <li>e. Students identify the difference between roughing and finishing operations and machining conditions related to these operations.</li> </ul>
<b>ME 352</b>	<ul style="list-style-type: none"> <li>a. The student can experimentally determine viscosity, calorific value, Flash and Fire points of fuels.</li> <li>b. The Students will be able to conduct performance tests on both petrol and diesel engines.</li> <li>c. The students will be able to do performance test on Reciprocating compressor and Blower.</li> </ul>
<b>ME 353</b>	<ul style="list-style-type: none"> <li>a. The students will be able to model the given 2D and 3D components, Assemblies etc.</li> <li>b. Has ability to layout an efficient production area and industrial facility using Computer-Aided Design (CAD) software.</li> </ul>
<b>ME 307</b>	<ul style="list-style-type: none"> <li>a. Ability to identify the functions of location, clamping devices and applications of JIGS &amp; FIXTURES</li> <li>b. Able to know methods of manufacturing various types of gears, principles of gear generation and finishing methods</li> <li>c. Able to visualize screw threads production methods</li> <li>d. Able to know the principles of operation, equipment and applications of UNCONVENTIONAL MACHINING PROCESSES</li> <li>e. Able to understand PRESS WORKING TOOLS major components, types of drawing dies, bending dies and related calculations.</li> <li>f. Able to know types of CMM (Coordinate Measuring Machines) and its related accessories</li> <li>g. Able to know Machine vision principle and its related equipment and applications</li> </ul>
<b>ME 308</b>	<ul style="list-style-type: none"> <li>a. This course provides the knowledge to design simple mechanical components subjected to static loads and their failure and concept of factor of safety in design of simple mechanical parts</li> <li>b. To apply knowledge in designing mechanical components subjected to stress concentration combined static &amp; variable loads by applying Soderberg, Goodman &amp; Gerber's Equations.</li> <li>c. The student will be able to design power screws like screw jack subjected to various stresses.</li> <li>d. To design riveted joints, including boiler joint and lozenge joint subjected to internal pressure, axial loads &amp; eccentric loads.</li> <li>e. Develop and use appropriate analytical models and software for design, modeling, and analysis</li> </ul>
<b>ME 309</b>	<ul style="list-style-type: none"> <li>a. Analyze and design various methods of heat transfer for the bodies undergoing heat exchange using fundamental concepts of Conduction, Convection and Radiation.</li> <li>b. To estimate heat loss from the system to the surroundings at an interval of time during its working eg. IC Engines, Turbines etc.</li> <li>c. Apply correlations to compute heat loss due to convection for</li> </ul>

	<p>practical applications.</p> <p>d. Design heat transfer equipment to prevent failures of components due to poor heat dissipation.</p> <p>e. Estimation of radiation heat transfer between bodies</p>
<b>ME 310</b>	<p>a. Create new solutions for the existing problems using FEA approaches.</p> <p>b. Derive element stiffness and mass matrix equations for various structural systems.</p> <p>c. To know the usage of different elements for different structures.</p> <p>d. Determine engineering design quantities (deformation, force, strain, stress) for bar, truss, beam and frame structures and under different loading conditions.</p> <p>e. Apply the steps in FEM solution to a variety of physical systems and Use FEA to do projects.</p>
<b>ME 311A</b>	<p>a. To learn nanoscale manufacturing techniques.</p> <p>b. To analyze, design and utilization of nano materials.</p> <p>c. Students can attain knowledge regarding the self-assembly and self-organization of nano-layers.</p> <p>d. Apply methodologies to study the nano structures.</p> <p>e. Students become professionally sound with regards to social responsibilities</p>
<b>ME 311B</b>	<p>a. Students will be able to identify and describe the theories of friction and the factors affecting the coefficient of friction between contacting surfaces in relative motion.</p> <p>b. Students will be able to identify wear mechanisms and show how to minimize wear for different interfacial conditions.</p> <p>c. Students will be able to identify the lubrication modes such as hydrodynamic lubrication.</p> <p>d. Students will be able to know requirements of bearing materials, Types of bearing materials</p> <p>e. Students able to know various coating techniques.</p>
<b>ME 311C</b>	<p>a. Identify the components of an automobile.</p> <p>b. Analyze the working of each of the components.</p> <p>c. Modify the design of the components.</p> <p>d. Repair and maintain some of the components.</p> <p>e. Predict the possible breakdowns. Modernize the components for the performance improvement.</p>
<b>ME 311D</b>	<p>a. Get the basic idea on the aeronautics.</p> <p>b. Understand the basic concepts of aerodynamics and structures</p> <p>c. Know the various components and parts of the aircrafts.</p> <p>d. Know the current trends of engine and control systems used in aircrafts.</p> <p>e. Learn the generalized concepts of aircraft stability and control.</p>
<b>ME 312A</b>	<p>a. Select the suitable method for processing of errors.</p> <p>b. To use the different Sensors for various applications.</p> <p>c. Manufacture them professionally to reduce the rejection rates in manufacturing sector.</p> <p>d. Select the suitable instrument to measure the parameters like pressure, temperature, force, Torque, etc.</p> <p>e. Analyze various types of measuring equipments used in control systems.</p> <p>f. Communicate effectively with the workers regarding the method of operation of the measuring equipment.</p>

<b>ME 312B</b>	<ul style="list-style-type: none"> <li>a. Identify the properties of fiber and matrix materials used in commercial composites</li> <li>b. Predict the elastic properties of both long and short fiber composites based on the constituent properties.</li> <li>c. Predict the failure strength of a laminated composite plates.</li> <li>d. Analyze problems on micro and macro mechanical behavior of laminate.</li> <li>e. Apply the mechanics of composites to design composite structural elements.</li> </ul>
<b>ME 312C</b>	<ul style="list-style-type: none"> <li>a. The students will get the knowledge about the principle of refrigeration, different methods of refrigeration.</li> <li>b. Able to know the various components of refrigeration system and their working principles.</li> <li>c. Able to understand what is meant by air conditioning and various psychrometric properties and processes and know the usage of Psychrometric chart.</li> <li>d. Know how to provide required environment to suit various needs of day to day requirements like comfort air conditioning, water cooling , storage of perishable food etc.,</li> <li>e. Enable them to do simple design calculations and analysis of these systems.</li> </ul>
<b>ME 312D</b>	<ul style="list-style-type: none"> <li>a. Explain the meaning of and the difference between the terms PDM and PLM</li> <li>b. Describe how a relational database is built and how it is used</li> <li>c. From an information model, create a database structure and populate it with relevant data</li> <li>d. Write simple SQL expressions for creating/retrieving relevant data in a relational database</li> <li>e. Explain the basic components and functionality of a PDM system</li> <li>f. From a given database structure, use and make small adjustments to a PDM system</li> <li>g. From a given activity model, use a PDM system to support and control a product realization process</li> <li>h. Given project, choose, configure, and adjust a PDM system to effectively support, follow up and control the project.</li> </ul>
<b>ME 354</b>	<ul style="list-style-type: none"> <li>a. Understand the basics of ANSYS capabilities, terminology and the GUI.</li> <li>b. Know how to perform a complete ANSYS analysis step-by-step.</li> <li>c. Acquire the knowledge in building solid models &amp; meshing, apply loads, solving &amp; reviewing results</li> <li>d. Be in a position to model and analyse for finding stress, temperature distribution etc, with the help of suitable boundary conditions.</li> <li>e. Solve various engineering problems in structural, thermal and fluid mechanics</li> </ul>
<b>ME 355</b>	To know Applications of heat transfer in daily life.
<b>ME 356</b>	To prepare the students to the industry needs
<b>ME 401</b>	<ul style="list-style-type: none"> <li>a. Analyze various methods of designing of gauges, measuring equipments used in the inspection and quality control department, examples plug gauges, ring gauges and dial gauges etc.,</li> <li>b. To use the different comparators and design of the comparators.</li> </ul>

	<ul style="list-style-type: none"> <li>c. Manufacture them professionally and with regard to their responsibilities to society, especially with respect to designing of measuring equipment to reduce the rejection rates in manufacturing sector.</li> <li>d. Communicate effectively with the workers regarding the methods of operating the measuring equipment and design of the equipment.</li> <li>e. To know the purpose and principles of alignment tests.</li> </ul>
<b>ME 402</b>	<ul style="list-style-type: none"> <li>a. Be able to approach a design problem successfully, taking decisions when there is not a unique answer.</li> <li>b. To master the fundamental processes of design and manufacturing and to gain an in-depth understanding of analytical and experimental methods of determination of stresses and strength of machine elements under various loading conditions.</li> <li>c. Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.</li> <li>d. Analyze and dimension both simple products as well as subsystems of more complicated mechanical products in an engineering manner.</li> <li>e. Through the study of optimum design, reliability and system design he will be able to assess the life of mechanical elements.</li> </ul>
<b>CE 404A</b>	<ul style="list-style-type: none"> <li>a. To Know about the various surveying instruments.</li> <li>b. To determine the relative positions of a point on the existing ground by conducting the survey.</li> <li>c. To use all basic surveying instruments.</li> <li>d. To operate Total Station instrument.</li> <li>e. To take the levels of existing ground and to determine the reduced levels.</li> </ul>
<b>CE 404B</b>	<ul style="list-style-type: none"> <li>a. Students are familiar with various building materials</li> <li>b. Students knows about various building elements and their specifications</li> <li>c. Students are familiar with types of masonry works and bonds used in construction</li> <li>d. Students are capable of understanding building plan and have knowledge about building rules, bye-laws and building elements</li> <li>e. Students will have knowledge about Valuation of building and rent fixation</li> </ul>
<b>CH 404A</b>	<ul style="list-style-type: none"> <li>a. An ability to understand the importance of environment and conservation of natural resources.</li> <li>b. An ability to succeed in the competitive exams of energy industry.</li> <li>c. An ability to utilize the non-conventional energies in place of conventional energies and its manufacture.</li> <li>d. An ability to utilize the non- conventional energies in place of conventional energies and its manufacture.</li> <li>e. An ability to maintain the sustainability in the environment</li> </ul>
<b>CH 404B</b>	<ul style="list-style-type: none"> <li>a. An ability to describe the functional principle of biofuel technologies in small and large scale.</li> <li>b. An ability to describe the main steps and components in bioethanol, biodiesel and biogas production.</li> <li>c. An ability to Participate actively in teamwork and work with case related problem solving.</li> <li>d. An ability to work with professional problem solving in an industrial</li> </ul>

	<p>environment.</p> <p>e. An ability to work in other fields of engineering.</p>
<b>CS 404A</b>	<p>a. Use the syntax and semantics of java programming language and basic concepts of OOP.</p> <p>b. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.</p> <p>c. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.</p> <p>d. Demonstrate how the java program communicates with the console and disk files using the concept of streams.</p> <p>e. Design event driven GUI and web related applications which mimic the real word scenarios.</p>
<b>CS 404B</b>	<p>a. An understanding of basic concepts and use of various database systems.</p> <p>b. An ability to enforce integrity constraints to maintain validity &amp; accuracy.</p> <p>c. An ability to write relational expressions for the queries.</p> <p>d. An ability to design and develop a database using normalization theory.</p> <p>e. An ability to use different concurrency control and Recovery techniques.</p>
<b>EC 404A</b>	<p>a. Able to understand the working, types and applications of microphones and loudspeakers.</p> <p>b. Able to understand the features of commercial, theatre sound recording and colour TV standards</p> <p>c. Able to understand the working of various electronic systems, telecommunication and switching systems.</p> <p>d. Able to understand the working of various applications like digital clocks, fiber optics, microprocessor and mobile radio systems.</p> <p>e. Able to understand consumer electronic equipment and systems like washing machines</p>
<b>EC 404B</b>	<p>a. Able to understand transmission of analog signals using amplitude modulation.</p> <p>b. Able to understand transmission of digital signals through PCM, PAM, PPM and DELTA Modulation techniques</p> <p>c. Able to know about various Broad band communication systems.</p> <p>d. Able to know about the monochrome and colour Television fundamentals.</p> <p>e. Able to know about Optical communication systems.</p>
<b>EE 404A</b>	<p>a. Know the national scene of energy production, utilization, consumption and energy storage systems.</p> <p>b. Understand about the basics of solar energy, collectors &amp; generation of electricity from solar energy &amp; photovoltaic's.</p> <p>c. Understand the assessment of wind energy potential, wind turbines and wind generators.</p> <p>d. Know about ocean energy, temperature differences &amp; principles, extraction of energy from waves.</p> <p>e. Understand about geothermal, types &amp; how biogas is produced &amp; digester for power generation.</p>
<b>EE 404B</b>	<p>a. To give the overall idea for the different types of lamps &amp; lighting schemes.</p> <p>b. To know about the different types electric heating methods.</p>

	<ul style="list-style-type: none"> <li>c. To know the designing of heat elements such as furnaces and ovens.</li> <li>d. To know how to utilize the electrical energy for production of heat and welding process.</li> <li>e. To gain knowledge on principles and characteristics of storage batteries.</li> </ul>
<b>IT 404A</b>	<ul style="list-style-type: none"> <li>a. Identify, formulate, and solve Software Engineering problems.</li> <li>b. Elicit, analyze and specify software requirements for various stakeholders.</li> <li>c. Familiar with Design, development, deployment and maintenance of a software project.</li> <li>d. Familiar with Architecture design and User Interface design</li> <li>e. Apply software engineering paradigms to web apps.</li> </ul>
<b>IT 404B</b>	<ul style="list-style-type: none"> <li>a. Apply technologies to develop web documents.</li> <li>b. Design web pages with css and apply scripting to web documents.</li> <li>c. Create dynamic web pages with javascript.</li> <li>d. Create valid and well-formed xml documents.</li> <li>e. Write server side scripts with php and database access.</li> </ul>
<b>ME 404A</b>	<ul style="list-style-type: none"> <li>a. At the end of the course, students will be familiarized in basic components of robotics, classification of robots and their applications.</li> <li>b. They will have knowledge on types of robot grippers, their usage and design considerations.</li> <li>c. They attain knowledge on various types of sensory devices their working and applications.</li> <li>d. Students will apply basic transformations related to the movement of manipulator.</li> <li>e. An ability to design a robot mechanism to meet kinematics requirements and to write simple programs.</li> </ul>
<b>ME 404B</b>	<ul style="list-style-type: none"> <li>a. Recognize the importance and value of Operations Research and linear programming in solving practical problems in industry</li> <li>b. Interpret the transportation models' solutions and infer solutions to the real-world problems.</li> <li>c. Recognize and solve game theory and assignment problems.</li> <li>d. Gain knowledge of drawing project networks for quantitative analysis of projects</li> <li>e. Know when simulation and dynamic programming can be applied in real world problems.</li> </ul>
<b>ME 405</b>	<ul style="list-style-type: none"> <li>a. Understand the role of forecasting, its importance in industry and apply the techniques to estimate the sales/demand</li> <li>b. Solve operations and project management problems</li> <li>c. Analyze aggregate production planning and determine a cost effective production plan</li> <li>d. Solve project sequencing problem using different sequencing techniques</li> <li>e. Recognize the importance of Inventory control to ensure their availability with minimum capital lock up.</li> <li>f. Understand and construct a network to determine project duration times</li> <li>g. Understand the purpose of Supply chain management to improve the overall organization performance and customer satisfaction</li> </ul>
<b>ME 406A</b>	<ul style="list-style-type: none"> <li>a. Demonstrates how mechatronics integrates knowledge from different disciplines in order to realize engineering and consumer products that are useful in everyday life.</li> </ul>



	<ul style="list-style-type: none"> <li>b. Select suitable actuators and sensors and integrate them with embedded control computers.</li> <li>c. Select appropriate transducer signal conditioning devices for data conversion including operational amplifiers for analogue signal processing.</li> <li>d. Builds a system model for mechanical, electrical, thermal and fluid power systems.</li> <li>e. Explains various modes of operation of closed loop controllers.</li> <li>f. Explains the architecture and programming of programmable logic controllers.</li> <li>g. Designs a mechatronics system.</li> </ul>
<b>ME 406B</b>	<ul style="list-style-type: none"> <li>a. Able to apply the concepts to select appropriate materials, manufacturing processes and layouts for economical batch production.</li> <li>b. Fabricate and manufacturing mechanical components using non machining operations.</li> <li>c. Gains knowledge on various design factors and recommendations during welding and forging.</li> <li>d. Gains sufficient knowledge on deep drawing, blanking, punching and extrusion.</li> <li>e. Able to identify various automated assembly approaches and their applications</li> </ul>
<b>ME 406C</b>	<ul style="list-style-type: none"> <li>a. Distinguish the differences among the variety of power plants.</li> <li>b. Explain the principles of operation of the power plants.</li> <li>c. Identify the places where a plant of a particular type can be set up.</li> <li>d. Explain the need for various types of assemblies required in a power house.</li> <li>e. Explain the importance of a non conventional energy resources.</li> </ul>
<b>ME 406D</b>	<ul style="list-style-type: none"> <li>a. To understand the functions and activities of safety engineering department.</li> <li>b. To carry out a safety audit and prepare a report for the audit.</li> <li>c. To prepare an accident investigation report.</li> <li>d. To estimate the accident cost using supervisors report and data.</li> <li>e. To evaluate the safety performance of an organization from accident records.</li> <li>f. To identify various agencies, support institutions and government organizations involved in safety training and promotion.</li> </ul>
<b>ME 451</b>	<ul style="list-style-type: none"> <li>a. The graduate shall be able to express problem to be solved, the method to solve the problem and the analysis done on the problem.</li> <li>b. The student will be able to know the latest tools available to get the solution of a given problem.</li> </ul>
<b>ME 452</b>	<ul style="list-style-type: none"> <li>a. do programming on MATLAB</li> <li>b. To find solutions of Mechanical Engineering Problems in an effective way</li> <li>c. To support the Project using MATLAB software.</li> </ul>
<b>ME 453</b>	<ul style="list-style-type: none"> <li>a. Identify the importance alignment of machine tools</li> <li>b. Gain the knowledge about various design principles practically</li> <li>c. Acquire the working/ operation of various types of dynamometers.</li> </ul>
<b>ME407</b>	<ul style="list-style-type: none"> <li>a. Able to understand concepts of productivity and know the ways of enhancing productivity.</li> <li>b. Acquire working knowledge of how to find the best method of doing</li> </ul>

	<p>a job and arrange a work place more productively.</p> <p>c. Appreciate the importance of work sampling and differentiate between time study and work sampling.</p> <p>d. Describe the role and responsibilities of management in organization</p> <p>e. Differentiate the structures of various organization systems</p> <p>f. Understand the concept of job design and analysis.</p> <p>g. Develop ability to understand various marketing strategies to enhance sales promotion.</p> <p>h. Develop the skills to estimate the product cost and fixing its selling price.</p>
<b>ME 408</b>	<p>a. Comprehensive theoretical knowledge about modern machining processes</p> <p>b. Ability to understand about automation and transfer lines</p> <p>c. List the canned cycles available for each CNC machine.</p> <p>d. The student should be able to explain the terminology used to describe CNC, DNC and adaptive control machine tools</p> <p>e. Students will able to Prepare simple programs for CNC Turning and machining centers</p> <p>f. Student able to understand the group technology, flexible manufacturing systems and computer aided process planning.</p>
<b>ME 409A</b>	<p>a. To get familiarize with the need and terminology associated with FMS</p> <p>b. To have an idea of material handling and Different storage systems used in Manufacturing</p> <p>c. To understand the FMS Control requirements</p> <p>d. To have an idea of the integration of different automatic systems to enhance the quality of manufacturing</p> <p>e. To apply GT Concepts in Manufacturing.</p>
<b>ME 409B</b>	<p>a. Use of computer Aided Design concepts for the creation of new entities in the database.</p> <p>b. Use parametric modelling techniques to reflect engineering requirements.</p> <p>c. Apply modelling techniques to enhance the design aspects.</p> <p>d. Design a part or assembly of parts using computer aided design software. Apply top-down design principles to model a product.</p> <p>e. Use motion and interference checking to ensure that parts will not interfere throughout their complete range of motion.</p>
<b>ME 409C</b>	<p>a. The course provides an introduction to computational fluid dynamics. The students will train the numerical solution of model problems.</p> <p>b. After completion of this course, the student will have knowledge on Classification of the basic equations of fluid dynamics.</p> <p>c. The student will be able to check and assess the accuracy of numerical results. Assessing the efficiency of numerical methods, consistency analysis choosing appropriate boundary conditions for model problems.</p> <p>d. After completion of this course, the student will have awareness on the mechanism of turbulence modelling.</p> <p>e. The student will be able to check and assess basic numerical methods for fluid flow problems and heat transfer problems.</p>
<b>ME 409D</b>	<p>a. Students will be able to gain basic knowledge in total quality management relevant to both manufacturing and service industry including IT sector.</p> <p>b. Select and apply appropriate techniques in identifying customer needs,</p>

	<p>as well as the quality impact that will be used as inputs in TQM methodologies;</p> <p>c. Students will be able to implement the basic principles of TQM in manufacturing and service based organization.</p> <p>d. Measure the cost of poor quality and process effectiveness and efficiency to track performance quality and to identify areas for improvement;</p> <p>e. Understand proven methodologies to enhance management processes, such as benchmarking and six-sigma;</p> <p>f. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.</p> <p>g. The students will be able to gain the knowledge on various ISO standards and quality systems.</p>
<b>ME 410A</b>	<p>a. At the end of the course, students will be familiarized in basic components of robotics, classification of robots and their applications.</p> <p>b. They will have knowledge on types of robot grippers, their usage and design considerations.</p> <p>c. They attain knowledge on various types of sensory devices their working and applications.</p> <p>d. Students will apply basic transformations related to the movement of manipulator.</p> <p>e. An ability to design a robot mechanism to meet kinematics requirements.</p>
<b>ME 410B</b>	<p>a. The student will be able to obtain the fundamentals and types of neural networks.</p> <p>b. Have an understanding of the concepts and techniques of neural networks through the study of the most important neural network models.</p> <p>c. Able to perform condition based monitoring on different real systems.</p> <p>d. Able to identify different phases to achieve less cost without compromising quality of products.</p> <p>e. To identify various sources and schemes of concurrent engineering and to apply them in present scenario.</p>
<b>ME 410C</b>	<p>a. To get the knowledge of resources available for different energies.</p> <p>b. The students will get the knowledge about the principle of Solar radiation and its utilization</p> <p>c. The students will get the knowledge about Different solar collectors.</p> <p>d. The students will get the knowledge about solar thermal power plants.</p> <p>e. The students will get the knowledge solar energy conversions</p>
<b>ME 410D</b>	<p>a. Able to understand concepts of economic environment.</p> <p>b. Acquire knowledge of business organizations while establishing the industry.</p> <p>c. Appreciate the importance of depreciation and value of money.</p> <p>d. Know the importance of capital and its effective utilization.</p> <p>e. Develop the skills to estimate the product cost and fixing its selling price.</p> <p>f. Describe the role and responsibilities of personnel management in organization</p> <p>g. Differentiate the structures of various organization systems</p> <p>h. Understand the concept of job design and analysis.</p>

<b>ME 454</b>	<ul style="list-style-type: none"><li>a. The students are able to write a CNC program for the profile to be generated. This is done with the help of CAM software.</li><li>b. The students are able to know and perform various operations on CNC Lathe and milling machines effectively and safely.</li><li>c. The students are able to create models for different contours and will be in a position to convert the part geometry into a NC code which is used for machining on CNC Lathe and milling machines</li></ul>
<b>ME 455</b>	<ul style="list-style-type: none"><li>a. The graduate will able to identify and analyze a problem. The graduate will be able to function effectively on teams to accomplish a common goal.</li><li>b. The graduate will be able to use current techniques, skill and tools necessary for completing an assignment.</li><li>c. The graduate will be able to design and develop applications in the related areas of Mechanical Engineering.</li></ul>