**2.6.1. Program outcomes, program specific outcomes and course outcomes for all programs offered by the Institution are stated and displayed on website and communicated to teachers and students**

# VIKAS COLLEGE OF ENGINEERING AND TECHNOLOGY
### (Sponsored by SARASWATHI VIDYA PEETAM)
### (Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)
Certified by ISO 9001:2015: Accredited by NAAC with 'B+'Grade.
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**2.6.1** Program outcomes, program specific outcomes and course outcomes for all programs offered by the Institution are stated and displayed on website and communicated to teachers and students.

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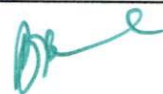PRINCIPAL
VIKAS COLLEGE OF ENGG. TEC
NUNNA - 521 212
Vijayawada Rural, NTR Dist., A.P

# Department of Agricultural  Engineering Courses Outcomes(R20)

## Agricultural Courses Outcomes(R20)

| B.Tech 1st Sem | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **BS1101- Mathematics-I** | CO1 | Utilize mean value theorems to real life problems |
| | CO2 | Solve the differential equations related to various engineering fields |
| | CO3 | Familiarize with functions of several variables which is useful in optimization |
| | CO4 | Apply double integration techniques in evaluating areas bounded by region |
| | CO5 | Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems |
| **HS1101-English** | CO1 | Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information |
| | CO2 | Ask and answer general questions on familiar topics and introduce oneself/others |
| | CO3 | Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information |
| | CO4 | Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs |
| | CO5 | Form sentences using proper grammatical structures and correct word forms. |
| **BP103T -Engineering Workshop and IT Workshop)** | CO1 | Assemble and disassemble components of a PC |
| | CO2 | Construct a fully functional virtual machine, Summarize various Linux operating system commands |
| | CO3 | Secure a computer from cyber threats, Learn and practice programming skill in Github, Hacker rank, Code chef, Hacker Earth, etc |
| | CO4 | Recognize characters & extract text from scanned images, Create audio files and podcasts |
| | CO5 | Create video tutorials and publishing, Use office tools for documentation, Build interactive |

| | | presentations, Build websites, Create quizzes & analyze responses. |
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| B.Tech 2nd Sem | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **MATHEMATICS - II (BS)** | CO1 | develop the use of matrix algebra techniques that is needed by engineers for practical applications |
| | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel |
| | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms |
| | CO4 | apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals |
| | CO5 | apply numerical integral techniques to different Engineering problems |
| | CO6 | apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations |
| **BS1210-**<br>**Engineering Chemistry** | CO1 | Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers. |
| | CO2 | Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion. |
| | CO3 | Synthesize nonmaterial's for modern advances of engineering technology.<br>Summarize the techniques that detect and measure changes of state of reaction.<br>Illustrate the commonly used industrial materials. |
| | CO4 | Differentiate petroleum, petrol, synthetic petrol and have knowledge how they are produced.<br>Study alternate fuels and analyze flue gases. |
| | CO5 | Analyze the suitable methods for purification and treatment of hard water and brackish water. |
| **ENIGINEERING MECHANICS (BS1204)** | CO1 | The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters. |
| | CO2 | He should be able to determine centroid for lines, areas and center of gravity for volumes and their composites. |

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| | CO3 | He should be able to determine area and mass movement of inertia for composite sections |
| | CO4 | He should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum |
| **PROGRAMMING FOR PROBLEM SOLVING USING C (ES1201)** | CO1 | To write algorithms and to draw flowcharts for solving problems |
| | CO2 | To convert flowcharts/algorithms to C Programs, compile and debug programs |
| | CO3 | To use different operators, data types and write programs that use two-way/ multi-way selection |
| | CO4 | To select the best loop construct for a given problem |
| | CO5 | To design and implement programs to analyze the different pointer applications |
| | CO6 | To decompose a problem into functions and to develop modular reusable code |
| | CO7 | To apply File I/O operation |
| **ES1103- ENGINEERING DRAWING** | CO1 | The student will learn how to visualize 2D & 3D objects |
| **ES1202- PROGRAMMING FOR PROBLEM SOLVING USING C LAB** | CO1 | Gains Knowledge on various concepts of a C language |
| | CO2 | Able to draw flowcharts and write algorithms. |
| | CO3 | Able design and development of C problem solving skills |
| | CO4 | Able to design and develop modular programming skills. |
| | CO5 | Able to trace and debug a program |
| **BS1211- ENGINEERING CHEMISTRY LABORATORY** | CO1 | The students entering into the professional course have practically very little exposure to lab classes. |
| | CO2 | The experiments introduce volumetric analysis; redoxtitrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. |
| | CO3 | Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills. |
| **MACHINE DRAWING AND COMPUTER GRAPHICS LABORATOR(ES1220)** | CO1 | Practical skills on preparing manual drawings of model isometric view of the objects, machine components, assembly drawings of different joints. |
| | CO2 | Practice on drawing of missing views; principles of dimensions and their methods |

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| | CO3 | Practical skills on sectioning concepts and its drawing & mechanical parts. |
| | CO4 | Practical skills on types of rivet heads & parts, square headed and hexagonal nuts, bolts, different types lock nuts, stands machine screws. |
| | CO5 | Practical knowledge on components of CAD and its hardware requirements, terms & command in Auto CAD software for practice. |
| | CO6 | Practical skills on drawing of riveted joints and thread fasteners, computer graphics in agricultural engineering applications, practice of commands in Auto CAD software. |
| | CO7 | Practical skills on 2-D drawings and projects in Auto CAD. |

| B.Tech 3<sup>rd</sup> Sem | | |
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| **MATHEMATICS-III** | CO1 | Interpret the physical meaning of different operators such as gradient, curl and divergence |
| | CO2 | Estimate the work done against a field, circulation and flux using vector calculus |
| | CO3 | Apply the Laplace transform for solving differential equations |
| | CO4 | Find or compute the Fourier series of periodic signals |
| | CO5 | Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms |
| | CO6 | Identify solution methods for partial differential equations that model physical processes |
| **PROPERTIES AND STRENGTH OF MATERIALS(ES)** | CO1 | Skill development on basic properties of engineering materials and their uses, testing of materials |
| | CO2 | Knowledge development on properties and application of difference of concrete, varieties, distempers, glass, rubber and plywood, plastics, iron-based materials, alloys etc., |
| | CO3 | Development of skill on stress – strain analysis of beams under different types of loading patterns. |
| | CO4 | Acquaintance of skill on Euler's theory and buckling load, analysis on columns & different types of |

| | | columns |
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| | CO5 | Skill development on different types of joints (Riveting), welding analysis cantilever, fixed, continuous beams, theory of moments and their analysis. |
| **FARM POWER AND TRACTOR SYSTEMS(PC)** | CO1 | Skill development on farm power sources classification I.C engine components & construction, operating systems |
| | CO2 | Skill development on fuel supply ignition, cooling & lubrication electrical ignition, fuels & their properties, governing systems of IC engines, power transmission, clutches & its applications |
| | CO3 | Acquaintance of knowledge on clutch types, concepts & principles, single & multiple plates clutches, working mechanism, gear theory and principles, differential unit of its functions, final drive & its applications. |
| | CO4 | Skill development on principles of fluid coupling &torque connector, brakes principles, classification & friction concepts of hydraulic system in factors. |
| | CO5 | Skill development on tractor powers outlets, P.T.O and its applications, Tractor testing and its main components, CG estimation, Tractor chassis its mechanics. |
| **FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS LAB(ES)** | CO1 | Imparting practical skills on determination of meta centric height and Bernoulli's theorem. |
| | CO2 | Exposure to practical skills on measurement of discharge with venture meter and pilot tubes. |
| | CO3 | Acquiring practical skills on determining discharge coefficient of rectangular, triangular and trapezoidal weir and orifices. |
| | CO4 | Imposing practical skills on flow measurement ....... Broad crested weirs and open channels. |
| | CO5 | Imposing practical skills on determination of head losses in pipes, roughness coefficient of open channels. |
| | CO6 | Practical exposes on determination of velocity and pressure in open channels, construction of flow net problems on flow nets.. |
| **FIELD OPERATIONSAND MAINTENANCE OF TRACTORS LAB(PC)** | CO1 | Improved practical skills on air kind fuel filtration systems, lubrication system and their maintenance in tractors. |
| | CO2 | Practical skills improvement on maintenance of |

| | | transmission and radiators cooling systems in tractor. |
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| | CO3 | Practical skills development on maintenance of tractor ignition and hydraulic systems. |
| | CO4 | Practical knowledge on periodical maintenance of tractors, emission of smoke, clutch and brake system maintenance |
| | CO5 | Practical skill development on maintenance of train machinery and implements |
| | CO6 | Practical knowledge on tractor on-off practice of tractors |
| **CONSTITUTION OF INDIA(MC)** | CO1 | Understand historical background of the constitution making and its importance for building a democratic India. |
| | CO2 | Understand the functioning of three wings of the government i.e., executive, legislative and judiciary. |
| | CO3 | Understand the value of the fundamental rights and duties for becoming good citizen of India. |
| | CO4 | Analyze the decentralization of power between central, state and local self-government. |
| | CO5 | Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy. 1. Know the sources, features and principles of Indian Constitution. 2. Learn about Union Government, State government and its administration. 3. Get acquainted with Local administration and Pachayati Raj. 4. Be aware of basic concepts and developments of Human Rights. 5. Gain knowledge on roles and functioning of Election Commission |

| B.Tech 4th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **HEAT AND MASS TRANSFER(PC)** | CO1 | Skill development on principles of heat and mass transfer, steady state heat transfer & its analysis, measurement of thermal conducting of pleasure & composite walls, tubes and spheres, multilayer tubes. |
| | CO2 | Skill development on conduction principles of different materials in parallel, combined convection and conduction, concept of insulation. |

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| | CO3 | Skill development on conduction, convection and radiation analysis of heat and mass transfer, different laws on radiation theory. |
| | CO4 | Imparting skills on unsteady state analysis of heat transfer in fins, free & force convection, cooling theories and principles. |
| | CO5 | Skill development on theory and principles of heat exchanges, their analysis, frick's law of mass transfer coefficients, Reynolds analogy.. |
| **GROUND WATER HYDROLOGY, WELL AND PUMPS(PC)** | CO1 | Skill development on principles of ground water resources development, different acquaintance and their principles. |
| | CO2 | Imparting knowledge on theory of open well hydraulics and drilling methods. |
| | CO3 | Skill development on aquifers characteristics under steady and unsteady state conditions, multiples well systems for coastal areas. |
| | CO4 | Knowledge development to students on artificial ground water recharge classification of indigenous pumps, solar pumps, wind mill pumps etc., |
| | CO5 | Skill development on principles of Centrifugal pumps, principles & characteristics, High lift pumps, mixed flow pumps and vertical turbine pump sets. |
| **THEORY OF STRUCTURES(PC)** | CO1 | Skill development on RCC theory and practice of principles, stress – Strain analysis. |
| | CO2 | Skill development on single, double reinforced sections, their theory & principles, shear stress analysis. |
| | CO3 | Acquaintance of knowledge on design principles of shear reinforcement, anchorage of bars &analysis |
| | CO4 | Skill development on theory and principles of design of one – way reinforced beams/slabs, two way slabs and columns. |
| | CO5 | Skill development on principles of auxiliary loaded columns, foundations retaining walls, stability analysis. |
| **SOIL MECHANICS(PC)** | CO1 | Skill development on principles of soil mechanics soil classification, stresses in soils. |
| | CO2 | Skill development on Bousinesq's analysis for vertical pressure applications & western guard's analysis for point load applications |
| | CO3 | Acquaintance of knowledge on shear stress analysis, Mohr's stress circle, measurement of shear strength. |
| | CO4 | Skill development on soil consolidations theory and |

| | | principles. |
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| | CO5 | Skill development on earth pressure and its effects on soil stability of slopes. |
| **MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS(HSS)** | CO1 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product. |
| | CO2 | The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. |
| | CO3 | The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. |
| | CO4 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis. |
| | CO5 | The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. |

| B.Tech 5th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **FARM MACHINERY AND EQUIPMENT – I(PC)** | CO1 | Apply Principles of Farm Mechanization to calculate field capacities and cost of cultivation |
| | CO2 | Calculate the forces acting on tillage tools, Draft and Unit draft. |
| | CO3 | Explain Earth moving Equipment. |
| | CO4 | Analyze Seeding methods, Plant protection Equipment |
| | CO5 | Discuss the features of Transplanting machinery and Fertilizer application equipment |
| **SURFACE WATER HYDROLOGY (PC)** | CO1 | Analyze probability of rainfall, Return Period, Plotting position |
| | CO2 | Determine net effective rainfall, Peak runoff and Peak runoff rate |
| | CO3 | Discuss the factors affecting flood hydrographs, hydrograph Separation for simple and complex storms. |
| | CO4 | Describe method of superposition, S-Curve and determine duration graphs. |
| | CO5 | Use the Concepts of Flood raining. |
| **POST HARVEST** | CO1 | Apply principles of Bond's law, Kick's law, |

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| **ENGINEERING OF CEREALS, PULSES AND OILSEEDS(PC)** | | Rittinger's law for size reduction |
| | CO2 | Explain the features and application of Material Handling equipment |
| | CO3 | Explain the concepts of Dryers |
| | CO4 | Use CFTRI and Jadavpur methods for Mixing and Milling Practices |
| | CO5 | Apply the principles of milling wheat and Oil seeds |
| **SEED PROCESSING AND STORAGE ENGINEERING (Professional Elective - I)(PE)** | CO1 | Estimate the moisture content by using different methods. |
| | CO2 | Calculate drying air temperature and air flow rate, air pressure within the grain bed. |
| | CO3 | Explain the causes for the spoilage in storage and calculate the parameters associated. |
| | CO4 | Design grain storage structures |
| | CO5 | Analyze Grain handling equipment. |
| **GREENHOUSE TECHNOLOGY (Professional Elective - I)(PE)** | CO1 | Classify the greenhouses based on different parameters |
| | CO2 | Identify the required environmental factors for crop growth |
| | CO3 | Analyze the Natural and forced ventilation, summer and winter cooling systems |
| | CO4 | Explain Greenhouse irrigation systems. |
| | CO5 | Describe protected Agricultural techniques |
| **TRACTOR DESIGN AND TESTING (Professional Elective - I) (PC)** | CO1 | Analyze parameters for balanced design of a tractor |
| | CO2 | Explain the Elements of mechanical power transmission in Agricultural tractor |
| | CO3 | Design seat controls of an agricultural tractor |
| | CO4 | Design gear box |
| | CO5 | Determine turning space, turning radius and other parameters associated |
| **ELECTRICAL CIRCUITS LAB(PC)** | CO1 | Apply various theorems |
| | CO2 | Determination of self and mutual inductances |
| | CO3 | Two port parameters of a given electric circuits |

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| | CO4 | Draw locus diagrams |
| | CO5 | Draw Waveforms and phasor diagrams for lagging and leading networks |
| SOFT SKILLS(SOC) | CO1 | Problem solving regards numerical methods in Linear Algebra |
| | CO2 | Analyze about Eigen values and Eigenvectors |
| | CO3 | Differentiation and Integration Finite difference formula using Taylor series. |
| | CO4 | Differentiation of Lagrange polynomials, Simpson's rule, Gauss-quadrature rule, Romberg method |
| | CO5 | Solving of Partial Differential Equations |
| : PROFESSIONAL ETHICS AND HUMAN VALUES(MC) | CO1 | Judge the concepts of human values. |
| | CO2 | Justify knowledge about the principles of engineering ethics. |
| | CO3 | Interpret engineering as social experimentation |
| | CO4 | Realize engineers' responsibility for safety and risk. |
| | CO5 | Discuss about the engineers' rights and responsibilities |

| B.Tech 6th Sem | | |
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| Course Name | | Course Outcomes |
| SOIL AND WATER CONSERVATION ENGINEERING(PC) | CO1 | Calculate Peak run off, time of conservation |
| | CO2 | Estimate soil loss by using Universal Soil Loss equation and modified soil loss equation, |
| | CO3 | Discuss factors affecting wind erosion, mechanics of wind |
| | CO4 | Design contour bunds, graded bunds and bench terraces |
| | CO5 | Design vegetated water ways, WH Structures |
| FARM MACHINERY AND EQUIPEMNT – II(PC) | CO1 | Describe Crop harvesting machinery |
| | CO2 | Analyze the Power operated vertical conveyer reapers |
| | CO3 | Apply the threshing principles for all types of threshers |
| | CO4 | Analyze the factors affecting the harvesters. |
| | CO5 | Explain the features of cotton harvesting equipment. |

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| **AGRICULTURAL PROCESS ENGINEERING(PC)** | CO1 | Discuss different types of Material handling devices. |
| | CO2 | Analyze the effectiveness and mixing index for granular solids, mixing indices |
| | CO3 | Explain Aerodynamics of Agricultural product . |
| | CO4 | Estimate moisture content in wet basis and dry basis for different types of grains |
| | CO5 | Apply milling principles for wheat, pulses and oil seeds. |
| **FOOD PACKAGING TECHNOLOGY (Professional Elective - II)(PE)** | CO1 | Apply principles of packaging for cost effective packaging |
| | CO2 | Estimate the Shelf life of processed foods |
| | CO3 | Describe different types of packaging materials. |
| | CO4 | Analyze the different techniques used for packaging of milk, fruits and meat. |
| | CO5 | Explain various container making processes |
| **WATERSHED MANAGEMENT(PE)** | CO1 | Plan for watershed development |
| | CO2 | Analyze the factors affecting the watershed management. |
| | CO3 | Explain rainwater conservation technologies. |
| | CO4 | Estimate the Effect of cropping systems, land management and cultural practices on watershed hydrology |
| | CO5 | Prepare project proposal for watershed management program including cost-benefit analysis. |
| **HUMAN ENGINEERING AND SAFETY (Professional Elective - II)** | CO1 | Design workspace for standing and seated workers. |
| | CO2 | Interpret the functions of the skeletal and muscular systems |
| | CO3 | Apply Biometrics and energy for muscle contraction for the design of Hand tools. |
| | CO4 | Estimate the Physical work capacity |
| | CO5 | Calculate sound, the nature of sound, damages due to noise |
| **SOIL AND WATER CONSERVATION ENGINEERING LAB(PC)** | CO1 | Estimation of soil and water conservation practices. |
| | CO2 | Estimation using erosivity index and erodibility index |
| | CO3 | Measurement of irrigation water with H-Flume |

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| | CO4 | Estimate the discharge rate of water by using current meter and water meter. |
| **FARM MACHINERY AND EQUIPMENT LAB(PC)** | CO1 | Study of various implements and functional element |
| | CO2 | Evaluation of field efficiencies and fuel efficiencies. |
| | CO3 | Evaluate performance of various agricultural implements and machines. |
| | CO4 | Design and calibration of seed drills and matching mechanism |
| **AGRICULTURAL PROCESS ENGINEERING LAB(PC)** | CO1 | Conducts the procedure, calculation of uniformity and milling index. |
| | CO2 | Design the procedural calculation of cyclone and pneumatic separation. |
| | CO3 | Solve the problems on psychometric chart, definition and various loss on site reduction. |
| | CO4 | Conduct the performance evaluation of hammer and attribution mills. |
| **STRUCTURAL DESIGN WITH ANSYS(SOC)** | CO1 | Design of connections, structural steel members in tension, and compression and bending. |
| | CO2 | Analyze singly and doubly reinforced sections, Shear, Bond and Torsion. |
| | CO3 | Design of Reinforced concrete Cantilever and Counter fort Retaining Walls |
| | CO4 | Design of Flat Slabs with and without drops by Direct Design Method of IS code. |
| | CO5 | Design of Eccentric Shear and Moment Resisting connections. |
| **EMPLOYABILITY SKILLS(MC)** | CO1 | Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems |
| | CO2 | Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. |
| | CO3 | Analyze, summarize and present information in quantitative forms including table, graphs and formulas |
| | CO4 | Understand the core competencies to succeed in professional and personal life |
| | CO5 | Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc. |
| **B.Tech 7th Sem** | | |

| Course Name | | Course Outcomes |
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| **IRRIGATION AND DRAINAGE ENGINEERING** (Professional Elective - III)(PE) | CO1 | Explain the terminology related to Irrigation and calculate Soil moisture by different methods. |
| | CO2 | Determine infiltration under check basin conditions and adaptability |
| | CO3 | Design irrigation canals using Lacey's and Kennedy's theories. |
| | CO4 | Describe the factors affecting drainage requirement, drainage coefficient based on the given criteria |
| | CO5 | Design subsurface drains under Steady State conditions. |
| **PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY** (Professional Elective - III)(PE) | CO1 | Choose appropriate cutting tool material for a given application |
| | CO2 | Explain CNC tooling |
| | CO3 | Calculate limits, fits & tolerances. |
| | CO4 | Apply the relevant motion control system of CNC machine for a given application. |
| | CO5 | Develop Part programmer for a given product. |
| **FOOD PLANT DESIGN AND MANAGEMENT** (Professional Elective - III)(PE) | CO1 | Explain the principles of plant layout. |
| | CO2 | Select a suitable plant layout for a given product. |
| | CO3 | Use principal considerations for plant location and design of layout |
| | CO4 | Describe the design criteria of plant building |
| | CO5 | Estimate Cost indices, total product cost. |
| **DESIGN OF SOIL AND WATER CONSERVATION AND FARM SYSTEMS** (Professional Elective - IV)(PE) | CO1 | Analyze types of flow, state of flow, regimes of flow. |
| | CO2 | Estimate runoff by using Parshall flume, H-Flume and weirs, water stage recorders, straight drop spill way-general description. |
| | CO3 | Design Chute spillway and SAF stilling basic |
| | CO4 | Design trapezoidal notch fall and siphon well drop type of canal falls. |
| | CO5 | Analyze different components of diversions head works. |
| **FOOD PROCESS EQUIPMENT DESIGN** (Professional Elective - IV)(PE) | CO1 | Apply design engineering principles for process Equipment Design |
| | CO2 | Design Food Process equipment. |
| | CO3 | Design high pressure monobolic and multilayer vessels. |
| | CO4 | Analyze the design Parameters of the Conveyors, dryers and other processing equipment. |

| | CO5 | Determine process efficiency, energy utilization and cost. |
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| **DESIGN OF AGRICULTURAL MACHINERY (Professional Elective - IV)(PE)** | CO1 | Analyze the general considerations in machine design. |
| | CO2 | Calculate the design Parameters of socket, spigot cotter joint and Knuckle joint. |
| | CO3 | Choose appropriate levers and springs for a given application |
| | CO4 | Design shafts and keys for the specified conditions. |
| | CO5 | Design Tillage equipment. |
| **MICRO IRRIGATION ENGINEERING (Professional Elective - V)(PE)** | CO1 | Explain the concept of Sprinkler Irrigation and its components. |
| | CO2 | Discuss Precipitation profiles and Moisture distribution patterns, sprinkler spacing's. |
| | CO3 | Design Sprinkler system, layout, laterals and mains. |
| | CO4 | Describe drip Irrigation and its components. |
| | CO5 | Plan for installation of drip irrigation system. |
| **Subject: MECHATRONICS IN AGRICULTURAL ENGINEERING (Professional Elective - V)** | CO1 | Describe various mechatronics systems, measurement systems, sensors and transducers. |
| | CO2 | Explain the functionality of solid state electronic devices. |
| | CO3 | Identify the components in the design of electro mechanical systems. |
| | CO4 | Apply the concepts of digital electronics and applications of PLCs for control. |
| | CO5 | Analyze the system interfacing, data acquisition and design of mechatronics systems |
| **DAIRY AND FOOD ENGINEERING (Professional Elective - V)(PE)** | CO1 | Estimate the physical and chemical properties of milk, water content, acidity, pH, developed acidity. |
| | CO2 | Analyze the parameters that influence Pasteurization |
| | CO3 | Describe emulsification and types of emulsions |
| | CO4 | Estimate the carbohydrates, protein, lipids, minerals, vitamins in food product. |
| | CO5 | Analyze the factors influencing rate of evaporation, thermodynamics of evaporation, and circulation in Evaporators. |
| **UNIVERSAL HUMAN VALUES: 2 UNDERSTANDING HARMONY (Humanities and Social Science** | CO1 | Analyze Principles of Solar Radiation. |
| | CO2 | Apply solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion. |
| | CO3 | Apply Principles of bio-conversion. |

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| **Elective)(HSS)** | CO4 | Analyze Geothermal Energy techniques. |
| | CO5 | Discus Direct Energy Conversion |
| **COMPUTATIONAL FLUID DYNAMICS WITH FLUENT(SOC)** | CO1 | Explain elementary details and numerical techniques for solving various engineering problems involving fluid flow. |
| | CO2 | Study about finite difference applications in heat conduction and convection. |
| | CO3 | Apply finite difference for flow modeling. |
| | CO4 | Understand the concepts of finite volume method. |
| | CO5 | Understand the concepts of finite element method applied to heat transfer problems |

| B.Tech 8th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **MANAGEMENT OF CANAL IRRIGATION SYSTEM** | CO1 | Apply the knowledge on canal classification and its alignment. |
| | CO2 | Determine duty, delta, base period relationships and canal capacity. |
| | CO3 | Design channels using Kennedy's theory and Lacey's regime theory. |
| | CO4 | Differentiate between lined and unlined channels. |
| | CO5 | Explain different irrigation structures. |
| **POST HARVEST ENGINEERING OF HORTICULTURAL CROPS** | CO1 | Explain about the properties and factors affecting quality of fruits and vegetables. |
| | CO2 | Classify post harvest operations involved in horticulture processing. |
| | CO3 | Identify preservation techniques for processed foods. |
| | CO4 | Apply the advanced packaging technology in food preservation. |
| | CO5 | Identify post harvest disorders in horticultural produce. |
| **INFORMATION TECHNOLOGY FOR LAND AND WATER MANAGEMENT** | CO1 | Analyze Information Technology (IT) and its application potential |
| | CO2 | Discuss about application and production of multimedia, internet application tools and web technology |
| | CO3 | Development of database concept for effective natural resources management. |
| | CO4 | Apply agricultural information management systems. |
| | CO5 | Application of decision support systems, multi sensor data loggers. |

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| **THEORY OF MACHINES** | CO1 | Analyze element, link, pairs. kinematics of chains and pairs |
| | CO2 | Apply helical, spiral, bevel and worm gear. Simple, compound, reverted and epicyclical mechanisms |
| | CO3 | Estimate the length of belt, power transmitted, velocity ratio, belt size for flat and v-belts |
| | CO4 | Discus Effect of friction, controlling force, curves, sensitiveness, stability, hunting, Isochronisms', power and effort of a governor. |
| | CO5 | Apply Partial primary balancing of reciprocating masses. |
| **INSTRUMENTATION AND PROCESS CONTROL IN FOOD INDUSTRY** | CO1 | Estimate Temperature and temperature scales |
| | CO2 | Analyze the different methods of liquid level measurement |
| | CO3 | Estimate the moisture content, specific gravity, measurement of humidity |
| | CO4 | Discus simple system analysis, dynamic behavior of simple process |
| | CO5 | Apply Temperature control, electronic controllers, flow ratio control, atmosphere control |
| **LANDSCAPE IRRIGATION DESIGN AND MANAGEMENT** | CO1 | Discus landscape irrigation- hose irrigation system, quick release coupling system |
| | CO2 | Incorporate modern methods of landscape irrigation- popup sprinklers, spray pop-up sprinkler, shrub adopter. |
| | CO3 | Estimation of Modern methods of landscape irrigation- popup sprinklers, spray pop-up sprinkler, shrub adopter. |
| | CO4 | Apply Automation system for landscape irrigation |
| | CO5 | Design of modern landscape irrigation systems |
| **TRACTOR SYSTEMS AND CONTROLS** | CO1 | Analyze functions of power transmission system and clutch system |
| | CO2 | Discus Gear Box – Gearing theory, principle of operation, gear box types. |
| | CO3 | Apply principle of operation, construction, calculation for braking torque. |
| | CO4 | Familiarization with system the Hydraulic adjustments and ADDC |
| | CO5 | Analyze the importance of moment of inertia of a tractor. Study of tractor static equilibrium, tractor stability especially at turns. |
| **FOOD QUALITY AND** | CO1 | Estimate Measurement of color, flavor, consistency, viscosity, texture and their relationship with food |

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| **CONTROL** | | quality | |
| | CO2 | Analyze sampling: purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials. | |
| | CO3 | Interpretation of sensory results. Instrumental method for testing quality. | |
| | CO4 | Detection of adulteration and examination of various food products | |
| | CO5 | Discus about Food Safety Management Systems GAP, GHP, GMP, Hazards and HACCP | |
| **FLOODS AND CONTROL MEASURES** | CO1 | Estimation and cause of floods. | |
| | CO2 | Discus flood forecasting. Flood routing - channel routing, Muskingum structural and nonstructural measures of flood control. | |
| | CO3 | Analyze the Gully erosion and its control structures. | |
| | CO4 | Design and construction of earthen dam, stability of earthen embankments against failure by tension | |
| | CO5 | Discus about Subsurface dams - site selection and constructional features | |
| **BIO-ENERGY SYSTEMS: DESIGN AND APPLICATIONS** | CO1 | Analyze fermentation processes and its general requirements. | |
| | CO2 | Discus Biomass Production. | |
| | CO3 | Apply Biomass preparation techniques for harnessing. | |
| | CO4 | Discus about Biomass preparation techniques for harnessing. | |
| | CO5 | Apply shaft power generation, thermal application and economics | |
| **AQUACULTURAL ENGINEERING** | CO1 | Analyze fresh water, brackish water and marine farms. | |
| | CO2 | Estimation of area of regular and irregular plane surfaces. | |
| | CO3 | Plan for fish ponds, layout planning, materials planning, manual planning, comparison of square and rectangular ponds, large and small ponds. | |
| | CO4 | Plan for construction of coastal aqua farms. Brackish water fish farms- tide fed, pump fed farms. | |
| | CO5 | Discus about pumps purpose of pumping, types, selection of pump, total head, horse power calculation. Filters- types and constructions. | |
| **RECISION FARMING TECHNIQUES FOR** | CO1 | Analyze the importance of agro climatic factors available inside of green house | |

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| **PROTECTED CULTIVATION** | CO2 | Discuss about controlling of greenhouse environment factors by using active devices |
| | CO3 | Design and installation of micro irrigation system inside the greenhouse |
| | CO4 | Optimize temperature and relative humidity in green house. |
| | CO5 | Select Crops for green house cultivation |
| **WASTELAND DEVELOPMENT** | CO1 | Plan for the development of wasteland |
| | CO2 | Analyze about conservation structures. |
| | CO3 | Discuss the reclamation of water logged and salt – affected lands. |
| | CO4 | Interpret the impact of land degradation, reclamation and rehabilitation. |
| | CO5 | Prepare proposal for wasteland development and benefit-cost analysis. |
| **FARM MACHINERY DESIGN AND PRODUCTION** | CO1 | Explain the basic concept of machine design. |
| | CO2 | Apply principles of design to mechanical power transmission elements such as shafts, keys & couplings, bearings. |
| | CO3 | Apply principles of design in designing farm machinery implements |
| | CO4 | Explain the advanced manufacturing techniques in Production. |
| | CO5 | Explain Industrial lay-out planning. |
| **TESTING AND EVALUATION OF TRACTORS AND FARM EQUIPMENT** | CO1 | Testing of agricultural machines |
| | CO2 | Testing of Sub-soiler, laser land leveler, Rotavator, Cultivator, Disc Harrow, Seed cum fertilizer drill and planters. |
| | CO3 | Testing of manual and power operated weeders, reaper and thresher. |
| | CO4 | Testing of Combine harvesters. Plant protection machines |
| | CO5 | Testing of farm tractor. |
| **EARTH MOVING MACHINES** | CO1 | Explain Engineering fundamentals of Earth Moving Machines. |
| | CO2 | Apply Principles of mechanisms in Crawler mounted tractors and Dump trucks. |
| | CO3 | Select suitable equipment for Land cleaning and reclamation. |
| | CO4 | Discuss the role of Earth diggers and ditches. |
| | CO5 | Analyze land development machines on Economic |

| | | aspects. |
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| **SPRINKLER AND MICRO IRRIGATION SYSTEMS** | CO1 | Explain scenario, types and different components of sprinkler irrigation system. |
| | CO2 | Evaluate performance and head losses calculation in sprinkler irrigation system. |
| | CO3 | Explain about various micro irrigation systems and components of drip irrigation system. |
| | CO4 | Evaluate performance and head losses calculation in drip irrigation system. |
| | CO5 | Identify proper method for maintenance of emitter and apply fertilizer through drip irrigation system. |
| **MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT** | CO1 | Analyze the Factors affecting performance of irrigation projects |
| | CO2 | Design lift irrigation systems |
| | CO3 | Explain Components, need, scope of command area development |
| | CO4 | Use remote sensing techniques for CAD works and enhancing water productivity |
| | CO5 | Plan and layout the water Conveyance systems and determine Storage Capacity of Tanks. |
| **DEVELOPMENT OF PROCESSED FOOD PRODUCTS** | CO1 | Analyze the unit operations and equipment for processing |
| | CO2 | Development of new products |
| | CO3 | Extraction of oil and refining of oil. |
| | CO4 | Study about value added products from fruits, vegetables and spices, Canned foods. |
| | CO5 | Preparation of Practical Process design and process flow chart |
| **ENGINEERING PROPERTIES OF AGRICULTURAL PRODUCE** | CO1 | Calculate the basic engineering properties of a biological material. |
| | CO2 | Analyze the flow behavior of biological materials and force deformation. |
| | CO3 | Analyze the Maxwell and Kelvin model equations in the theology for important biological materials. |
| | CO4 | Explain the applications of frictional and aerodynamic properties in the design of processing equipment |
| | CO5 | Explain the applications of electrical and thermal properties in the design of processing equipment |

| AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL | CO1 | Plan and layout farmstead. |
| --- | --- | --- |
| | CO2 | Design farm structures |
| | CO3 | Design grain storage go downs, Bag storage structures, Shallow and Deep bin |
| | CO4 | Analyze the sources of water supply, norms of water supply for human beings and animals |
| | CO5 | Measure environmental parameters and cooling load of a farm building |
| FOOD WASTE AND BY-PRODUCTS UTILIZATION | CO1 | Analyze the basic applications of agro industries and by- products utilization, importance of rice husk and their uses and rice husk combustion |
| | CO2 | Describe the manufacturing of alcohol processes and production of furfural |
| | CO3 | Explain by-products of coconut, mango, cashew nut and banana |
| | CO4 | Explain about the feed manufacturing equipments, paper making process and different types of sugarcane by-products. |
| | CO5 | Justify the biological treatment with their advantages and disadvantages. |

# DEPARTMENT OF CIVIL ENGINEERING Courses Outcomes(R20)

# CIVIL ENGINEERING Courses Outcomes(R20)

| B.Tech 1ˢᵗSem | | |
|---|---|---|
| Course Name | | Course Outcomes |
| Engineering Physics(Integrated)(Theory & Lab) | CO1 | Explain the need of coherent sources and the conditions for sustained interference (L2). Identify applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary polarized light and extraordinary polarized light (L2) The different realms of physics and their applications in both scientific and technological systems are achieved through the study of wave optics. |
| | CO2 | Explain various types of emission of radiation (L2). Identify lasers as tools in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify the optical fibers based on refractive index profiles and modes of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3). |
| | CO3 | Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Clausius- Mosti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3). |
| | CO4 | Explain sound waves and its propagation/absorption of construction material used in design of buildings (L2). Analyze acoustic parameters of typical materials used in buildings (L4). Recognize sound level disruptors and their application in architectural acoustics (L2). Identify the use of ultrasonics in diversified fields of engineering (L3) |
| | CO5 | Interpret various crystal systems (L2) and Analyze the characterization of materials by XRD (L4). Identify the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique (L3). Analysis of structure of the crystals by Laue and Powder techniques (L2). |

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| | CO1 | Identify and classify the geological minerals |
| | CO2 | Measure the rock strengths of various rocks |
| Engineering Geology | CO3 | Classify and measure the earthquake prone areas to practice the hazard zonation |
| | CO4 | Classify, monitor and measure the Landslides and subsidence |
| | CO5 | Prepares, analyses and interpret the Engineering Geologic maps |
| Engineering Geology(LAB) | CO1 | Identify Megascopic minerals & their properties. |
| | CO2 | Identify Megascopic rocks & their properties. |
| BASICS OF CIVIL ENGG. (WORK SHOP) LAB (ESC1103) | CO1 | identify various components of a building and give lump-sum estimate. ϖ Determine distances and irregular areas using conventional survey instruments like chain, tape, cross-staff and compass ϖ Identify different soils ϖ Know various traffic signs & signals ϖ Determine center of gravity and moment of inertia of channel and I-sections. ϖ Set out a signal room building as per given plan ϖ Install simple sanitary filling and find discharge/velocity in a water pipe line as density of water ϖ Know to the process of making cement mortar / concrete for nominal mix |
| | CO2 | Determine distances and irregular areas using conventional survey instruments like chain, tape, cross-staff and compass |
| | CO3 | Identify different soils ϖ Know various traffic signs & signals |
| | CO4 | Determine center of gravity and moment of inertia of channel and I-section |
| | CO5 | Set out a signal room building as per given plan ϖ Install simple sanitary filling and find discharge/velocity in a water pipe line as density of water |
| | CO6 | Know to the process of making cement mortar / concrete for nominal mix. |

| B.Tech2ndSem | | |
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| Course Name | | Course Outcomes |
| Mathematics– II (Linear | CO1 | develop the use of matrix algebra techniques that is |

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| Algebra &Numerical Methods) | | needed by engineers for practical applications (L6) |
| | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3) |
| | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5) |
| | CO4 | • apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) |
| | CO5 | apply numerical integral techniques to different Engineering problems (L3) |
| | CO6 | apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3) |
| Engineering Chemistry | CO1 | At the end of this unit, the students will be able to • Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion. |
| Programing for problem solving using c. | CO1 | To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program |
| | CO2 | To gain knowledge of the operators, selection, control statements and repetition in C |
| | CO3 | To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage. |
| | CO4 | To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor |
| | CO5 | To assimilate about File I/O and significance of functions |
| Building Materials and Concrete Technology | CO1 | . Know various engineering properties of building construction materials and suggest their suitability |
| | CO2 | Identify the functional role of ingredients of concrete and apply this knowledge to concrete mix design. |
| | CO3 | |

| | | Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete |
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| Building Planning And Aided Building Drawing | CO1 | Perform basic commands of any suitable CAD software to draw 2D drawings |
| | CO2 | Interpret the conventions, signs and symbols from a given drawing. |
| | CO3 | Prepare line plans of residential and public buildings using principles of planning. |
| | CO4 | Prepare submission and working drawing from the given requirement for Load Bearing and Framed structures |

| CHEMISTRY LAB (BSC1203) | CO1 | practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills |
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| B.Tech3rdSem | |
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| Course Name | Course Outcomes |
| Mathematics -III (Vector Calculus, Transforms and PDE | CO1 | interpret the physical meaning of different operators such as gradient, curl and divergence(L50 |
| | CO2 | estimate the work done against a field, circulation and flux using vector calculus (L5) |
| | CO3 | apply the Laplace transform for solving differential equations (L3) |
| | CO4 | find or compute the Fourier series of periodic signals (L3) |
| | CO5 | know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3) |
| | CO6 | identify solution methods for partial differential equations that model physical processes (L3) |
| Strength of Materials - I | CO1 | The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions . |
| | CO2 | The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces |
| | CO3 | The student will have knowledge of bending concepts |

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| | | and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions . |
| | CO4 | The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation. |
| Fluid Mechanics | CO1 | • Understand the various properties of fluids and their influence on fluid motion and analyses a variety of problems in fluid statics and dynamics. |
| | CO2 | variety of problems in fluid statics and dynamics. |
| | CO3 | Calculate the forces that act on submerged planes and curves. |
| | Co4 | Ability to analyses various types of fluid flows. |
| | CO5 | • Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces. |
| | CO6 | Able Measure the quantities of fluid flowing in pipes, tanks and channels. |
| Surveying And Geometrics. | CO1 | Apply the knowledge to calculate angles, distances and levels |
| | CO2 | Identify data collection methods and prepare field notes |
| | CO3 | Understand the working principles of survey instruments, measurement errors and corrective measures. |
| | CO4 | Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies. |
| HIGHWAY ENGINEERING | CO1 | Plan highway network for a given area. |
| | CO2 | Determine Highway alignment and design highway geometrics |
| | CO3 | Design Intersections and prepare traffic management plans |
| | CO4 | Judge suitability of pavement materials and design flexible and rigid pavements |

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| CONCRETE TECHNOLOGY LAB | CO1 | n successful completion of this course, student will be able to • Determine consistency and fineness of cement. |

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| | | CO2 | Determine consistency and fineness of cement |
| | | CO3 | Determine setting times of cement |
| | | CO4 | Determine specific gravity and soundness of cement. |
| | | CO5 | Determine compressive strength of cement |
| | | CO6 | Determine workability of cement concrete by compaction factor, slump and Vee – Bee test |
| | | CO7 | Determine specific gravity of coarse aggregate and fine aggregate by Sieve analysis |
| | | CO8 | Determine flakiness and elongation index of aggregates. |
| | | CO9 | Determine bulking of sand. |
| | | C10 | Understand non-destructive testing procedures on concrete. |
| HIGHWAY ENGINEERING LAB | | CO1 | . Test aggregates and judge the suitability of materials for the road construction |
| | | CO2 | Test the given bitumen samples and judge their suitability for the road construction |
| | | CO3 | Obtain the optimum bitumen content for Bituminous Concrete. |
| | | CO4 | Determine the traffic volume, speed and parking characteristics. |
| CONSTITUTION OF INDIA (MC) | | CO1 | Understand the concept of Indian constitution . |
| | | CO2 | Apply the knowledge on directive principle of state policy |
| | | CO3 | Analyze the History, features of Indian constitution |
| | | CO4 | Evaluate Preamble Fundamental Rights and Duties. |

| B.Tech4thSem | | |
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| Course Name | | Course Outcomes |
| | CO4 | apply discrete and continuous probability distributions (L3) |
| | CO5 | design the components of a classical hypothesis test (L6) |

| | CO6 | infer the statistical inferential methods based on small and large sampling tests (L4) |
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| Strength of Materials - II | CO1 | The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections. |
| | CO2 | The student can assess stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions |
| Hydraulics and Hydraulic Machinery | CO1 | Solve uniform and non-uniform open channel flow problems. |
| | CO2 | Apply the principals of dimensional analysis and similitude in hydraulic model testing. |
| | CO3 | Understand the working principles of various hydraulic machineries and pumps. |
| Environmental Engineering | CO1 | Select a source based on quality and quantity and Estimate design population and water demand |
| | CO2 | Design a water treatment plant for a village/city |
| | CO3 | Design a sewer by estimating DWF and Strom water flow and plumbing system for buildings |
| | CO4 | Design a Sewage Treatment Plant for a town/city |
| Managerial Economics & Financial Analysis | CO1 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product. |
| | CO2 | The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. |
| | CO3 | The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. |
| | CO4 | The Learner is able to prepare Financial Statements and the usage of various accounting tools for Analysis. |
| | CO5 | The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. |
| | CO4 | Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies. |
| Environmental Engineering | CO1 | Estimate some important characteristics of water, wastewater and soil in the laboratory . |
| | CO2 | Draw some conclusion and decide whether the water is suitable for Drinking/Construction / Agriculture/ Industry |
| | CO3 | Estimate Chloride, EC and Salinity of Soil and suggest their |

| | | suitability for Construction/Agriculture |
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| | CO4 | Estimation of the strength of the sewage in terms of BOD and COD and Decide whether the water body is polluted or not with reference to the stated parameters in the list of experiments |
| | CO5 | Demonstration of various instruments used in testing of water and soil and study of Drinking water standards, WHO guidelines, Effluent standards and standards for Construction/ Agriculture |

### B.Tech 5<sup>th</sup> Sem

| Course Name | | Course Outcomes |
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| Professional Core courses (STRUCTURAL ANALYSIS) | CO1 | Distinguish between the determinate and indeterminate structures. |
| | CO2 | Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure. |
| | CO3 | Estimate the bending moment and shear forces in beams for different fixity conditions. |
| | CO4 | Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems |
| | CO5 | Draw the influence line diagrams for various types of Shoving loads on beams/bridges. |
| | CO6 | Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss. |
| Professional Core courses (DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES) | CO1 | Work on different types of design methods |
| | CO2 | Carryout analysis and design of flexural members and detailing |
| | CO3 | Design structures subjected to shear, bond and torsion |
| | CO4 | Design different type of compression members and footings |
| Professional Core courses (GEOTECHNICAL ENGINEERING-1) | CO1 | The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships |
| | CO2 | The student should be able to know the methods of determination of the various index properties of the soils and classify the soils |
| | CO3 | . The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory. |
| | CO4 | The student should be able to apply the above |

| | | concepts in day-to-day civil engineering practice. |
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| GeotechnicalEngineering(Lab) | CO1 | Determine index properties of soil and classify them. b. Determine permeability of soils. c. Determine Compaction, Consolidation and shear strength characteristics. |
| | CO2 | Determine permeability of soils |
| | CO3 | Determine Compaction, Consolidation and shear strength characteristics |
| Construction Technology &Management. | CO1 | appreciate the importance of construction planning 2. understand the functioning of various earth moving equipment 3. know the methods of production of aggregate products and concreting 4. apply the gained knowledge to project management and construction techniques |
| | CO2 | understand the functioning of various earth moving equipment. |
| | CO3 | . know the methods of production of aggregate products and concreting. |
| | CO4 | apply the gained knowledge to project management and construction techniques. |
| | CO1 | Be familiar with ground, air and satellite-based sensor platforms. |
| | CO2 | Interpret the aerial photographs and satellite imageries |
| | CO3 | Create and input spatial data for GIS application. |
| | CO4 | . Apply RS and GIS concepts for application in Civil Engineering |
| Construction Technology &Management. | CO1 | Prepare EMP, EIS and EIA report, estimate cost benefit ratio of a project . |
| | CO2 | Selection of an appropriate EIA me |
| Remote sensing and Giss | CO3 | Evaluation of impacts on environment |
| | CO4 | Evaluation of risk assessment. |

| B.Tech6thSem | | |
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| Course Name | | Course Outcomes |
| Design And Drawing Of Steel Structure. | CO1 | • Work with relevant Is codes. |
| | CO2 | Carryout analysis and design of flexural members and detailing |
| | CO3 | Design compression members of different types with connection detailing |
| | CO4 | Design Plate Girder and Gantry Girder with connection detailing |

| | CO5 | Produce the drawings pertaining to different components of steel structures. |
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| Water Resources Engineering | CO1 | Have a thorough understanding of the theories and principles governing the hydrologic processes. |
| | CO2 | Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects. |
| | CO3 | Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures |
| | CO4 | Develop design storms and carry out frequency analysis. |
| | CO5 | Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects |
| | CO6 | Develop unit hydrograph and synthetic hydrograph. |
| Geotechnical Engineering-II | CO1 | The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics. |
| | CO2 | The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly |
| | CO3 | . The student must be able to use the field test data and arrive at the bearing capacity. |
| | CO4 | The student must be able to apply the principles of bearing capacity of piles and design them accordingly. |
| Estimation Costing Construct (Lab) | CO1 | The student should be able to determine the quantities of different components of buildings. |
| | CO2 | The student should be in a position to find the cost of various building components. |
| | CO3 | The student should be capable of finalizing the value of structures. |
| | CO4 | Understand design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceuticparameters |
| | CO5 | Apply non linear kinetics. |
| PC-Lab-Remote Sensing & Giss LAB | CO1 | Work comfortably on GIS software. |
| | CO2 | Digitize and create thematic map and extract important features |
| | CO3 | Develop digital elevation model |
| | CO4 | Interpretation and Estimation of features from satellite imagery |
| | CO5 | Analyze and Modelling using GIS software. |

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| PC-Lab -Civil Engineering Practice LAB | CO1 | Gains adequate confidence to work as a consulting engineer in any field of Civil . |
| | CO2 | Understands the duties, responsibilities and coal practices of Civil Engineering profession |
| | CO3 | Will be ready to plan, design and execute Civil Engineering projects |
| | CO4 | Can build safety related and environmental impact related |
| | CO5 | Can optimize project costs using sustainability concepts |
| SC-Lab-Cad LAB | CO1 | Model the geometry of real-world structure Represent the physical model of structural element/structure . |
| | CO2 | Perform analysis |
| | CO3 | Interpret from the Post processing results |
| | CO4 | Design the structural elements and a system as per IS Codes |
| MC-Employability Skills | CO1 | To solve aptitude and reasoning problems. |
| | CO2 | Apply the soft skills in dealing the issues related to Employability |
| | CO3 | Successful in getting employment in campus placement interview. |
| B.Tech 7th Sem | | |
| PE-601-II a) ADVANCED STRUCTURAL ANALYSIS | CO1 | • Differentiate Determinate and Indeterminate Structures |
| | CO2 | Carryout lateral Load analysis of structure |
| | CO3 | Analyze Cable and Suspension Bridge structures |
| | CO4 | Analyze structures using Moment Distribution, Kani's Method and Matrix methods |
| PE-601- II b). Architecture And Town Planning | CO1 | Distinguish architectural styles of eastern and western world. |
| | CO2 | Understand the importance of Orders of architecture |
| | CO3 | . Compose spaces of buildings using design concepts, planning principles |
| | CO4 | Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities. |
| PE-601- II c). Road Safety Engineering | CO1 | To understand fundamental of Traffic Engineering . |
| | CO2 | To investigate & determine the collective factors & remedies of accident involved |
| | CO3 | To design & planning various road geometrics |

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| | CO4 | To massage the traffic system from road safety point of view |
| PE-601- II (d) – Traffic Engineering | CO1 | Determine traffic speed, volume, travel time and density |
| | CO2 | Design traffic signals |
| | CO3 | Determine highway capacity and LOS |
| HSC701-INTELLECTUAL PROPERTY RIGHTS AND PATENTSs | CO1 | understood the significance of innovations, distinguish different kinds of IPRs and know the legislative framework, practice and procedure relating to Patents, Copyrights, Trademarks, Designs, Trade Secrets, Geographical Indications, Traditional Knowledge and certain emerging areas. |
| | CO2 | understood the various components of copyright law, its protection and enforcement to know the application of copyright law, its duration, advantages and the issues of 'fair use' and 'plagiarism' in the digital era. |
| | CO3 | Understood the Patent law in India and its global instruments and spell out the procedural requirements of novelty, non-obviousness and inventive step involved in obtaining a Patent, its exclusive rights besides assignment and licensing patterns and how the patent does benefit the society. |
| | CO4 | understood the conceptual and legal framework, procedural requirements relating to Trade Marks and its infringement and gives an insight how the Trademark is commercially advantageous to its owner and to prevent unfair competition and further safeguarding the trade secrets of the business enterprises. |
| | CO5 | Understood the importance of E-commerce, data security, online transactions and how the confidentiality and privacy can be safeguarded through the digital signatures and the prevention and punishment of cybercrimes under the law. |
| SC-701- Project Planning, Town Planning. | CO1 | Design raft foundations and different types of RCC retaining walls. |
| | CO2 | Carryout analysis and design of different types of RCC water tanks. |
| | CO3 | Solve the problems regarding design of RCC Bunkers, Silos and Chimneys. |
| | CO4 | Understand the concepts of prefabricated construction. |
| PE-701- III b) BRIDGE ENGINEERING | CO1 | Explain different types of Bridges with diagrams and Loading standards. |
| | CO2 | Carryout analysis and design of Slab bridges, T |

| | | Beam bridges, Box culvers and suggest structural detailing |
|---|---|---|
| | CO3 | Carryout analysis and design of Plate girder bridges |
| | CO4 | Organize for attending inspections and maintenance of bridges and prepare reports |
| PE-701- III c) STRUCTURAL DYNAMICS | CO1 | CO1 Understand the response of structural systems to dynamic loads loads Harmonic |
| | CO2 | Realize the behavior and response oflinear and nonlinear SDOFandMDOF structures with various dynamic loading |
| | CO3 | CO3 Understand the behavior and response of MDOF structures with various dynamic Loading. |
| | CO4 | CO4 Possess the ability to find out suitable solution for continuous system. |
| | CO5 | Understandthe behavior of structures subjected toddy manic loads underfree vibration. |
| PE-701- III d) URBAN TRANSPORTATION PLANNING | CO1 | . Estimate travel demand for an urban area . |
| | CO2 | Plan the transportation network for a city |
| | CO3 | Identify the corridor and plan for providing good transportation facilities |
| | CO4 | Evaluate various alternative transportation proposals |
| PE-702- IV a). GROUND IMPROVEMENT TECHNIQUES | CO1 | By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations. of grouting. |
| | CO2 | The student should be in a position to design a reinforced earth embankment and check its stability |
| | CO3 | . The student should know the various functions of Geo synthetics and their applications in Civil Engineering practice |
| | CO4 | The student should be able to understand the concepts and applications of grouting |
| PE-702- IV (b) GEO-SPATIAL TECHNOLOGIES | CO1 | Understand the geospatial technology relating to the data acquiring and processing that is associated with geographic locations . |
| | CO2 | Apply Geospatial techniques in the decision support systems useful for decision makers and community services |
| | CO3 | Ability to solve the problems related to the natural resource management, environment, urban planning and Infrastructure development, etc.. |

| | CO4 | Able to generate the thematic maps using Geospatial techniques e) Apply the concept of Geospatial Techniques to the Civil Engineering problems |
|---|---|---|
| PE-702- IV d). SOIL DYNAMICS AND MACHINE FOUNDATIONS | CO1 | Use theory of vibrations to find the behavior of soil under dynamic loading. |
| | CO2 | Design machine foundations under different loads and soil conditions |
| | CO3 | . Understand the liquefaction phenomena. |
| | CO4 | . Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its interpretation |
| | CO5 | Design vibration isolators under any vibratory machines. |
| | CO3 | Canal drop-Notch type. |
| | CO4 | Canal regulator. |
| PE-703- V b). EARTH & ROCKFILL DAMS | CO1 | Able to design earth and rock fill dams . |
| | CO2 | Get familiarity with slope stability calculations. |
| | CO3 | Prevention techniques for slope failures. |
| PE-703- V c). URBAN HYDROLOGY | CO1 | develop intensity duration frequency curves for urban drainage systems. |
| | CO2 | Develop design storms to size the various components of drainage systems |
| | CO3 | Apply best management practices to manage urban flooding |
| | CO4 | Prepare master drainage plan for an urbanized area |
| B.Tech 8th Sem | | |
| STRENGTH OF MATE(RIALS | CO1 | The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions.. |
| | | The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces. |
| | | The student will have knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions. |
| | | The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal |

| | | pressure using Lame's equation | |
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| FLUID MECHANICS | Course Name | Course Outcomes | |
| | CO1 | 1. Understand the various properties of fluids and their influence on fluid motion and analyze a variety of problems in fluid statics and dynamics. 2. Calculate the forces that act on submerged planes and curves. 3. Analyze various types of flow problems through closed conduits. 4. Measure the quantities of fluid flowing in pipes and channels. 5. Understand the concepts of Boundary layer and solve problems on boundary layer. | |
| | CO2 | Calculate the forces that act on submerged planes and curves. | |
| | CO3 | Analyze various types of flow problems through closed conduits. | |
| | CO4 | . Measure the quantities of fluid flowing in pipes and channels. | |
| | CO5 | Understand the concepts of Boundary layer and solve problems on boundary layer. | |
| SURVEYING & GEOMATICS | CO1 | 1. Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations. | |
| | CO2 | Calculate, design and layout horizontal and vertical curves. | |
| | CO3 | Operate a total station and GPS to measure distance, angles, and to calculate differences in Elevation. Reduce data for application in a geographic information system. | |
| | CO4 | Relate and apply principles of photogrammetry for surveying. | |
| | CO5 | Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems. | |
| HIGHWAY ENGINEERING | CO1 | Plan highway network for a given area. | |
| | CO2 | Plan highway network for a given area. Determine Highway alignment and design highway geometrics.. | |
| | CO3 | Design Intersections and prepare traffic management plans. | |
| | CO4 | Judge suitability of pavement materials and design flexible and rigid pavement. | |

| Course | CO | Outcome |
|---|---|---|
| . ROAD SAFETY ENGINEERING | CO1 | a) To understand fundamental of Traffic Engineering. |
| | CO2 | To investigate & determine the collective factors & remedies of accident involved. |
| | CO3 | To massage the traffic system from road safety point of view. |
| ENVIRONMENTAL MANAGEMENT | CO1 | . a. Plan and design the water and wastewater systems |
| | CO2 | Identify the source of emissions and select proper control systems. |
| | CO3 | Design & estimation of water supply system for a city. |
| | CO4 | to get knowledge about various environmental aspects. |
| | CO5 | Selection of suitable treatment flow for raw water treatments. |
| URBAN PLANNING | CO1 | . A Estimate travel demand for an urban area . |
| | CO2 | Plan the transportation network for a city. |
| | CO3 | Identify the corridor and plan for providing good transportation facilities. |
| | CO4 | D Evaluate various alternative transportation proposals. |
| | CO5 | |
| ELEMENTS OF CIVIL ENGINEERING | CO1 | a) basics of Civil Engineering concepts . |
| | CO2 | the surveying the elevations and mapping. |
| | CO3 | the construction materials and elements. |
| | CO4 | water resource development and. |
| | CO5 | overall infrastructure development. |
| ENVIRONMENTAL ENGINEERING | CO1 | . A Plan and design the water and distribution networks and sewerage systems . |
| | CO2 | Identify the water source and select proper intake structure. |
| | CO3 | Design & estimation of water supply system of an apartment. |
| | CO4 | . Select the appropriate appurtenances in the water supply. |
| | CO5 | Selection of suitable treatment flow for raw water treatments. |
| DISASTER MANAGEMENT | CO1 | a. Affirm the usefulness of integrating management principles in disaster mitigation . |
| | CO2 | Distinguish between the different approaches |

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| | | needed to manage pre- during and post- disaster periods. |
| | CO3 | Explain the process of risk management. |
| | CO4 | Relate to risk transfer. |
| | CO5 | |
| WATER RESOURCES ENGINEERING | CO1 | . A Have a thorough understanding of the theories and principles governing the hydrologic processes. |
| | CO2 | . Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects. |
| | CO3 | . Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures. |
| | CO4 | D Develop design storms and carry out frequency analysis. |
| | CO5 | Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects. |
| | CO6 | Develop unit hydrograph and synthetic hydrograph. |
| HYDRAULICS AND HYDRAULIC MACHINERY | CO1 | ¬ Solve uniform and non-uniform open channel flow problems. |
| | CO2 | ¬ Apply the principals of dimensional analysis and similitude in hydraulic model testing. |
| | CO3 | . Select suitable pumps and turbines. |
| GREEN TECHNOLOGY | CO1 | ¬ Enlist different concepts of green technologies in a project . |
| | CO2 | Understand the principles of Energy efficient technologies. |
| | CO3 | ¬ Estimate the carbon credits of various activities. |
| | CO4 | Identify the importance of life cycle assessment. |
| | CO5 | Recognize the benefits of green fuels with respect to sustainable development. |
| REMOTE SENSING & GIS | CO1 | At the end of the course the student will be able to . |
| | CO2 | interpret the aerial photographs and satellite imageries. |
| | CO3 | create and input spatial data for GIS application. |
| | CO4 | . apply RS and GIS concepts for application in Civil Engineering. |

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| FINITE ELEMENT METHOD(HONOR COURSE) | CO1 | Develop finite element formulations of 1 degree of freedom problems and solve them |
| | CO2 | Understand any Finite Elements of twaretoper form stress, thermal and modal analysis |
| | CO3 | Compute the stiffness matrices of different elements and system |
| | CO4 | Interpret displacements, strains and stress resultants |
| | CO5 | Analyze planar structural systems using finite element modeling Mapping of Course |
| EARTHQUAKE RESISTANT DESIGN | CO1 | CO1 To learn the fundamentals of seismology and basic earthquake mechanisms, Tectonics types of ground motion, and propagation of ground motion. |
| | CO2 | Understand qualitative and quantitative representations of earthquake magnitude. |
| | CO3 | Determinethenaturalfrequencyofasingledegreeoff reedomdynamicsystem For given mass, stiffness and damping properties. |
| | CO4 | Determinethemaximumdynamicresponseofanelas ticvibratingstructuretoa given forcing function . |
| | CO5 | Learn the fundamentals of building code based structural design. |
| PRE-STRESSED CONCRETE | CO1 | • Understand different methods of pre stressing |
| | CO2 | . Estimate effective pre stress including short and long-term losses. |
| | CO3 | Analyze and design pre stressed concrete beams under flexure and shear. |
| | CO4 | . Understand the relevant IS Code provisions for pre stressed concrete. |
| REPAIR AND REHABILITATION OF STRUCTURES | CO1 | CO1 Recognize the mechanisms of degradation of concrete structures and to design durable Concrete structures. DEPARTMENT OF CIVIL ENGINEERING CO2 Conduct field monitoring and . |
| | CO2 | Conduct field monitoring and non destructive evaluation of concrete structures. Design and suggest repair strategies for deteriorated concrete structures including Repairing with composites. |
| | CO3 | Understand the methods of strengthening methods for concrete structures. |
| | CO4 | Assessment of the service ability and residual life span of concrete structures by Visual inspection and in situ tests. |

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| REINFORCED SOIL STRUCTURES | CO1 | Understand the history and mechanism of reinforced soil. |
| | CO2 | Become aware about situations where geo-synthetics can be used. |
| | CO3 | Know about various types of geo-synthetics and their functions. |
| | CO4 | Be able to do dimple design of reinforced soil retaining walls and reinforced earth beds. |
| ADVANCED FOUNDATION ENGINEERING | CO1 | CO1 Understand classification of piles and determine the load carrying capacity of piles by various methods |
| | CO2 | Determine the load carrying capacity of pile groups. |
| | CO3 | Evaluate the pull-out capacity of piles and down drag forces on piles due to negative skin friction. |
| | CO4 | Determine the load carrying capacity of laterally loaded piles. |
| | CO5 | Determine the load carrying capacity of piers and caissons. |
| EARTH RETAINING STRUCTURES | CO1 | CO1 Quantify the lateral earth pressures associated with different earth systems. |
| | CO2 | CO2 Evaluate the mechanical properties of geo synthetics used for soil reinforcement. |
| | CO3 | . Identify the merits and demerits of different earth retaining systems. |
| | CO4 | CO4 Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems. |
| | CO5 | Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods. |
| GEOENVIRONMENTAL ENGINEERING | CO1 | Understand various ground contaminations, pollution transport phenomena. |
| | CO2 | . Collect pollutant data Apply principles to get the information about the transport through the unsaturated soil. |
| | CO3 | Develop various models for contamination transport. |
| EARTH AND ROCKFILL DAMS | CO1 | O1 Understand the basic concepts of earth-fill dams and rock-fill dams and identify the site topography and foundations conditions |
| | CO2 | conditions Identify basic design requirements and causes of failures of dams, distinguish foundation types and the different fill materials. |

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| | CO3 | conditions Identify basic design requirements and causes of failures of dams, distinguish foundation types and the different fill materials. |
| | CO4 | . Estimate seepage through dam sections, foundations and select core and shell materials. |
| | CO5 | Understand and design the methods to control seepage through different units of dams . |
| a) URBAN HYDROLOGY | CO1 | Basic concepts of Urban Hydrological cycle and effect of urbanization on . |
| | CO2 | 1. Slightly 2. Moderately 3. Detailed. |
| | CO3 | Knowledge about the methods of quantity estimation of storm water. |
| | CO4 | Analyze the Infrastructure for storm water management. |
| | CO5 | Explain about the Study the process of urbanization and its influence on urban hydrological processes and urban water supply system including, storm water modeling. Mapping of Course Outcomes. |

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# DEPARTMENT OF CSE (AIML) Courses Outcomes(R20)

## CSE (AIML) Courses Outcomes(R20)

| B. tech 1st Semester | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **COMMUNICATIVE ENGLISH (HS1101)** | CO1 | understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information |
| | CO2 | ask and answer general questions on familiar topics and introduce oneself/others |
| | CO3 | employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information |
| | CO4 | recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs |
| | CO5 | form sentences using proper grammatical structures and correct word forms |
| **MATHEMATICS-I (BS1101)** | CO1 | utilize mean value theorems to real life problems |
| | CO2 | solve the differential equations related to various engineering fields |
| | CO3 | familiarize with functions of several variables which is useful in optimization |
| | CO4 | apply double integration techniques in evaluating areas bounded by region |
| | CO5 | students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems |
| **APPLIED CHEMISTRY (BS1102)** | CO1 | Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers. |
| | CO2 | Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion. |
| | CO3 | Synthesize nano materials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors. |
| | CO4 | Analyze the principles of different analytical instruments and their applications. Design models for energy by different natural |

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| | | sources. |
| | CO5 | Obtain the knowledge of computational chemistry and molecular machines |
| :PROGRAMMING FOR PROBLEM SOLVING USING C (ES1101) | CO1 | To write algorithms and to draw flowcharts for solving problems |
| | CO2 | To convert flowcharts/algorithms to C Programs, compile and debug programs |
| | CO3 | To use different operators, data types and write programs that use two-way/ multi-way selection |
| | CO4 | To select the best loop construct for a given problem |
| | CO5 | To design and implement programs to analyze the different pointer applications |
| | CO6 | To decompose a problem into functions and to develop modular reusable code |
| | CO7 | To apply File I/O operations |
| COMPUTER ENGINEERING WORKSHOP (ES1102) | CO1 | Assemble and disassemble components of a PC |
| | CO2 | Construct a fully functional virtual machine, Summarize various Linux operating system commands, |
| | CO3 | Recognize characters & extract text from scanned images, Create audio files and podcasts |
| APPLIED CHEMISTRY LAB (BS1103) | CO1 | The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills. |
| PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1103) | CO1 | Gains Knowledge on various concepts of a C language. |
| | CO2 | Able to draw flowcharts and write algorithms. |
| | CO3 | Able design and development of C problem solving skills. |
| | CO4 | Able to design and develop modular programming skills. |
| | CO5 | Able to trace and debug a program |

| B.Tech 2nd Semester | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **MATHEMATICS - II**<br>**(BS1201)** | CO1 | develop the use of matrix algebra techniques that is needed by engineers for practical applications |
| | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel |
| | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms |
| | CO4 | apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals |
| | CO5 | apply numerical integral techniques to different Engineering problems |
| | CO6 | apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations |
| **APPLIED PHYSICS**<br>**(BS1202)** | CO1 | Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) |
| | CO2 | Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3). |
| | CO3 | Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2). |
| | CO4 | Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic |

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| | | materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices |
| | CO5 | Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2). |
| **DIGITAL LOGIC DESIGN (ES1201)** | CO1 | An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. |
| | CO2 | An ability to understand the different switching algebra theorems and apply them for logic functions. |
| | CO3 | An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions. |
| | CO4 | Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays. |
| | CO5 | Students will be able to design various sequential circuits starting from flip-flop to registers and counter |
| **PYTHON PROGRAMMING (ES1202)** | CO1 | Develop essential programming skills in computer programming concepts like data types, containers |
| | CO2 | Apply the basics of programming in the Python language |
| | CO3 | Solve coding tasks related conditional execution, loops |
| | CO4 | Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming |
| **DATA STRUCTURES (CS1201)** | CO1 | Summarize the properties, interfaces, and behaviors of basic abstract data types |
| | CO2 | Discuss the computational efficiency of the principal algorithms for sorting & searching |
| | CO3 | Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs |
| | CO4 | Demonstrate different methods for traversing trees |
| **PYTHON** | CO1 | Write, Test and Debug Python Programs |

| Course Name | | Course Outcomes |
|---|---|---|
| PROGRAMMING LAB (ES1203) | CO2 | Use Conditionals and Loops for Python Programs |
| | CO3 | Use functions and represent Compound data using Lists, Tuples and Dictionaries |
| | CO4 | Use various applications using python |
| DATA STRUCTURES LAB (CS1202) | CO1 | Use basic data structures such as arrays and linked list. |
| | CO2 | Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths. |
| | CO3 | Use various searching and sorting algorithms. |
| CONSTITUTION OF INDIA (MC1201) | CO1 | Understand historical background of the constitution making and its importance for building a democratic India. |
| | CO2 | Understand the functioning of three wings of the government i.e., executive, legislative and judiciary |
| | CO3 | Understand the value of the fundamental rights and duties for becoming good citizen of India |
| | CO4 | Analyze the decentralization of power between central, state and local self-government. |
| | CO5 | Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy. 1. Know the sources, features and principles of Indian Constitution. 2. Learn about Union Government, State government and its administration. 3. Get acquainted with Local administration and Pachayati Raj. 4. Be aware of basic concepts and developments of Human Rights. 5. Gain knowledge on roles and functioning of Election Commission |

| B. Tech 3rd Semester | | |
|---|---|---|
| Course Name | | Course Outcomes |
| MATHEMATICS - III | CO1 | Interpret the physical meaning of different operators such as gradient, curl and divergence |
| | CO2 | Estimate the work done against a field, circulation and flux using vector calculus |
| | CO3 | Apply the Laplace transform for solving differential equations |
| | CO4 | Find or compute the Fourier series of periodic signals |

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| | CO5 | Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms |
| | CO6 | Identify solution methods for partial differential equations that model physical processes |
| **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE** | CO1 | Demonstrate skills in solving mathematical problems |
| | CO2 | Comprehend mathematical principles and logic |
| | CO3 | Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software |
| | CO4 | Manipulate and analyze data numerically and/or graphically using appropriate Software |
| | CO5 | Communicate effectively mathematical ideas/results verbally or in writing |
| **INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING** | CO1 | Enumerate the history and foundations of Artificial Intelligence |
| | CO2 | Apply the basic principles of AI in problem solving |
| | CO3 | Choose the appropriate representation of Knowledge |
| | CO4 | Enumerate the Perspectives and Issues in Machine Learning |
| | CO5 | Identify issues in Decision Tree Learning |
| **OBJECT ORIENTED PROGRAMMING WITH JAVA** | CO1 | Able to realize the concept of Object Oriented Programming & Java Programming Constructs |
| | CO2 | Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords |
| | CO3 | Apply the concept of exception handling and Input/ Output operations |
| | CO4 | Able to design the applications of Java & Java applet |
| | CO5 | Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit |
| **DATABASE MANAGEMENT SYSTEMS** | CO1 | Describe a relational database and object-oriented database |
| | CO2 | Create, maintain and manipulate a relational database using SQL |
| | CO3 | Describe ER model and normalization for database design |
| | CO4 | Examine issues in data storage and query processing and can formulate appropriate solutions |

| | CO5 | Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage |
|---|---|---|
| **INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB** | CO1 | Apply the basic principles of AI in problem solving using LISP/PROLOG |
| | CO2 | Implement different algorithms using LISP/PROLOG |
| | CO3 | Develop an Expert System using JESS/PROLOG |
| **OBJECT ORIENTED PROGRAMMING WITH JAVA LAB** | CO1 | Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings |
| | CO2 | Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism |
| | CO3 | Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism |
| | CO4 | Construct Threads, Event Handling, implement packages, developing applets |
| **DATABASE MANAGEMENT SYSTEMS LAB** | CO1 | Utilize SQL to execute queries for creating database and performing data manipulation operations |
| | CO2 | Examine integrity constraints to build efficient databases |
| | CO3 | Apply Queries using Advanced Concepts of SQL |
| | CO4 | Build PL/SQL programs including stored procedures, functions, cursors and triggers |
| **MOBILE APP DEVELOPMENT** | CO1 | Identify various concepts of mobile programming that make it unique from programming for other platforms |
| | CO2 | Critique mobile applications on their design pros and cons |
| | CO3 | Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces, |
| | CO4 | Program mobile applications for the Android operating system that use basic and advanced phone features and |
| | CO5 | Deploy applications to the Android marketplace for distribution |
| **ESSENCE OF INDIAN TRADITIONAL** | CO1 | Understand the significance of Indian Traditional Knowledge |

| KNOWLEDGE | CO2 | Classify the Indian Traditional Knowledge |
| | CO3 | Compare Modern Science with Indian Traditional Knowledge system. |
| | CO4 | Analyze the role of Government in protecting the Traditional Knowledge |
| | CO5 | Understand the impact of Philosophical tradition on Indian Knowledge System. |

| B.Tech 4th Semester | | |
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| **Course Name** | | **Course Outcomes** |
| **PROBABILITY AND STATISTICS** | CO1 | Classify the concepts of data science and its importance |
| | CO2 | Interpret the association of characteristics and through correlation and regression tools |
| | CO3 | Make use of the concepts of probability and their applications |
| | CO4 | Apply discrete and continuous probability distributions |
| | CO5 | Design the components of a classical hypothesis test |
| | CO6 | Infer the statistical inferential methods based on small and large sampling tests |
| **COMPUTER ORGANIZATION** | CO1 | Develop a detailed understanding of computer systems |
| | CO2 | Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations |
| | CO3 | Develop a detailed understanding of architecture and functionality of central processing unit |
| | CO4 | Exemplify in a better way the I/O and memory organization |
| | CO5 | Illustrate concepts of parallel processing, pipelining and inter processor communication |
| **DATA WAREHOUSING AND MINING** | CO1 | Summarize the architecture of data warehouse |
| | CO2 | Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data |
| | CO3 | Construct a decision tree and resolve the problem of model over fitting |
| | CO4 | Compare Apriori and FP-growth association rule |

| | | mining algorithms for frequent item set generation |
|---|---|---|
| | CO5 | Apply suitable clustering algorithm for the given data set |
| **FORMAL LANGUAGES AND AUTOMATA THEORY** | CO1 | Classify machines by their power to recognize languages |
| | CO2 | Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy |
| | CO3 | Employ finite state machines to solve problems in computing |
| | CO4 | Illustrate deterministic and non-deterministic machines |
| | CO5 | Quote the hierarchy of problems arising in the computer science |
| **MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY** | CO1 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product |
| | CO2 | The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs |
| | CO3 | The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units |
| | CO4 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis |
| | CO5 | The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making |
| **R PROGRAMMING LAB** | CO1 | Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming. |
| | CO2 | Implement the concepts of R Script to extract the data from data frames and file operations. |
| | CO3 | Implement the various statistical techniques using R. |
| | CO4 | Extend the functionality of R by using add-on packages |
| | CO5 | Use R Graphics and Tables to visualize results of various statistical operations on data |
| **DATA MINING USING** | CO1 | Apply preprocessing techniques on real world datasets |

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| **PYTHON LAB** | CO2 | Apply apriori algorithm to generate frequent item sets. |
| | CO3 | Apply Classification and clustering algorithms on different datasets. |
| **WEB APPLICATION DEVELOPMENT LAB** | CO1 | Develop Single Page Applications |
| | CO2 | Develop NodeJS & ReactJS Reusable Service |
| | CO3 | Store the data in MySQL |
| | CO4 | Get acquainted with the latest web application development trends in the IT industry |
| **NATURAL LANGUAGE PROCESSING WITH PYTHON** | CO1 | Explore natural language processing (NLP) libraries in Python |
| | CO2 | Learn various techniques for implementing NLP including parsing & text processing |
| | CO3 | Understand how to use NLP for text feature engineering |

| B.Tech 5th Semester | | |
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| **Course Name** | **Course Outcomes** | |
| **COMPILER DESIGN** | CO1 | Demonstrate phases in the design of compiler |
| | CO2 | Organize Syntax Analysis, Top Down and LL(1) grammars |
| | CO3 | Design Bottom Up Parsing and Construction of LR parsers |
| | CO4 | Analyze synthesized, inherited attributes and syntax directed translation schemes |
| | CO5 | Determine algorithms to generate code for a target machine |
| **OPERATING SYSTEMS** | CO1 | Describe various generations of Operating System and functions of Operating System |
| | CO2 | Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance |
| | CO3 | Solve Inter Process Communication problems using Mathematical Equations by various methods |
| | CO4 | Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques |
| | CO5 | Outline File Systems in Operating System like UNIX/Linux and Windows |

| MACHINE LEARNING | CO1 | Explain the fundamental usage of the concept Machine Learning system |
| | CO2 | Demonstrate on various regression Technique |
| | CO3 | Analyze the Ensemble Learning Methods |
| | CO4 | Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning. |
| | CO5 | Discuss the Neural Network Models and Fundamentals concepts of Deep Learning |
| OPTIMIZATION IN OPERATIONS RESEARCH | CO1 | State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem. |
| | CO2 | Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution. |
| | CO3 | Apply and Solve transportation and assignment problem by using Linear programming Simplex method. |
| | CO4 | Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions |
| | CO5 | Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. |
| SOFTWARE ENGINEERING(Professional Elective-I) | CO1 | Ability to transform an Object-Oriented Design into high quality, executable code |
| | CO2 | Skills to design, implement, and execute test cases at the Unit and Integration level |
| | CO3 | Compare conventional and agile software methods |
| COMPUTER VISION (Professional Elective-I) | CO1 | Identify basic concepts, terminology, theories, models and methods in the field of computer vision, |
| | CO2 | Describe known principles of feature detection and matching, |
| | CO3 | Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal. |
| | CO4 | Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths. |

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| **DATA VISUALIZATION (Professional Elective-I)** | CO1 | Understand basics of Data Visualization |
| | CO2 | Implement visualization of distributions |
| | CO3 | Write programs on visualization of time series, proportions & associations |
| | CO4 | Apply visualization on Trends and uncertainty |
| | CO5 | Explain principles of proportions |
| **DevOps (Professional Elective-I)** | CO1 | Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility |
| | CO2 | Describe DevOps & DevSecOps methodologies and their key concepts |
| | CO3 | Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models |
| | CO4 | Set up complete private infrastructure using version control systems and CI/CD tools |
| | CO5 | Acquire the knowledge of maturity model, Maturity Assessment |
| **OPERATING SYSTEMS & COMPILER DESIGN LAB** | CO1 | Implement various scheduling, page replacement algorithms and algorithms related to deadlocks |
| | CO2 | Design programs for shared memory management and semaphores |
| | CO3 | Determine predictive parsing table for a CFG |
| | CO4 | Apply Lex and Yacc tools |
| | CO5 | Examine LR parser and generating SLR Parsing table |
| **MACHINE LEARNING LAB** | CO1 | Implement procedures for the machine learning algorithms |
| | CO2 | Design and Develop Python programs for various Learning algorithms |
| | CO3 | Apply appropriate data sets to the Machine Learning algorithms |
| | CO4 | Develop Machine Learning algorithms to solve real world problems |
| **CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY** | CO1 | Understand the why, what and how of DevOps adoption |
| | CO2 | Attain literacy on Devops |

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| USING DevOps (Skill Oriented Course III) | CO3 | Align capabilities required in the team |
| | CO4 | Create an automated CICD pipeline using a stack of tools |
| EMPLOYABILITY SKILLS-I | CO1 | Understand the corporate etiquette. |
| | CO2 | Make presentations effectively with appropriate body language |
| | CO3 | Be composed with positive attitude |
| | CO4 | Understand the core competencies to succeed in professional and personal life |
| MACHINE LEARNING(MINOR COURSE) | CO1 | Implement procedures for the machine learning algorithms |
| | CO2 | Design and Develop Python programs for various Learning algorithms |
| | CO3 | Apply appropriate data sets to the Machine Learning algorithms |
| | CO4 | Develop Machine Learning algorithms to solve real world problems |

| B.Tech 6th Semester | | |
|---|---|---|
| Course Name | | Course Outcomes |
| COMPUTER NETWORKS | CO1 | Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards. |
| | CO2 | Discuss different transmission media and different switching networks. |
| | CO3 | Analyze data link layer services, functions and protocols like HDLC and PPP. |
| | CO4 | Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols |
| | CO5 | Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc. |
| DEEP LEARNING | CO1 | Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning |
| | CO2 | Discuss the Neural Network training, various |

| | | random models. |
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| | CO3 | Explain the Techniques of Keras, TensorFlow, Theano and CNTK |
| | CO4 | Classify the Concepts of CNN and RNN |
| | CO5 | Implement Interactive Applications of Deep Learning. |
| **DESIGN AND ANALYSIS OF ALGORITHMS** | CO1 | Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms |
| | CO2 | List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method |
| | CO3 | Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations. |
| | CO4 | Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches |
| | CO5 | Demonstrate NP- Completeness theory ,lower bound theory and String Matching |
| **SOFTWARE PROJECT MANAGEMENT (Professional Elective-II)** | CO1 | Apply the process to be followed in the software development life-cycle models |
| | CO2 | Apply the concepts of project management & planning |
| | CO3 | Implement the project plans through managing people, communications and change |
| | CO4 | Conduct activities necessary to successfully complete and close the Software projects |
| | CO5 | Implement communication, modeling, and construction & deployment practices in software development |
| **DISTRIBUTED SYSTEMS (Professional Elective-II)** | CO1 | Elucidate the foundations and issues of distributed systems |
| | CO2 | Illustrate the various synchronization issues and global state for distributed systems |
| | CO3 | Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems |
| | CO4 | Describe the agreement protocols and fault tolerance mechanisms in distributed systems |
| | CO5 | Describe the features of peer-to-peer and distributed shared memory systems |
| **INTERNET OF THINGS** | CO1 | Review Internet of Things (IoT). |

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| **(Professional Elective-II)** | CO2 | Demonstrate various business models relevant to IoT. |
| | CO3 | Construct designs for web connectivity |
| | CO4 | Organize sources of data acquisition related to IoT, integrate to enterprise systems. |
| | CO5 | Describe IoT with Cloud technologies. |
| **NETWORK PROGRAMMING (Professional Elective-II)** | CO1 | Identifying different models and sockets |
| | CO2 | Demonstrate different TCP Echo server functions and I/O models |
| | CO3 | Rationalize IPV4 and IPV6 Socket options |
| | CO4 | Identifying daemon processing and Advanced input and output functions |
| | CO5 | Analyze Broadcasting and multicasting |
| **MEAN STACK DEVELOPMENT (Job Oriented Course)** | CO1 | Build static web pages using HTML 5 elements. |
| | CO2 | Apply JavaScript to embed programming interface for web pages and also to perform Client side validations |
| | CO3 | Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js |
| | CO4 | Develop JavaScript applications using typescript and work with document database using MongoDB |
| | CO5 | Utilize Angular JS to design dynamic and responsive web pages. |
| **COMPUTER NETWORKS LAB** | CO1 | Know how reliable data communication is achieved through data link layer. |
| | CO2 | Suggest appropriate routing algorithm for the network. |
| | CO3 | Provide internet connection to the system and its installation. |
| | CO4 | Work on various network management tools |
| **ALGORITHMS FOR EFFICIENT CODING LAB** | CO1 | Analyze the program execution time |
| **DEEP LEARNING WITH TENSORFLOW** | CO1 | Implement deep neural networks to solve real world problems |
| | CO2 | Choose appropriate pre-trained model to solve real time problem |
| | CO3 | Interpret the results of two different deep learning models |
| **MEAN STACK** | CO1 | Develop professional web pages of an application |

| Course Name | | Course Outcomes |
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| TECHNOLOGIES-MODULE I- HTML 5, JAVASCRIPT, NODE.JS, EXPRESS.JS, AND TYPESCRIPT (Skill Oriented Course) | | using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles. |
| | CO2 | Utilize JavaScript for developing interactive HTML web pages and validate form data. |
| | CO3 | Build a basic web server using Node.js and also working with Node Package Manager (NPM). |
| | CO4 | Build a web server using Express.js |
| | CO5 | Make use of Typescript to optimize JavaScript code by using the concept of strict type checking. |
| BIG DATA : APACHE SPARK (Skill Oriented Course) | CO1 | Develop Map Reduce Programs to analyze large dataset Using Hadoop and Spark |
| | CO2 | Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components |
| | CO3 | Perform the filter, count, distinct, map, flatMap RDD Operations in Spark. |
| | CO4 | Build Queries using Spark SQL |
| | CO5 | Apply Spark joins on Sample Data Sets |
| | CO6 | Make use of sqoop to import and export data from hadoop to database and vice-versa |
| EMPLOYABILITY SKILLS-II | CO1 | Solve various Basic Mathematics problems by following different methods |
| | CO2 | Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems |
| | CO3 | Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. |
| | CO4 | Analyze, summarize and present information in quantitative forms including table, graphs and formulas |
| DEEP LEARNING(MINOR COURSE) | CO1 | Implement deep neural networks to solve real world problems |
| | CO2 | Choose appropriate pre-trained model to solve real time problem |
| | CO3 | Interpret the results of two different deep learning models |

| B.Tech 7th Semester | | |
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| Course Name | | Course Outcomes |
| REINFORCEMENT | CO1 | Understand basic concepts of Reinforcement |

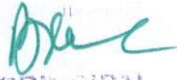| | | |
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| LEARNING (Professional Elective-III) | | learning |
| | CO2 | Identifying appropriate learning tasks for Reinforcement learning techniques |
| | CO3 | Understand various methods and applications of reinforcement learning |
| SOFT COMPUTING (Professional Elective-III) | CO1 | Able to apply fuzzy logic and reasoning to handle uncertainty in engineering problems Make use of genetic algorithms to combinatorial optimization problems |
| | CO2 | Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning. |
| | CO3 | Learn and apply the principles of self adopting and self organizing neuro fuzzy inference systems |
| | CO4 | Evaluate and compare solutions by various soft computing approaches for a given problem |
| CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective-III) | CO1 | Explain different security threats and countermeasures and foundation course of cryptography mathematics. |
| | CO2 | Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography |
| | CO3 | Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more |
| | CO4 | Design applications of hash algorithms, digital signatures and key management techniques |
| | CO5 | Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec . |
| BLOCK CHAIN TECHNOLOGIES (Professional Elective-III) | CO1 | Demonstrate the block chain basics, Crypto currency |
| | CO2 | To compare and contrast the use of different private vs. public block chain and use cases |
| | CO3 | Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins |
| | CO4 | Classify Permission Block chain and use cases – Hyper ledger, Corda |
| | CO5 | Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others |

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| **SPEECH PROCESSING** (Professional Elective-III) | CO1 | Understand the speech production and perception process. |
| | CO2 | Analyze speech signals in time and frequency domain. |
| | CO3 | Design and implement algorithms for processing speech signals. |
| **ROBOTIC PROCESS AUTOMATION** (Professional Elective-IV) | CO1 | Describe RPA, where it can be applied and how it's implemented |
| | CO2 | Describe the different types of variables, Control Flow and data manipulation techniques. |
| | CO3 | Identify and understand Image, Text and Data Tables Automation. |
| | CO4 | Describe how to handle the User Events and various types of Exceptions and strategies |
| | CO5 | Understand the Deployment of the Robot and to maintain the connection. |
| **CLOUD COMPUTING** (Professional Elective-IV) | CO1 | Illustrate the key dimensions of the challenge of Cloud Computing |
| | CO2 | Classify the Levels of Virtualization and mechanism of tools. |
| | CO3 | Analyze Cloud infrastructure including Google Cloud and Amazon Cloud. |
| | CO4 | Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud |
| | CO5 | Assess control storage systems and cloud security, the risks involved its impact and develop cloud application |
| **BIG DATA ANALYTICS** (Professional Elective-IV) | CO1 | Illustrate big data challenges in different domains including social media, transportation, finance and medicine |
| | CO2 | Use various techniques for mining data stream |
| | CO3 | Design and develop Hadoop |
| | CO4 | Identify the characteristics of datasets and compare the trivial data and big data for various applications |
| | CO5 | Explore the various search methods and visualization techniques |
| **NOSQL DATABASES** (Professional Elective-IV) | CO1 | Discuss about Aggregate Data Models |
| | CO2 | Explain about Master-Slave Replication, Peer-to-Peer Replication |
| | CO3 | Describe the Structure of Data, Scaling, Suitable Use Cases |

| | CO4 | Make use of Complex Transactions Spanning Different Operations |
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| | CO5 | Identify Routing, Dispatch and Location-Based Services |
| VIDEO ANALYTICS (Professional Elective-IV) | CO1 | Design video analytic algorithms for security applications |
| | CO2 | Design video analytic algorithms for business intelligence |
| | CO3 | Design custom made video analytics system for the given target application |
| SOCIAL NETWORK ANALYSIS (Professional Elective-V) | CO1 | Know basic notation and terminology used in network science |
| | CO2 | Be able to visualize, summarize and compare networks |
| | CO3 | Illustrate basic principles behind network analysis algorithms |
| | CO4 | Develop practical skills of network analysis in R programming language |
| | CO5 | Be capable of analyzing real work networks |
| RECOMMENDER SYSTEMS (Professional Elective-V) | CO1 | Understand the basic concepts of recommender systems |
| | CO2 | Carry out performance evaluation of recommender systems based on various metrics |
| | CO3 | Implement machine-learning and data-mining algorithms in recommender systems data sets. |
| | CO4 | Design and implement a simple recommender system. |
| AI CHATBOTS (Professional Elective-V) | CO1 | Develop an in-depth understanding of conversation design, including on boarding, flows, utterances, entities, and personality. |
| | CO2 | Design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform. |
| | CO3 | Deploy the finished chatbot for public use and interaction. |
| OBJECT ORIENTED ANALYSIS AND DESIGN (Professional Elective-V) | CO1 | Analyze the nature of complex system and its solutions. |
| | CO2 | Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships |
| | CO3 | Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time |

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| | | applications |
| | CO4 | Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams. |
| | CO5 | Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems. |
| **SEMANTIC WEB (Professional Elective-V)** | CO1 | Demonstrate social network analysis and measures. |
| | CO2 | Analyze random graph models and navigate social networks dat |
| | CO3 | Apply the network topology and Visualization tools. |
| | CO4 | Analyze the experiment with small world models and clustering model |
| | CO5 | Compare the application driven virtual communities from social network Structure. |
| **API AND MICROSERVICES (Job Oriented Course)** | CO1 | Develop a Spring Data JPA application with Spring Boot |
| | CO2 | Implement CRUD operations using Spring Data JPA |
| | CO3 | Implement pagination and sorting mechanism using Spring Data JPA |
| | CO4 | Implement query methods for querying the database using Spring Data JPA |
| | CO5 | Implement a custom repository to customize a querying mechanism using Spring Data JPA |
| | CO6 | Understand update operation using query approaches in Spring Data JPA |
| | CO7 | Implement Spring Transaction using Spring Data JPA |
| | CO8 | Develop RESTful endpoints using Spring REST Processing URI parameters |
| | CO9 | Write RESTful services using Spring REST that consumes and produces data in different formats |
| | CO10 | Handle exceptions and errors in Spring REST endpoints |
| | CO11 | Write Spring based REST clients to consume RESTful services programmatically |
| | CO12 | Create secure RESTful endpoints using Spring Security Document and version the Spring REST endpoints Implement CORS in a Spring REST |

| | | application |
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| **SECURE CODING TECHNIQUES (Job Oriented Course)** | CO1 | Differentiate the objectives of information security |
| | CO2 | Understand the trend, reasons and impact of the recent Cyber attacks |
| | CO3 | Understand OWASP design principles while designing a web application |
| | CO4 | Understand Threat modelling |
| | CO5 | Importance of security in all phases of SDLC |
| | CO6 | Write secure coding using some of the practices in C/C++/Java and Python programming languages |
| **UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY** | CO1 | By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. This is only an introductory foundational input. It would be desirable to follow it up by a) faculty-student or mentor-mentee programs throughout their time with the institution b) Higher level courses on human values in every aspect of living. E.g. as a professional |
| **MEAN STACK TECHNOLOGIES-MODULE II- ANGULAR JS AND MONGODB (Skill Oriented Course)** | CO1 | Build a component-based application using Angular components and enhance their functionality using directives. |
| | CO2 | Utilize data binding for developing Angular forms and bind them with model data. |
| | CO3 | Apply Angular built-in or custom pipes to format the rendered data. |
| | CO4 | Develop a single page application by using synchronous or asynchronous Angular routing. |
| | CO5 | Make use of MongoDB queries to perform CRUD operations on document database. |
| **REINFORCEMENT LEARNING(MINOR** | CO1 | Understand basic concepts of Reinforcement learning |

| COURSE) | CO2 | Identifying appropriate learning tasks for Reinforcement learning techniques |
| | CO3 | Understand various methods and applications of reinforcement learning |

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# DEPARTMENT OF CSE -Data Science Course Outcomes(R20)

## CSE -Data Science Course Outcomes(R20)

| B.Tech 1ˢᵗSem | | |
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| **Course Name** | | **Course Outcomes** |
| **Communicative English(HS1101)** | CO1 | Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers |
| | CO2 | Focusonappropriatereadingstrategiesforcomprehension ofvariousacademictextsandauthenticmaterials |
| | CO3 | Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations. |
| | CO4 | Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information |
| | CO5 | Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing. |
| **Mathematics – I (BS1101)** | CO1 | Utilize mean value theorems to real life problems (L3) |
| | CO2 | Solve the differential equations related to various engineering fields (L3) |
| | CO3 | Familiarize with functions of several variables which is useful in optimization (L3) |
| | CO4 | Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5 ) |
| | CO5 | Apply double integration techniques in evaluating areas bounded by region (L3) |
| **Applied Chemistry(BS1102)** | CO1 | Analyze the different types of composite plastic materials and interpret the mechanism of conduction Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers. |
| | CO2 | Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion. |
| | CO3 | Summarize the preparation of semiconductors; analyze the applications of liquid crystals and |

| Course Name | | Course Outcomes |
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| | | superconductors. |
| | CO4 | Analyze the principles of different analytical instruments and their applications. |
| | CO5 | Obtain the knowledge of computational chemistry and molecular machines |
| **Programming for Problem Solving using C (ES1101)** | CO1 | To write algorithms and to draw flowcharts for solving problems |
| | CO2 | To convert flowcharts/algorithms to C Programs, compile and debug programs |
| | CO3 | To use different operators, data types and write programs that use two-way/ multi-way selection. |
| | CO4 | To select the best loop construct for a given problem |
| | CO5 | To decompose a problem into functions and to develop modular reusable code |
| | CO6 | To apply File I/O operations |
| | CO7 | To design and implement programs to analyze the different pointer applications |
| **Computer Engineering Workshop (ES1102)** | CO1 | Assemble and disassemble components of a PC |
| | CO2 | Construct a fully functional virtual machine, Summarize various Linux operating system commands,. |
| | CO3 | Recognize characters & extract text from scanned images, Create audio files and podcasts |
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| Course Name | | Course Outcomes |
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| **Programming for Problem Solving using C Lab (ES1103)** | CO1 | To write algorithms and to draw flowcharts for solving problems |
| | CO2 | To convert flowcharts/algorithms to C Programs, compile and debug programs |
| | CO3 | To use different operators, data types and write programs that use two-way/ multi-way selection |
| | CO4 | To select the best loop construct for a given problem |
| | CO5 | To design and implement programs to analyze the different pointer applications |
| | C06 | To decompose a problem into functions and to develop modular reusable code |
| | CO7 | To apply File I/O operations |

| B.Tech2ndSem | |
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| **Course Name** | **Course Outcomes** |

| MATHEMATICS - II (BS1201) | CO1 | develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6). |
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| | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3). |
| | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5). |
| | CO4 | apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3). |
| | CO5 | apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3). |
| APPLIED PHYSICS (BS1202) | CO1 | Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) . |
| | CO2 | Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3). |
| | CO3 | Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2). |
| | CO4 | Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials |

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| | | (L2). Apply the concept of magnetism to magnetic devices (L3). |
| | CO5 | Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2). |
| **DIGITAL LOGIC DESIGN (ES1201)** | CO1 | An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. |
| | CO2 | An ability to understand the different switching algebra theorems and apply them for logic functions. |
| | CO3 | . An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions. |
| | CO4 | Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays. |
| | CO5 | Students will be able to design various sequential circuits starting from flip-flop to registers and counters. |
| | | |
| **PYTHON PROGRAMMING (ES1202)** | CO1 | Develop essential programming skills in computer programming concepts like data types, containers . |
| | CO2 | Apply the basics of programming in the Python language. |
| | CO3 | Solve coding tasks related conditional execution, loops |
| | CO4 | Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming. |
| | | |
| **DATA STRUCTURES (CS1201)** | CO1 | • Summarize the properties, interfaces, and behaviors of basic abstract data types . |
| | CO2 | Discuss the computational efficiency of the principal algorithms for sorting & searching. |
| | CO3 | Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs. |

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| | CO4 | Demonstrate different methods for traversing trees. |
| | | |
| **PYTHON PROGRAMMING LAB** | CO1 | Write, Test and Debug Python Programs . |
| | CO2 | Use Conditionals and Loops for Python Programs. |
| | CO3 | Use functions and represent Compound data using Lists, Tuples and Dictionaries. |
| | CO4 | Use various applications using python. |
| | | |
| **DATA STRUCTURES LAB (CS1202)** | CO1 | . Use basic data structures such as arrays and linked list. |
| | CO2 | Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths |
| | CO3 | Use various searching and sorting algorithms. |
| | | |
| **CONSTITUTION OF INDIA (MC1201)** | CO1 | Understand historical background of the constitution making and its importance for building a democratic India. |
| | CO2 | Understand the functioning of three wings of the government ie., executive, legislative and judiciary. |
| | CO3 | . Understand the value of the fundamental rights and duties for becoming good citizen of India. |
| | CO4 | .Analyze the decentralization of power between central, state and local self-government. |
| | | Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy. 1. Know the sources, features and principles of Indian Constitution. 2. Learn about Union Government, State government and its administration. 3. Get acquainted with Local administration and Panchayati Raj. 4. Be aware of basic concepts and developments of Human Rights. 5. Gain knowledge on roles and functioning of Election Commission |

| B.Tech 3rdSem | | |
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| **Course Name** | | **Course Outcomes** |
| **MATHEMATICS - III** | CO1 | Interpret the physical meaning of different operators such as gradient, curl and divergence (L5) . |
| | CO2 | Estimate the work done against a field, circulation and flux using vector calculus (L5). |
| | CO3 | Apply the Laplace transform for solving differential |

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| | | equations (L3). |
| | CO4 | Find or compute the Fourier series of periodic signals (L3). |
| | CO5 | Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3). |
| **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE** | CO1 | Demonstrate skills in solving mathematical problems . |
| | CO2 | Comprehend mathematical principles and logic. |
| | CO3 | Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software. |
| | CO4 | Manipulate and analyze data numerically and/or graphically using appropriate Software. |
| | CO5 | Communicate effectively mathematical ideas/results verbally or in writing. |
| **FUNDAMENTALS OF DATA SCIENCE** | CO1 | Apply principles of NumPy and Pandas to the analysis of data.. |
| | CO2 | Make use of various file formats in loading and storage of data. |
| | CO3 | Identify and apply the need and importance of pre-processing techniques. |
| | CO4 | Show the results and present them in a pictorial format. |
| | | |
| **DATABASE MANAGEMENT SYSTEMS** | CO1 | Describe a relational database and object-oriented database |
| | CO2 | Create, maintain and manipulate a relational database using SQL. |
| | CO3 | Describe ER model and normalization for database design. |
| | CO4 | Examine issues in data storage and query processing and can formulate appropriate solutions. |
| | CO5 | Examine issues in data storage and query processing and can formulate appropriate solutions |
| **FUNDAMENTALS OF DATA SCIENCE(LAB)** | CO1 | Perform various operations on NumPy . |
| | CO2 | Importing data from different file formats using pandas. |
| | CO3 | Draw different types of charts using matplotlib. |

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| **OBJECT ORIENTED PROGRAMMING WITH JAVA LAB** | CO1 | Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings |
| | CO2 | Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism. |
| | CO3 | Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism |
| **DATABASE MANAGEMENT SYSTEMS LAB** | CO1 | Utilize SQL to execute queries for creating database and performing data manipulation operations . |
| | CO2 | Examine integrity constraints to build efficient databases. |
| | CO3 | Apply Queries using Advanced Concepts of SQL. |
| | CO4 | Build PL/SQL programs including stored procedures, functions, cursors and triggers. |
| | | |
| **MOBILE APP DEVELOPMENT** | CO1 | Identify various concepts of mobile programming that make it unique from programming for other platforms . |
| | CO2 | Critique mobile applications on their design pros and cons. |
| | CO3 | Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces. |
| | CO4 | . Program mobile applications for the Android operating system that use basic and advanced phone features and. |
| | CO5 | Deploy applications to the Android marketplace for distribution. |
| **ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE** | CO1 | Understand the significance of Indian Traditional Knowledge . |
| | CO2 | Classify the Indian Traditional Knowledge. |
| | CO3 | . Compare Modern Science with Indian Traditional Knowledge system. |
| | CO4 | Analyze the role of Government in protecting the Traditional Knowledge. |
| | CO5 | Understand the impact of Philosophical tradition on Indian Knowledge System. |

**B.Tech4ᵗʰSem**

| Course Name | | Course Outcomes |
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| **PROBABILITY AND STATISTICS** | CO1 | . Classify the concepts of data science and its importance . |
| | CO2 | Interpret the association of characteristics and through correlation and regression tools. |
| | CO3 | . Make use of the concepts of probability and their applications. |
| | CO4 | Apply discrete and continuous probability distributions. |
| | CO5 | Infer the statistical inferential methods based on small and large sampling tests. |
| **COMPUTER ORGANIZATION** | CO1 | .• Develop a detailed understanding of computer . |
| | CO2 | Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations. |
| | CO3 | Develop a detailed understanding of architecture and functionality of central processing unit. |
| | CO4 | Exemplify in a better way the I/O and memory organization. |
| | CO5 | Illustrate concepts of parallel processing, pipelining and inter processor communication. |
| **DATA WAREHOUSING AND MINING** | CO1 | Summarize the architecture of data warehouse . |
| | CO2 | Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data. |
| | CO3 | Construct a decision tree and resolve the problem of model over fitting. |
| | CO4 | Compare Apriorism and FP-growth association rule mining algorithms for frequent item set generation. |
| | CO5 | Apply suitable clustering algorithm for the given data set. |
| **FORMAL LANGUAGES AND AUTOMATA THEORY** | CO1 | Classify machines by their power to recognize languages. |
| | CO2 | Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy. |
| | CO3 | Employ finite state machines to solve problems in computing. |
| | CO4 | Illustrate deterministic and non-deterministic machines. |
| | CO5 | Quote the hierarchy of problems arising in the computer science. |
| **MANAGERIAL** | CO1 | The Learner is equipped with the knowledge of |

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| **ECONOMICS AND FINANCIAL ACCOUNTANCY** | | | estimating the Demand and demand elasticities for a product . |
| | | CO2 | The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. |
| | | CO3 | The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. |
| | | CO4 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis. |
| | | CO5 | . The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. |
| **R PROGRAMMING LAB** | | CO1 | Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming. |
| | | CO2 | . Implement the concepts of R Script to extract the data from data frames and file operations. |
| | | CO3 | Implement the various statistical techniques using R. |
| | | CO4 | Extend the functionality of R by using add-on packages. |
| | | CO5 | Use R Graphics and Tables to visualize results of various statistical operations on data. |
| **DATA MINING USING PYTHON LAB** | | CO1 | . Apply preprocessing techniques on real world |
| | | CO2 | . Apply apriorism algorithm to generate frequent itemset |
| | | CO3 | Apply Classification and clustering algorithms on different datasets. |
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| **WEB APPLICATION DEVELOPMENT LAB** | | CO1 | Develop Single Page Applications |
| | | CO2 | Develop NodeJS & ReactJS Reusable Service • Store the data in MySQL. |
| | | CO3 | Get acquainted with the latest web application development trends in the IT industry |

| MONGO DB | CO1 | . Installing and configuring mongo DB in windows |
| | CO2 | Perform all database operations using MongoDB. |
| | CO3 | Develop applications by integrating mongo DB with java/PHP. |
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| B.Tech5<sup>th</sup>Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **COMPILER DESIGN** | CO1 | Demonstrate phases in the design of compiler . |
| | CO2 | Organize Syntax Analysis, Top Down and LL(1) grammars. |
| | CO3 | Design Bottom Up Parsing and Construction of LR parsers. |
| | CO4 | Analyze synthesized, inherited attributes and syntax directed translation schemes. |
| | CO5 | Determine algorithms to generate code for a target machine. |
| **OPERATING SYSTEMS** | CO1 | Describe various generations of Operating System and functions of Operating System . |
| | CO2 | . Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance. |
| | CO3 | Solve Inter Process Communication problems using Mathematical Equations by various methods. |
| | CO4 | Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques. |
| | CO5 | • Outline File Systems in Operating System like UNIX/Linux and Windows. |
| **MACHINE LEARNING** | CO1 | Explain the fundamental usage of the concept Machine Learning system. |

| | CO2 | Demonstrate on various regression Technique. |
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| | CO3 | Analyze the Ensemble Learning Methods • Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning. |
| | CO4 | Discuss the Neural Network Models and Fundamentals concepts of Deep Learning. |
| | CO5 | Explain the fundamental usage of the concept Machine Learning system . |
| **OPTIMIZATION IN OPERATIONS RESEARCH** (Job oriented course) | CO1 | State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem. optimal solution. |
| | CO2 | Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution. |
| | CO3 | Apply and Solve transportation and assignment problem by using Linear programming Simplex method.. |
| | CO4 | Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions. |
| | CO5 | Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. |
| **SOFTWARE ENGINEERING** (Professional Elective-I) | CO1 | Ability to transform an Object-Oriented Design into high quality, executable code . |
| | CO2 | Skills to design, implement, and execute test cases at the Unit and Integration level. |
| | CO3 | Compare conventional and agile software methods. |
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| **OBJECT ORIENTED ANALYSIS AND DESIGN** (Professional Elective-I) | CO1 | Analyze the nature of complex system and its solutions. |
| | CO2 | Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships. |
| | CO3 | Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and |

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| | | apply basic and Advanced Structural Modeling Concepts for designing real time applications. |
| | CO4 | Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams. |
| | CO5 | Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems. |
| **DevOps (Professional Elective-I)** | CO1 | . Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility. |
| | CO2 | . Describe DevOps & Dev SecOps methodologies and their key concepts. |
| | CO3 | Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models. |
| | CO4 | Set up complete private infrastructure using version control systems and CI/CD tools. |
| | CO5 | Acquire the knowledge of maturity model, Maturity Assessment. |
| **INTERNET OF THINGS** (Professional Elective-I) | CO1 | Review Internet of Things (IoT). |
| | CO2 | Demonstrate various business models relevant to IoT. |
| | CO3 | Construct designs for web connectivity. |
| | CO4 | Organize sources of data acquisition related to IoT, integrate to enterprise systems. |
| **OPERATING SYSTEMS & COMPILER DESIGN LAB** | CO5 | Describe IoT with Cloud technologies. |
| | CO1 | Implement various scheduling, page replacement algorithms and algorithms related to deadlocks . |
| | CO2 | Design programs for shared memory management and semaphores. |
| | CO3 | Determine predictive parsing table for a CFG. |
| | CO4 | Apply Lex and Yuck tools |
| | CO5 | Examine LR parser and generating SLR Parsing table. |
| | CO5 | **Describe IoT with Cloud technologies.** |

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| **MACHINE LEARNING LAB** | CO1 | Implement procedures for the machine learning algorithms |
| | CO2 | . Design and Develop Python programs for various Learning algorithms. |
| | CO3 | Apply appropriate data sets to the Machine Learning algorithms. |

| | CO4 | Develop Machine Learning algorithms to solve real world problems. |
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| **CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps** | CO1 | Understand the why, what and how of DevOps adoption . |
| | CO2 | Attain literacy on DeVos. |
| | CO3 | Align capabilities required in the team. |
| | CO4 | . Create an automated CICD pipeline using a stack of tools. |
| **HELICAL INSIGHT (Skill Oriented Course III)** | CO1 | develop data analysis on top of your data and embed it . |
| | CO2 | support better business decision-making. |
| | CO3 | implement their own custom business processes very easily. |
| | | |
| **EMPLOYABILITY SKILLS-I** | CO1 | . Understand the corporate etiquette. |
| | CO2 | . Make presentations effectively with appropriate body language. |
| | CO3 | . Be composed with positive attitude. |
| | | |
| **DATA WAREHOUSING AND DATA MINING(Minor course)** | CO1 | Design a data mart or data warehouse for any organization. |
| | CO2 | Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques. |
| | CO3 | Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data. |
| | CO4 | Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results. |

| B.Tech 6<sup>th</sup> Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **COMPUTER NETWORKS** | CO1 | Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards. |
| | CO2 | Discuss different transmission media and different switching networks. |
| | CO3 | Analyze data link layer services, functions and protocols like HDLC and PPP. |
| | CO4 | . Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols |
| | CO5 | Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc. |
| **BIG DATA ANALYTICS** | CO1 | Illustrate big data challenges in different domains including social media, transportation, finance and medicine t |
| | CO2 | Use various techniques for mining data stream. |
| | CO3 | Design and develop Hadoop. |
| | CO4 | Identify the characteristics of datasets and compare the trivial data and big data for various applications. |
| | CO5 | . Explore the various search methods and visualization techniques. |
| **DESIGN AND ANALYSIS OF ALGORITHMS** | CO1 | Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms . |
| | CO2 | . List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method. |
| | CO3 | Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations. |
| | CO4 | Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches. |
| | CO5 | Demonstrate NP- Completeness theory ,lower bound theory and String Matching. |
| **DEEP LEARNING** | CO1 | Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine |

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| **(Professional Elective-II)** | | Learning and Deep Learning. |
| | CO2 | Discuss the Neural Network training, various random models. |
| | CO3 | Explain the Techniques of Kera's, TensorFlow, Theano and CNTK. |
| | CO4 | Classify the Concepts of CNN and RNN. |
| | CO5 | Implement Interactive Applications of Deep Learning.. |
| **SOFTWARE PROJECT MANAGEMENT (Professional Elective-II)** | CO1 | Apply the process to be followed in the software development life-cycle models . |
| | CO2 | Apply the concepts of project management & planning. |
| | CO3 | Implement the project plans through managing people, communications and change. |
| | CO4 | Conduct activities necessary to successfully complete and close the Software projects. |
| | CO5 | Implement communication, modeling, and construction & deployment practices in software development. |
| **DISTRIBUTED SYSTEMS (Professional Elective-II)** | CO1 | Elucidate the foundations and issues of distributed systems . |
| | CO2 | Illustrate the various synchronization issues and global state for distributed systems. |
| | CO3 | Illustrate the Mutual Exclusion and Dead lock detection algorithms in distributed systems. |
| | CO4 | systems Describe the agreement protocols and fault tolerance mechanisms in distributed systems. |
| | CO5 | Describe the features of peer-to-peer and distributed shared memory systems. |
| **DATA WRANGLING IN DATA SCIENCE (Professional Elective-II)** | CO1 | Identify and execute the basic data format. |
| | CO2 | . Perform the computations with Excel and pdf files. |
| | CO3 | Understand the concepts of data cleanup. |
| | CO4 | Explore and analyze the Image and video data. |
| | CO5 | Understand the concepts web scraping. |
| **ETL PRINCIPLES (Professional Elective-II)s** | CO1 | Understand the basic principles of ETL . |
| | CO2 | Understand various processes like extraction, cleaning, conforming etc. |
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| **MEAN STACK DEVELOPMENT (Job Oriented Course)** | CO1 | Build static web pages using HTML 5 elements. |
| | CO2 | . Apply JavaScript to embed programming interface for web pages and also to perform Client side validations. |
| | CO3 | Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js. |
| | CO4 | Develop JavaScript applications using typescript and work with document database using MongoDB. |
| | CO5 | Utilize Angular JS to design dynamic and responsive web pages. |
| **COMPUTER NETWORKS LAB** | CO1 | end of the course student will be able to . |
| | CO2 | Know how reliable data communication is achieved through data link layer. |
| | CO3 | Suggest appropriate routing algorithm for the network. |
| | CO4 | Provide internet connection to the system and its installation. |
| | CO5 | Work on various network management tools. |
| **DEEP LEARNING WITH TENSORFLOW** | CO1 | Implement deep neural networks to solve real world problems . |
| | CO2 | Choose appropriate pre-trained model to solve real time problem. |
| | CO3 | Interpret the results of two different deep learning models. |
| | | |
| **ETL DESIGN PROCEDURES-SPARK (Skill Oriented Course)** | CO1 | Develop various applications for ETL with Spark. |
| **EMPLOYABILITY SKILLS-II** | CO1 | . Solve various Basic Mathematics problems by following different methods . |
| | CO2 | Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems. |
| | CO3 | Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. |
| | CO4 | Analyze, summarize and present information in |

| | | quantitative forms including table, graphs and formulas. |
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| **DATA SCIENCE APPLICATIONS** | CO1 | Apply principles of NumPy and Pandas to the analysis of data. |
| | CO2 | Make use of various file formats in loading and storage of data. |
| | CO3 | Identify and apply the need and importance of pre-processing techniques. |
| | CO4 | • Show the results and present them in a pictorial format. |

| B.Tech7th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **Reinforcement Learning (Professional Elective-III)** | CO1 | Understand basic concepts of Reinforcement learning |
| | CO2 | Identifying appropriate learning tasks for Reinforcement learning techniques. |
| | CO3 | Understand various methods and applications of reinforcement learning. |
| | | |
| **Nature Inspired Computing Techniques (Professional Elective-III)** | CO1 | Understand the strengths, weaknesses and appropriateness of nature-inspired algorithms |
| | CO2 | Apply nature-inspired algorithms to optimization, design and learning problems. |
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| **Social Media Analytics (Professional Elective-III)** | CO1 | Understand social media categories and types of social media analytics . |
| | CO2 | Understand the impact of social media analytics integration with and affects other areas of business. |
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| **Block Chain Technologies** | CO1 | Demonstrate the block chain basics, Crypto |

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| **(Professional Elective-III)** | | currency . |
| | CO2 | To compare and contrast the use of different private vs. public block chain and use cases. |
| | CO3 | .Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins. |
| | CO4 | Classify Permission Block chain and use cases – Hyper ledger, Corda. |
| | CO5 | Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and other. |
| **SnowFlake Cloud Analytics (Professional Elective-IV)** | CO1 | Load & transform data in Snowflake . |
| | CO2 | scale virtual warehouses for performance and concurrency. |
| | CO3 | share data and work with semi-structured data. |
| | CO4 | gain a thorough knowledge of query constructs, DDL & DML operations, managing and monitoring Snowflake accounts and Snowflake's continuous data protection methods. |
| **Cloud Computing (Professional Elective-IV)** | CO1 | Illustrate the key dimensions of the challenge of Cloud Computing . |
| | CO2 | Classify the Levels of Virtualization and mechanism of tools. |
| | CO3 | Analyze Cloud infrastructure including Google Cloud and Amazon Cloud. |
| | CO4 | Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud |
| | CO5 | Assess control storage systems and cloud security, the risks involved its impact and develop cloud application. |
| **Information Retrieval Systems (Professional Elective-IV)** | CO1 | Identify basic theories in information retrieval . |
| | CO2 | .Classify the analysis tools as they apply to information retrieval systems. |
| | CO3 | Illustrate the problems solved in currentIR systems. |
| | CO4 | .Discuss the advantages of current IR systems |
| | | Translatethelatesttechnologiesfor linking, describing and searching the web. |
| **NOSQL Databases (Professional Elective-IV)** | CO1 | Discuss about Aggregate Data Models . |
| | CO2 | Explain about Master-Slave Replication, Peer-to-Peer Replication. |
| | CO3 | Describe the Structure of Data, Scaling, Suitable Use Cases. |

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| | CO4 | Make use of Complex Transactions Spanning Different Operations. | |
| Social Network Analysis (Professional Elective-V) | CO1 | Knowbasic | |
| | CO2 | Beabletovisualize, summarizeandcomparenetwork. | |
| | CO3 | Illustratebasicprinciplesbehind networkanalysisalgorithms. | |
| | CO4 | Developpracticalskillsonetwork analysis inRprogramminglanguage. | |
| Recommender Systems (Professional Elective-V) | CO1 | Understand the basic concepts of recommender systems . | |
| | CO2 | Carry out performance evaluation of recommender systems based on various metrics. | |
| | CO3 | Implement machine-learning and data-mining algorithms in recommender systems data sets. | |
| | CO4 | Design and implement a simple recommender system. | |

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| AI Chatbots (Professional Elective-V) | CO1 | Develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality. |
| | CO2 | Design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform. |
| | CO3 | Deploy the finished chatbot for public use and interaction. |
| Data Visualization (Professional Elective-V) | CO1 | Understand basics of Data Visualization |
| | CO2 | Implement visualization of distributions. |
| | CO3 | Write programs on visualization of time series, proportions & associations. |
| | CO4 | Apply visualization on Trends and uncertainty. |
| | CO5 | Explain principles of proportions. |
| API and Microservices (Job Oriented Course) | CO1 | Develop a Spring Data JPA application with Spring Boot |
| | CO2 | Implement CRUD operations using Spring Data JPA. |
| | CO3 | Implement pagination and sorting mechanism using Spring Data JPA. |
| | CO4 | Implement query methods for querying the database using Spring Data JPA. |
| | CO5 | Understand update operation using query approaches |

| | | in Spring Data JPA. |
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| | CO6 | Write RESTful services using Spring REST that consumes and produces data in different formats. |
| | CO7 | Write Spring based REST clients to consume RESTful services programmatically. |
| **Secure Coding Techniques (Job Oriented Course)** | CO1 | Differentiate the objectives of information security |
| | CO2 | Understand the trend, reasons and impact of the recent Cyber attacks. |
| | CO3 | Understand OWASP design principles while designing a web application. |
| | CO4 | Understand Threat modelling. |
| | CO5 | Importance of security in all phases of SDLC. |
| **Universal Human Values 2: Understanding Harmony** | CO1 | By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature |
| | CO2 | they would become more responsible in life, and in handling problems with sustainable solutions. |
| | CO3 | while keeping human relationships and human nature in mind. |
| | CO4 | They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). |
| | CO5 | It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. |
| **MEAN Stack Technologies-Module II-Angular JS and MongoDB (Skill Oriented Course)** | CO1 | Build a component-based application using Angular components and enhance their functionality using directives. |
| | CO2 | Utilize data binding for developing Angular forms and bind them with model data. |
| | CO3 | Apply Angular built-in or custom pipes to format the rendered data. |
| | CO4 | Develop a single page application by using synchronous or asynchronous Angular routing |
| | CO5 | Make use of MongoDB queries to perform CRUD operations on document database. |
| **Data Wrangling in Data Science(Minor)** | CO1 | Identify and execute the basic data format. |
| | CO2 | Perform the computations with Excel and pdf files. |
| | CO3 | Understand the concepts of data cleanup. |
| | CO4 | Explore and analyze the Image and video data. |

| | CO5 | Understand the concepts web scraping. |
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# DEPARTMENT OF CSE Courses Outcomes(R20)

| B.tech 1st Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **COMMUNICATIVE ENGLISH** | CO1 | Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information |
| | CO2 | ask and answer general questions on familiar topics and introduce oneself/others |
| | CO3 | Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information |
| | CO4 | Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs |
| | CO5 | Form sentences using proper grammatical structures and correct word forms |
| **MATHEMATICS-I** | CO1 | Utilize mean value theorems to real life problems |
| | CO2 | Solve the differential equations related to various engineering fields |
| | CO3 | Familiarize with functions of several variables which is useful in optimization |
| | CO4 | Apply double integration techniques in evaluating areas bounded by region |
| | CO5 | Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems |
| **APPLIED PHYSICS** | CO1 | Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) |
| | CO2 | Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other |

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| | | fields (L2). Apply the fiber optic concepts in various fields (L3). |
| | CO3 | Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in onedimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2). |
| | CO4 | Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3) |
| | CO5 | Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissonier's effect (L2). Explain Meissonier's effect, BCS theory & Josephson effect in superconductors (L2). |
| PROGRAMMING FOR PROBLEM SOLVING USING C | CO1 | To write algorithms and to draw flowcharts for solving problems |
| | CO2 | To convert flowcharts/algorithms to C Programs, compile and debug programs |
| | CO3 | To use different operators, data types and write programs that use two-way/ multi-way selection |
| | CO4 | To select the best loop construct for a given problem |
| | CO5 | To design and implement programs to analyze the different pointer applications |
| | CO6 | To decompose a problem into functions and to develop modular reusable code |
| | CO7 | To apply File I/O operations |
| COMPUTER ENGINEERING WORKSHOP | CO1 | Assemble and disassemble components of a PC |
| | CO2 | Construct a fully functional virtual machine, Summarize various Linux operating system commands, |
| | CO3 | Recognize characters & extract text from scanned images, Create audio files and podcasts |

| PROGRAMMING FOR PROBLEM SOLVING USING C LAB | CO1 | Gains Knowledge on various concepts of a C language. |
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| | CO2 | Able to draw flowcharts and write algorithms. |
| | CO3 | Able design and development of C problem solving skills. |
| | CO4 | Able to design and develop modular programming skills. |
| | CO5 | Able to trace and debug a program |

| B.tech 2nd Sem | | |
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| Course Name | | Course Outcomes |
| MATHEMATICS-II | CO1 | develop the use of matrix algebra techniques that is needed by engineers for practical applications |
| | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel |
| | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms |
| | CO4 | apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals |
| | CO5 | apply numerical integral techniques to different Engineering problems |
| | CO6 | apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations |
| APPLIED CHEMISTRY | CO1 | Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers |
| | CO2 | Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion |
| | CO3 | Synthesize nonmaterial's for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors. |
| | CO4 | Analyze the principles of different analytical instruments and their applications. Design models for energy by different natural sources |
| | CO5 | Obtain the knowledge of computational chemistry |

| | | | and molecular machines |
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| **COMPUTER ORGANIZATION** | CO1 | | Demonstrate and understanding of the design of the functional units of a digital computer system. |
| | CO2 | | Relate Postulates of Boolean algebra and minimize combinational functions |
| | CO3 | | Recognize and manipulate representations of numbers stored in digital computers |
| | CO4 | | Build the logic families and realization of logic gates. |
| | CO5 | | Design and analyze combinational and sequential circuits |
| | CO6 | | Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components |
| | CO7 | | Solve elementary problems by assembly language programming |
| **PYTHON PROGRAMMING** | CO1 | | Develop essential programming skills in computer programming concepts like data types, containers |
| | CO2 | | Apply the basics of programming in the Python language |
| | CO3 | | Solve coding tasks related conditional execution, loops |
| | CO4 | | Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming |
| **DATA STRUCTURES** | CO1 | | Summarize the properties, interfaces, and behaviors of basic abstract data types |
| | CO2 | | Discuss the computational efficiency of the principal algorithms for sorting & searching |
| | CO3 | | Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs |
| | CO4 | | Demonstrate different methods for traversing trees |
| **APPLIED CHEMISTRY LAB** | CO1 | | The students entering into the professional course have practically very little exposure to lab classes. |
| | CO2 | | The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. |
| | CO3 | | Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. |
| | CO4 | | They thus acquire some experimental skills. |
| **SPYTHON** | CO1 | | Develop essential programming skills in computer |

| PROGRAMMING LAB | | programming concepts like data types, containers |
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| | CO2 | Apply the basics of programming in the Python language |
| | CO3 | Solve coding tasks related conditional execution, loops |
| | CO4 | Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming |
| DATA STRUCTURES LAB | CO1 | Use basic data structures such as arrays and linked list. |
| | CO2 | Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths. |
| | CO3 | Use various searching and sorting algorithms. |

| B.tech 3rd Sem | | |
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| **Course Name** | | **Course Outcomes** |
| MATHEMATICS - III | CO1 | Interpret the physical meaning of different operators such as gradient, curl and divergence |
| | CO2 | Estimate the work done against a field, circulation and flux using vector calculus |
| | CO3 | Apply the Laplace transform for solving differential equations |
| | CO4 | Find or compute the Fourier series of periodic signals |
| | CO5 | Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms |
| | CO6 | Identify solution methods for partial differential equations that model physical processes |
| OBJECT ORIENTED PROGRAMMING THROUGH C++ | CO1 | Classify object oriented programming and procedural programming |
| | CO2 | Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling |
| | CO3 | Build C++ classes using appropriate encapsulation and design principles |

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| | CO4 | Apply object oriented or non-object oriented techniques to solve bigger computing problems | |
| **OPERATING SYSTEMS** | CO1 | Describe various generations of Operating System and functions of Operating System | |
| | CO2 | Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance | |
| | CO3 | Solve Inter Process Communication problems using Mathematical Equations by various methods | |
| | CO4 | Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques | |
| | CO5 | Outline File Systems in Operating System like UNIX/Linux and Windows | |
| **SOFTWARE ENGINEERING** | CO1 | Ability to transform an Object-Oriented Design into high quality, executable code | |
| | CO2 | Skills to design, implement, and execute test cases at the Unit and Integration level | |
| | CO3 | Compare conventional and agile software methods | |
| **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE** | CO1 | Demonstrate skills in solving mathematical problems | |
| | CO2 | Comprehend mathematical principles and logic | |
| | CO3 | Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software | |
| | C04 | Manipulate and analyze data numerically and/or graphically using appropriate Software | |
| | CO5 | Communicate effectively mathematical ideas/results verbally or in writing | |
| **OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB** | CO1 | Apply the various OOPs concepts with the help of programs. | |
| **OPERATING SYSTEM LAB** | CO1 | To use Unix utilities and perform basic shell control of the utilities | |
| | CO2 | To use the Unix file system and file access control | |
| | CO3 | To use of an operating system to develop software | |
| | CO4 | Students will be able to use Linux environment efficiently | |
| | CO5 | Solve problems using bash for shell scripting | |

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| **SOFTWARE ENGINEERING LAB** | CO1 | By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project |
| | CO2 | prepare SRS document, design document, test cases and software configuration management and risk management related document. |
| | CO3 | develop function oriented and object oriented software design using tools like rational rose. |
| | CO4 | use modern engineering tools necessary for software project management, estimations, time management and software reuse |
| | CO5 | generate test cases for software testing |
| **APPLICATIONS OF PYTHON-NumPy** | CO1 | Explain how data is collected, managed and stored for processing |
| | CO2 | Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems |
| | CO3 | Understand how to apply some linear algebra operations to n-dimensional arrays |
| | CO4 | Use NumPy perform common data wrangling and computational tasks in Python. |
| **WEB APPLICATION DEVELOPMENT USING FULL STACK** | CO1 | Analyze a web page and identify its elements and attributes. |
| | CO2 | Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet |
| | CO3 | Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone |
| | CO4 | Create web pages using HTML and Cascading Style Sheets. |
| **CONSTITUTION OF INDIA** | CO1 | Understand historical background of the constitution making and its importance for building a democratic India. |
| | CO2 | Understand the functioning of three wings of the government i.e., executive, legislative and judiciary. |
| | CO3 | Understand the value of the fundamental rights and duties for becoming good citizen of India |
| | CO4 | Analyze the decentralization of power between central, state and local self government. |
| | CO5 | Apply the knowledge in strengthening of the constitutional institutions like CAG, Election |

| | | Commission and UPSC for sustaining democracy. |
| | | 1. Know the sources, features and principles of Indian Constitution. |
| | | 2. Learn about Union Government, State government and its administration. |
| | | 3. Get acquainted with Local administration and Pachayati Raj. |
| | | 4. Be aware of basic concepts and developments of Human Rights. |
| | | 5. Gain knowledge on roles and functioning of Election Commission |

| B.tech 4th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **PROBABILITY AND STATISTICS** | CO1 | Classify the concepts of data science and its importance |
| | CO2 | Interpret the association of characteristics and through correlation and regression tools |
| | CO3 | Make use of the concepts of probability and their applications |
| | CO4 | Apply discrete and continuous probability distributions |
| | CO5 | Design the components of a classical hypothesis test |
| | CO6 | Infer the statistical inferential methods based on small and large sampling tests |
| **DATABASE MANAGEMENT SYSTEMS** | CO1 | Describe a relational database and object-oriented database |
| | CO2 | Create, maintain and manipulate a relational database using SQL |
| | CO3 | Describe ER model and normalization for database design |
| | CO4 | Examine issues in data storage and query processing and can formulate appropriate solutions |
| | CO5 | Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage |
| **FORMAL LANGUAGES AND AUTOMATA THEORY** | CO1 | Classify machines by their power to recognize languages. |
| | CO2 | Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy |

| | CO3 | Employ finite state machines to solve problems in computing |
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| | CO4 | Illustrate deterministic and non-deterministic machines |
| | CO5 | Quote the hierarchy of problems arising in the computer science |
| **JAVA PROGRAMMING** | CO1 | Able to realize the concept of Object Oriented Programming & Java Programming Constructs |
| | CO2 | Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords. |
| | CO3 | Apply the concept of exception handling and Input/ Output operations |
| | CO4 | Able to design the applications of Java & Java applet |
| | CO5 | Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit |
| **MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY** | CO1 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product |
| | CO2 | The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs |
| | CO3 | The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units |
| | CO4 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis |
| | CO5 | The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making |
| **DATABASE MANAGEMENT SYSTEMS LAB** | CO1 | Utilize SQL to execute queries for creating database and performing data manipulation operations |
| | CO2 | Examine integrity constraints to build efficient databases |
| | CO3 | Apply Queries using Advanced Concepts of SQL |
| | CO4 | Build PL/SQL programs including stored procedures, functions, cursors and triggers |
| **R PROGRAMMING LAB** | CO1 | Access online resources for R and import new function packages into the R workspace |
| | CO2 | Import, review, manipulate and summarize data-sets in R |

| Course Name | | Course Outcomes |
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| | CO3 | Explore data-sets to create testable hypotheses and identify appropriate statistical tests |
| | CO4 | Perform appropriate statistical tests using R |
| | CO5 | Create and edit visualizations with R |
| JAVA PROGRAMMING LAB | CO1 | Evaluate default value of all primitive data type, Operations, Expressions, Control flow, Strings |
| | CO2 | Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism |
| | CO3 | Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism |
| | CO4 | Construct Threads, Event Handling, implement packages, developing applets |
| APPLICATIONS OF PYTHON-Pandas | CO1 | Use Pandas to create and manipulate data structures like Series and Data Frames. |
| | CO2 | Work with arrays, queries, and data frames |
| | CO3 | Query Data Frame structures for cleaning and processing and manipulating files |
| | CO4 | Understand best practices for creating basic charts |
| WEB APPLICATION DEVELOPMENT USING FULL STACK | CO1 | develop of the major Web application tier- Client side development |
| | CO2 | participate in the active development of cross-browser applications through JavaScript |
| | CO3 | Develop JavaScript applications that transition between states |

| B.tech 5th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| COMPUTER NETWORKS | CO1 | Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards. |
| | CO2 | Discuss different transmission media and different switching networks. |
| | CO3 | Analyze data link layer services, functions and protocols like HDLC and PPP. |
| | CO4 | Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols |
| | CO5 | Determine application layer services and client server |

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| | | protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc. |
| **DESIGN AND ANALYSIS OF ALGORITHMS** | CO1 | Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms |
| | CO2 | List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method |
| | CO3 | Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations. |
| | CO4 | Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches |
| | CO5 | Demonstrate NP- Completeness theory ,lower bound theory and String Matching |
| **DATA WAREHOUSING AND DATA MINING** | CO1 | Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications. |
| | CO2 | Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms. |
| | CO3 | Choose appropriate classification technique to perform classification, model building and evaluation. |
| | CO4 | Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent item sets generation. |
| | CO5 | Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result. |
| **OPTIMIZATION IN OPERATIONS RESEARCH** | CO1 | State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem. |
| | CO2 | Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution. |
| | CO3 | Apply and Solve transportation and assignment problem by using Linear programming Simplex method. |
| | CO4 | Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions |

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| | CO5 | Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. |
| ARTIFICIAL INTELLIGENCE | CO1 | Understand the fundamental concepts in Artificial Intelligence |
| | CO2 | Analyze the applications of search strategies and problem reductions |
| | CO3 | Apply the mathematical logic concepts. |
| | CO4 | Develop the Knowledge representations in Artificial Intelligence. |
| | CO5 | Explain the Fuzzy logic systems. |
| SOFTWARE PROJECT MANAGEMENT | CO1 | Apply the process to be followed in the software development life-cycle models |
| | CO2 | Apply the concepts of project management & planning |
| | CO3 | Implement the project plans through managing people, communications and change |
| | CO4 | Conduct activities necessary to successfully complete and close the Software projects |
| | CO5 | Implement communication, modeling, and construction & deployment practices in software development |
| DISTRIBUTED SYSTEMS | CO1 | Elucidate the foundations and issues of distributed systems |
| | CO2 | Illustrate the various synchronization issues and global state for distributed systems |
| | CO3 | Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems |
| | CO4 | Describe the agreement protocols and fault tolerance mechanisms in distributed systems |
| | CO5 | Describe the features of peer-to-peer and distributed shared memory systems |
| ADVANCED UNIX PROGRAMMING | CO1 | Gain good knowledge on Unix commands and awareness of shell programming |
| | CO2 | Know about different system calls for files and directories |
| | CO3 | Ability to know the working of processes and signals |
| | CO4 | Application of client server program for IPC |
| | CO5 | Knowledge about socket programming |
| DATA WAREHOUSING | CO1 | Design a data mart or data warehouse for any |

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| AND DATA MINING LAB | | organization |
| | CO2 | Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques |
| | CO3 | Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data |
| | CO4 | Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results |
| COMPUTER NETWORKS LAB | CO1 | Know how reliable data communication is achieved through data link layer. |
| | CO2 | Suggest appropriate routing algorithm for the network. |
| | CO3 | Provide internet connection to the system and its installation. |
| | CO4 | Work on various network management tools |
| ANIMATION COURSE: ANIMATION DESIGN | CO1 | learn various tools of digital 2-D animation |
| | CO2 | understand production pipeline to create 2-D animation. |
| | CO3 | apply the tools to create 2D animation for films and videos |
| | CO4 | understand different styles and treatment of content in 3D model creation |
| | CO5 | apply tools to create effective 3D modeling texturing and lighting |
| CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps | CO1 | Understand the why, what and how of DevOps adoption |
| | CO2 | Attain literacy on Devops |
| | CO3 | Align capabilities required in the team |
| | CO4 | Create an automated CICD pipeline using a stack of tools |
| EMPLOYABILITY SKILLS-I | CO1 | Understand the corporate etiquette. |
| | CO2 | Make presentations effectively with appropriate body language |
| | CO3 | Be composed with positive attitude |
| | CO4 | Understand the core competencies to succeed in professional and personal life |
| DATABASE MANAGEMENT SYSTEMS | CO1 | Describe a relational database and object-oriented database |
| | CO2 | Create, maintain and manipulate a relational database using SQL |

| | CO3 | Describe ER model and normalization for database design |
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| | CO4 | Examine issues in data storage and query processing and can formulate appropriate solutions |
| | CO5 | Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage |
| | CO6 | Examine integrity constraints to build efficient databases |
| | CO7 | Apply Queries using Advanced Concepts of SQL |
| | CO8 | Build PL/SQL programs including stored procedures, functions, cursors and triggers |

| B.tech 6th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| **MACHINE LEARNING** | CO1 | Explain the fundamental usage of the concept Machine Learning system |
| | CO2 | Demonstrate on various regression Technique |
| | CO3 | Analyze the Ensemble Learning Methods. |
| | CO4 | Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning |
| | CO5 | Discuss the Neural Network Models and Fundamentals concepts of Deep Learning |
| **COMPILER DESIGN** | CO1 | Demonstrate phases in the design of compiler |
| | CO2 | Organize Syntax Analysis, Top Down and LL(1) grammars |
| | CO3 | Design Bottom Up Parsing and Construction of LR parsers |
| | CO4 | Analyze synthesized, inherited attributes and syntax directed translation schemes |
| | CO5 | Determine algorithms to generate code for a target machine |
| **CRYPTOGRAPHY AND NETWORK SECURITY** | CO1 | Explain different security threats and countermeasures and foundation course of cryptography mathematics |
| | CO2 | Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography |
| | CO3 | Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more |

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| | CO4 | Design applications of hash algorithms, digital signatures and key management techniques. |
| | CO5 | Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec . |
| **MOBILE COMPUTING** | CO1 | Develop a strong grounding in the fundamentals of mobile Networks |
| | CO2 | Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network |
| | CO3 | Comprehend, design, and develop a lightweight network stack |
| | CO4 | Analyze the Mobile Network Layer system working |
| | CO5 | Explain about the WAP Model |
| **BIG DATA ANALYTICS** | CO1 | Illustrate big data challenges in different domains including social media, transportation, finance and medicine |
| | CO2 | Use various techniques for mining data stream |
| | CO3 | Design and develop Hadoop |
| | CO4 | Identify the characteristics of datasets and compare the trivial data and big data for various applications |
| | CO5 | Explore the various search methods and visualization techniques |
| **OBJECT ORIENTED ANALYSIS AND DESIGN** | CO1 | Analyze the nature of complex system and its solutions. |
| | CO2 | Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships |
| | CO3 | Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications. |
| | CO4 | Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams. |
| | CO5 | Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems. |
| **NETWORK PROGRAMMING** | CO1 | Identifying different models and sockets |
| | CO2 | Demonstrate different TCP Echo server functions and I/O models |

| | CO3 | Rationalize IPV4 and IPV6 Socket options |
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| | CO4 | Identifying daemon processing and Advanced input and output functions |
| | CO5 | Analyze Broadcasting and multicasting |
| **MEAN STACK DEVELOPMENT** | CO1 | Build static web pages using HTML 5 elements. |
| | CO2 | Apply JavaScript to embed programming interface for web pages and also to perform Client side validations. |
| | CO3 | Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js. |
| | CO4 | Develop JavaScript applications using typescript and work with document database using MongoDB |
| | CO5 | Utilize Angular JS to design dynamic and responsive web pages. |
| **MACHINE LEARNING USING PYTHON LAB** | CO1 | Implement procedures for the machine learning algorithms |
| | CO2 | Design and Develop Python programs for various Learning algorithms |
| | CO3 | Apply appropriate data sets to the Machine Learning algorithms |
| | CO4 | Develop Machine Learning algorithms to solve real world problems |
| **COMPILER DESIGN LAB** | CO1 | Design simple lexical analyzers |
| | CO2 | Determine predictive parsing table for a CFG |
| | CO3 | Apply Lex and Yacc tools |
| | CO4 | Examine LR parser and generating SLR Parsing table |
| | CO5 | Relate Intermediate code generation for subset C language |
| **CRYPTOGRAPHY NETWORK SECURITY LAB** | CO1 | Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher |
| | CO2 | Demonstrate the different algorithms like DES, Blowfish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm. |
| | CO3 | Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm |
| **BIG DATA: SPARK** | CO1 | Develop Map Reduce Programs to analyze large dataset Using Hadoop and Spark |

| | CO2 | Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components |
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| | CO3 | Perform the filter, count, distinct, map, flat Map RDD Operations in Spark. |
| | CO4 | Build Queries using Spark SQL |
| | CO5 | Apply Spark joins on Sample Data Sets |
| | CO6 | Make use of sqoop to import and export data from hadoop to database and vice-versa |
| **MEAN STACK TECHNOLOGIES-MODULE I (HTML 5, JAVASCRIPT, EXPRESS.JS, NODE.JS AND TYPESCRIPT)** | CO1 | Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles. |
| | CO2 | Utilize JavaScript for developing interactive HTML web pages and validate form data. |
| | CO3 | Build a basic web server using Node.js and also working with Node Package Manager |
| | CO4 | Build a web server using Express.js |
| | CO5 | Make use of Typescript to optimize JavaScript code by using the concept of strict type checking. |
| **EMPLOYABILITY SKILLS-II** | CO1 | Solve various Basic Mathematics problems by following different methods |
| | CO2 | Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems |
| | CO3 | Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. |
| | CO4 | Analyze, summarize and present information in quantitative forms including table, graphs and formulas |
| **DATA STRUCTURES AND ALGORITHMS** | CO1 | Use basic data structures such as arrays and linked list. |
| | CO2 | Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths. |
| | CO3 | Use various searching and sorting algorithms. |
| **CLOUD COMPUTING** | CO1 | Illustrate the key dimensions of the challenge of Cloud Computing |
| | CO2 | Classify the Levels of Virtualization and mechanism of tools |
| | CO3 | Analyze Cloud infrastructure including Google Cloud and Amazon Cloud. |

| | CO4 | Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud |
|---|---|---|
| | CO5 | Assess control storage systems and cloud security, the risks involved its impact and develop cloud application |
| **NEURAL NETWORKS AND SOFT COMPUTING** | CO1 | Understand the concepts of Artificial intelligence and soft computing techniques |
| | CO2 | Analyze the concepts of Neural Networks and select the Learning Networks in modeling real world systems |
| | CO3 | Implement the concepts of Fuzzy reasoning and concepts of Genetic algorithm and its applications to soft computing |
| | CO4 | Classify Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization. |
| | CO5 | Design hybrid system incorporating neural network, genetic algorithms, fuzzy systems. |

| B.tech 7th Sem | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **AD-HOC AND SENSOR NETWORKS** | CO1 | Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks. |
| | CO2 | Determine the principles and characteristics of wireless sensor networks. |
| | CO3 | Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks. |
| | CO4 | Illustrate the various sensor network Platforms, tools and applications. |
| | CO5 | Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs. |
| **CYBER SECURITY & FORENSICS** | CO1 | Explain the Cybercrime Fundamentals |
| | CO2 | Describe the types of attacks on networks |
| | CO3 | Analyze various tools available for Cybercrime |

| | | Investigation |
|---|---|---|
| | CO4 | Explain the Computer Forensics and Investigation Fundamentals and tools |
| | CO5 | Analyze the legal perspectives of Cybercrime |
| **DEEP LEARNING TECHNIQUES** | CO1 | Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning. |
| | CO2 | Discuss the Neural Network training, various random models. |
| | CO3 | Explain the Techniques of Keras, TensorFlow, Theano and CNTK |
| | CO4 | Classify the Concepts of CNN and RNN |
| | CO5 | Implement Interactive Applications of Deep Learning. |
| **SOCIAL NETWORKS & SEMANTIC WEB** | CO1 | Demonstrate social network analysis and measures. |
| | CO2 | Analyze random graph models and navigate social networks data |
| | CO3 | Apply the network topology and Visualization tools. |
| | CO4 | Analyze the experiment with small world models and clustering models. |
| | CO5 | Compare the application driven virtual communities from social network Structure. |
| **COMPUTER VISION** | CO1 | Identify basic concepts, terminology, theories, models and methods in the field of computer vision, |
| | CO2 | Describe known principles of feature detection and matching, |
| | CO3 | Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal. |
| | CO4 | Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths. |
| **BLOCK-CHAIN TECHNOLOGIES** | CO1 | Demonstrate the block chain basics, Crypto currency |
| | CO2 | To compare and contrast the use of different private vs. public block chain and use cases |
| | CO3 | Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins |
| | CO4 | Classify Permission Block chain and use cases – Hyper ledger, Corda |

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|---|---|---|
| | CO5 | Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others |
| **WIRELESS NETWORK SECURITY** | CO1 | Explain the Threats in networks and provide Authentication to real time problems. |
| | CO2 | Identify and investigate in-depth both early and contemporary threats to wireless networks security |
| | CO3 | Ability to analyze and determine for any organization the database security requirements and appropriate solutions |
| | CO4 | Determined IP Security Issues and solve real time problems. |
| | CO5 | Build wireless Development Strategies in real time issues |
| **ETHICAL HACKING** | CO1 | Explain the concepts related to hacking, ports and protocols, pen testing and virtualization |
| | CO2 | Determine the applicable foot printing techniques and scanning methods |
| | CO3 | Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures |
| | CO4 | Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks |
| | CO5 | Determine the applicable methods of cryptography, stenography and Vulnerability Assessment |
| **API AND MICROSERVICES** | CO1 | Develop a Spring Data JPA application with Spring Boot |
| | CO2 | Implement CRUD operations using Spring Data JPA |
| | CO3 | Implement pagination and sorting mechanism using Spring Data JPA |
| | CO4 | Implement query methods for querying the database using Spring Data JPA |
| | CO5 | Implement a custom repository to customize a querying mechanism using Spring Data JPA |
| | CO6 | Understand update operation using query approaches in Spring Data JPA |
| | CO7 | Implement Spring Transaction using Spring Data JPA |
| | CO8 | Develop RESTful endpoints using Spring REST Processing URI parameters |

| | CO9 | Write RESTful services using Spring REST that consumes and produces data in different formats |
|---|---|---|
| | CO10 | Handle exceptions and errors in Spring REST endpoints |
| | CO11 | Write Spring based REST clients to consume RESTful services programmatically |
| | CO12 | Create secure RESTful endpoints using Spring Security Document and version the Spring REST endpoints Implement CORS in a Spring REST application |
| SECURE CODING TECHNIQUES | CO1 | Differentiate the objectives of information security |
| | CO2 | Understand the trend, reasons and impact of the recent Cyber attacks |
| | CO3 | Understand OWASP design principles while designing a web application |
| | CO4 | Understand Threat modelling |
| | CO5 | Importance of security in all phases of SDLC |
| | CO6 | Write secure coding using some of the practices in C/C++/Java and Python programming languages |
| UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMON | CO1 | By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. This is only an introductory foundational input. It would be desirable to follow it up by a) faculty-student or mentor-mentee programs throughout their time with the institution b) Higher level courses on human values in every aspect of living. E.g. as a professional |
| PYTHON: DEEP LEARNING | CO1 | Demonstrate the basic concepts fundamental learning techniques and layers. |
| | CO2 | Discuss the Neural Network training, various random models. |
| | CO3 | Apply various optimization algorithms to comprehend different activation |
| | CO4 | functions to understand hyper parameter tuning |

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| | CO5 | Build a convolutional neural network, and understand its application to build a |
| | CO6 | recurrent neural network, and understand its usage to comprehend auto encoders to briefly explain transfer learning |
| **MEAN STACK TECHNOLOGIES- MODULE II- ANGULAR JS, MONGODB** | CO1 | Build a component-based application using Angular components and enhance their functionality using directives |
| | CO2 | Utilize data binding for developing Angular forms and bind them with model data. |
| | CO3 | Apply Angular built-in or custom pipes to format the rendered data. |
| | CO4 | Develop a single page application by using synchronous or asynchronous Angular routing. |
| | CO5 | Make use of MongoDB queries to perform CRUD operations on document database. |
| **Subject: SOFTWARE ENGINEERING** | CO1 | Ability to transform an Object-Oriented Design into high quality, executable code |
| | CO2 | Skills to design, implement, and execute test cases at the Unit and Integration level |
| | CO3 | Compare conventional and agile software methods |
| | CO4 | Prepare SRS document, design document, test cases and software configuration management and risk management related document. |
| | CO5 | Develop function oriented and object oriented software design using tools like rational rose. |
| | CO6 | Use modern engineering tools necessary for software project management, estimations, time management and software reuse |
| | CO7 | Generate test cases for software testing |
| **COMPUTATIONAL THINKING** | CO1 | Describe the skills that are involved in computational thinking |
| | CO2 | Demonstrate the concepts of Boolean Logic and Software Development. |
| | CO3 | Analyze the concepts of algorithmic thinking as modeling and abstraction as encapsulation. |
| | CO4 | Illustrate the distinctive nature of data organization, White box and Black box testing |
| | CO5 | Student will be aware of a range of applications of computational thinking in different disciplines, Authentication and authorization. |
| **OBJECT ORIENTED PROGRAMMING** | CO1 | Evaluate default value of all primitive data type, Operations, Expressions, Control- flow, Strings |

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| THROUGH JAVA | CO2 | Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism |
| | CO3 | Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism |
| | CO4 | Construct Threads, Event Handling, implement packages, developing applets |
| DATA ANALYTICS USING PYTHON | CO1 | Understand various file formats in loading and storage of data. |
| | CO2 | Understand NumPy and Pandas |
| ARTIFICIAL INTELLIGENCE | CO1 | Understand the fundamental concepts in Artificial Intelligence |
| | CO2 | Analyze the applications of search strategies and problem reductions |
| | CO3 | Apply the mathematical logic concepts. |
| | CO4 | Develop the Knowledge representations in Artificial Intelligence. |
| | CO5 | Explain the Fuzzy logic systems. |
| UNIX AND SHELL PROGRAMMING | CO1 | Gain good knowledge on Unix commands and awareness of shell programming |
| | CO2 | Know about different system calls for files and directories |
| | CO3 | Ability to know the working of processes and signals |
| | CO4 | Application of client server program for IPC |
| | CO5 | Knowledge about socket programming |
| CLOUD COMPUTING | CO1 | Illustrate the key dimensions of the challenge of Cloud Computing |
| | CO2 | Classify the Levels of Virtualization and mechanism of tools. |
| | CO3 | Analyze Cloud infrastructure including Google Cloud and Amazon Cloud |
| | CO4 | Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud |
| | CO5 | Assess control storage systems and cloud security, the risks involved its impact and develop cloud application |

**B.tech 8th Sem**

| Course Name | | Course Outcomes |
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| **MATHEMATICS FOR MACHINE LEARNING (AI & ML)** | CO1 | understand the basic notions of machine learning and of the related basic mathematical tools; |
| | CO2 | comprehend the basic concepts and techniques of convex optimization |
| | CO3 | have a good knowledge of the statistical and computational properties of some well known machine learning algorithms; |
| | CO4 | implement machine learning algorithms on synthetic and real data sets using mathematical concepts like linear algebra, probability and calculus |
| **TEXT MINING AND TIME SERIES ANALYSIS (AI & ML)** | CO1 | Student will be aware of fundamental concepts of text mining, unsupervised information extraction. |
| | CO2 | Student will be aware of text clustering algorithms like feature selection, distance-based clustering and latent semantic indexing. |
| | CO3 | Student will be aware of Text classification algorithm and text mining techniques. |
| | CO4 | Student should aware of all the characteristics of time series and measures of dependencies. |
| | CO5 | Student will be able to understand the ARIMA Models. |
| **NATURAL LANGUAGE PROCESSING (AI & ML)** | CO1 | Demonstrate a given text with basic Language features |
| | CO2 | To design an innovative application using NLP components |
| | CO3 | Explain a rule based system to tackle morphology/syntax of a language |
| | CO4 | To design a tag set to be used for statistical processing for real-time applications |
| | CO5 | To compare and contrast the use of different statistical approaches for different types of NLP applications. |
| **REINFORCEMENT LEARNING (AI & ML)** | CO1 | Learn how to define RL problems like Tic-Tac-Toe, Multi-arm. |
| | CO2 | Student will be able to understand the finite markov decision processes. |
| | CO3 | Student will be to Understand Monte Carlo Methods and how it is work with tabular methods to solve classical control problems |
| | CO4 | Student should aware of Eligibility Traces and Understand how to find with approximate solutions. |

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| | CO5 | Explore imitation learning tasks and solutions |
| | CO6 | Recognize current advanced techniques and applications in RL |
| **INTERNET OF THINGS (Systems Engineering)** | CO1 | Explain in a concise manner how the general Internet as well as Internet of Things work. |
| | CO2 | Understand constraints and opportunities of wireless and mobile networks for Internet of Things. |
| | CO3 | Use basic sensing and measurement and tools to determine the real-time performance of network of devices. |
| | CO4 | Develop prototype models for various applications using IoT technology. |
| **DATA COMMUNICATIONS AND INFORMATION CODING THEORY** | CO1 | Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them. |
| | CO2 | Describe the real life applications based on the fundamental theory. |
| | CO3 | Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and so on |
| | CO4 | Implement the encoder and decoder of one block code or convolutional code using any program language |
| **SERVICE ORIENTED ARCHITECTURES** | CO1 | Get the foundations and concepts of service based computing |
| | CO2 | Advocate the importance and means of technology alignment with business |
| | CO3 | Understanding the basic operational model of web services, |
| | CO4 | Gain the knowledge of key technologies in the service oriented computing arena |
| | CO5 | Apply and practice the learning through a real or illustrative project/case study. |
| **DESIGN OF SECURE PROTOCOLS** | CO1 | Get the exposure to various protocols. |
| | CO2 | Gain knowledge on various secure mechanisms through set of protocols. |
| | CO3 | Efficiently design new set of protocols |
| | CO4 | Learn Security issues and overcome means with protocols. |
| **NETWORK CODING (Systems Engineering)** | CO1 | Explain the client-server paradigm and socket structures. |
| | CO2 | Describe the basic concepts of TCP sockets and |

| | | TCP echo client-server programs. |
|---|---|---|
| | CO3 | Discuss the UDP sockets and UDP echo client-server programs |
| | CO4 | Explain Socket options and ability to understand IPC |
| | CO5 | Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc. |
| **PRINCIPLES OF CYBER SECURITY (Information Security)** | CO1 | Apply cyber security architecture principles |
| | CO2 | Demonstrate the risk management processes and practices. |
| | CO3 | Appraise cyber security incidents to apply appropriate response |
| | CO4 | Distinguish system and application security threats and vulnerabilities. |
| | CO5 | Identify security tools and hardening techniques |
| **COMPUTATIONAL NUMBER THEORY** | CO1 | understand with basics of number theory and its applications. |
| | CO2 | demonstrate the arithmetic of finite fields, polynomials. |
| | CO3 | analyze the elliptic curves, testing and factorization. |
| | CO4 | Student will be able to solve the discrete logarithms and large sparse linear systems. |
| | CO5 | Student will be able to apply the skills for writing programs of cryptography algorithms. |
| CRYPTANALYSIS (Information Security) | CO1 | Understand the cryptanalysis of classic ciphers, stream ciphers and block ciphers |
| | CO2 | Understand the cryptanalysis of public key attacks |
| **ELLIPTIC CURVE CRYPTOGRAPHY** | CO1 | Understands Finite Field Arithmetic and Elliptic Curve Arithmetic |
| | CO2 | Survey the attacks and validates the domain parameters and keypairs. |
| **INTRODUCTION TO QUANTUM COMPUTING AND QUANTUM CRYPTOGRAPHY** | CO1 | Analyze complex vector space for quantum computing |
| | CO2 | Understand QKD algorithms |
| **PUBLIC KEY INFRASTRUCTURE AND TRUST MANAGEMENT** | CO1 | In depth understanding of Public key cryptography and Infrastructure. |
| | CO2 | Ability to design and analyze Public Key cryptographic techniques. |
| | CO3 | Ability to solve network security issues in real |

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| | | time applications. |
| | CO4 | Ability to take up doctoral level research work in security. |
| **INFORMATION SECURITY ANALYSIS AND AUDIT** | CO1 | Illustrate the fundamental concepts of information security and systems auditing |
| | CO2 | Analyze the latest trend of computer security threats and defense |
| | CO3 | Identify security weaknesses in information systems, and rectify them with appropriate security mechanisms |
| | CO4 | Explain the security controls in the aspects of physical, logical and operational security control and case studies |
| | CO5 | Evaluate the security of information systems |
| **CLOUD AND IOT SECURITY** | CO1 | Discuss about Security Requirements in IoT Architecture |
| | CO2 | Explain Random number generation |
| | CO3 | Demonstrate Authorization with Publish / Subscribe schemes |
| | CO4 | Identify Lightweight and robust schemes for Privacy protection |
| | CO5 | Explain about IoT cloud security architecture |
| **WEB SECURITY** | CO1 | Demonstrate security concepts, security professional roles, and security resources in the context of systems and security development life cycle |
| | CO2 | Justify applicable laws, legal issues and ethical issues regarding computer crime |
| | CO3 | Explain the business need for security, threats, attacks, top ten security vulnerabilities, and secure software development |
| | CO4 | Apply information security policies, standards and practices, the information security blueprint |
| | CO5 | Analyze and describe security requirements for typical web application scenario |
| **BLOCK CHAIN ARCHITECTURE DESIGN AND USE CASES** | CO1 | Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding |
| | CO2 | Identify the risks involved in building Block chain applications. |
| | CO3 | Review of legal implications using smart contracts. |

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|---|---|---|
| | CO4 | Choose the present landscape of Block chain implementations and Understand Crypto currency markets |
| | CO5 | Examine how to profit from trading crypto currencies. |
| **DATA VISUALIZATION** | CO1 | Identify and recognize visual perception and representation of data. |
| | CO2 | Illustrate about projections of different views of objects. |
| | CO3 | Apply various Interaction and visualization techniques. |
| | CO4 | Analyze various groups for visualization |
| | CO5 | Evaluate visualizations |
| **STATISTICAL FOUNDATIONS FOR DATA SCIENCE** | CO1 | Use the statistical concepts in the field of data science. |
| | CO2 | Employ the techniques and methods related to the area of data science in variety of applications. |
| | CO3 | Apply logical thinking to understand and solve the problem in context. |
| | CO4 | Explore statistical learning methods and their application to modern problems in science, industry, and society |
| | CO5 | Build analytics pipelines for regression problems and classification problems |
| **MINING MASSIVE DATA SETS** | CO1 | Discuss research directions in Mining Massive Datasets, such as similarity search, streaming data, clustering, and graph mining. |
| | CO2 | Analyze policy, focusing on methods for mining massive datasets and potential policy and management applications, by synthesizing and summarizing the current state of the art, and facilitating discussion by posing questions, preliminary conclusions, and ideas to explore. |
| | CO3 | Develop a research project relevant to Mining Massive Datasets and produce a report describing the project's background, methods, results, and conclusions. |
| | CO4 | Knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program. |
| | CO5 | Good knowledge of Java and Python will be extremely helpful since most assignments will require the use of Spark |
| **MEDICAL IMAGE DATA** | CO1 | Student will be able to explain the basic concepts |

| PROCESSING | | of Medical Imaging Technologies, Systems and Formation Principles. |
|---|---|---|
| | CO2 | Student will be able to analyze the Medical Image Storage and Processing. |
| | CO3 | Student will be able to visualize the MRI, NMR and Artifacts. |
| | CO4 | Student should expertise the Segmentation and Classification techniques on Medical Image Data. |
| | CO5 | Student will be able to analyze the Nuclear Imaging like PET, SPECT and 3D Images. |

# DEPARTMENT OF ECE Courses Outcomes(R20)

## ECE Courses Outcomes

| Course Name | | Course Outcomes |
|---|---|---|
| **COMMUNICATIVE ENGLISH** | CO1 | understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information . |
| | CO2 | ask and answer general questions on familiar topics and introduce oneself/others |
| | CO3 | employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information |
| | CO4 | . recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs |
| | CO5 | form sentences using proper grammatical structures and correct word forms.SSS |
| **MATHEMATICS-I** | CO1 | Utilize mean value theorems to real life problems (L3) |
| | CO2 | Solve the differential equations related to various engineering fields (L3) |
| | CO3 | Familiarize with functions of several variables which is useful in optimization |
| | CO4 | Apply double integration techniques in evaluating areas bounded by region |
| | CO5 | Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5 |
| **APPLIED CHEMISTRY** | CO1 | synthesize nanomaterials for modern advances of engineering technology. |
| | CO2 | Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors. |
| | | |
| **PROGRAMMING FOR PROBLEM SOLVING USING C** | CO1 | To write algorithms and to draw flowcharts for solvingproblems . |
| | CO2 | To apply File/Operation's. |

The heading above the table reads **B.Tech1ˢᵗSem**.

| | CO3 | To convert flowcharts/algorithms to C Programs, compile anddebugprograms |
|---|---|---|
| | CO4 | To use different operators, data types and write programs that use two-way/ multi- way selection |
| | CO5 | To select the best loop construct for agivenproblem |
| **ENGINEERING DRAWING** | CO6 | To design and implement programs to analyze the differentpointerapplications |
| | CO1 | The student will learn how to visualize 2D & 3D objects. |
| | | |
| **APPLIED CHEMISTRY LAB** | CO1 | The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills. |
| **PROGRAMMING FOR PROBLEM SOLVING USING C** | | |
| **PROGRAMMING FOR PROBLEM SOLVING USING C** | CO1 | Gains Knowledge on various concepts of a language debug program |
| | CO2 | Able to draw flowcharts andwritealgorithms. |
| | CO3 | Able design and development of C problemsolvingskills. |
| | CO4 | Able to design and develop modular programmingskills |
| | CO5 | Able to trace and debug program |

| B.Tech 2nd Sem | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **MATHEMATICS-II** | CO1 | develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) |
| | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel |
| | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5) |
| | CO4 | apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) |
| | CO5 | apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3) |
| | CO6 | apply numerical integral techniques to different Engineering problems (L3) |
| **APPLIED PHYSICS** | CO1 | plain the need of coherent sources and the conditions for sustained interference(L2) ¬ Identify engineering applications of interference(L3) ¬ Analyze the differences between interference and diffraction with applications(L4) ¬ Illustrate the concept of polarization of light and its applications(L2) ¬ Classify ordinary polarized light and extraordinary polarized light(L2) |
| | CO2 | understand the basic concepts of LASER light Sources(L2) ¬ Apply the concepts to learn the types of lasers(L3) ¬ Identifies the Engineering applications of lasers(L2) ¬ Explain the working principle of optical fibers(L2) ¬ Classify optical fibers based on refractive index profile and mode of propagation(L2) ¬ Identify the applications of optical fibers in various fields(L2) |
| | CO3 | Explain the concept of dual nature of matter(L2) ¬ Understand the significance of wave function(L2) ¬ Interpret the concepts of classical and quantum free electron theories(L2) ¬ Explain the importance of K-P model ¬ Classify the materials based on band theory(L2) ¬ Apply the concept of effective mass of electron(L3) |
| | CO4 | Explain the concept of dielectric constant and polarization in dielectric materials(L2) ¬ Summarize various types of polarization of |

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| | | dielectrics(L2) ¬ Interpret Lorentz field and Clausius- Mosti relation in dielectrics(L2) ¬ Classify the magnetic materials based on susceptibility and their temperature dependence (L2) ¬ Explain the applications of dielectric and magnetic materials(L2) ¬ Apply the concept of magnetism to magnetic data storage devices(L3) |
| | CO5 | assify the energy bands of semiconductors(L2) ¬ Interpret the direct and indirect band gap semiconductors(L2) ¬ Identify the type of semiconductor using Hall effect(L2) ¬ Identify applications of semiconductors in electronic devices(L2) ¬ Classify superconductors based on Meissner's effect(L2) ¬ Explain Meissner's effect, BCS theory & Josephson effect in superconductors(L2) |
| OBJECT ORIENTED PROGRAMMING THROUGH JAVA | CO1 | Show competence in the use of the Java programming language in the development of small to medium- sized application programs that demonstrate professionally acceptable coding and performance standard . |
| | CO2 | Illustrate the basic principles of the object-oriented programming |
| | CO3 | Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming. |
| NETWORK ANALYSIS | CO1 | gain the knowledge on basic networkelements. will analyze the RLC circuits behavior in detailed. analyze the performance of periodicwaveforms. gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h&g). analyze the filter design concepts in real world applications. |
| | CO2 | will analyze the RLC circuits behavior in detailed |
| | CO3 | analyze the performance of periodic waveforms |
| | CO4 | gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h&g |
| | CO5 | analyze the filter design concepts in real world applications. |
| BASIC ELECTRICAL ENGINEERING | CO1 | Able to explain the operation of DC generator and analyze the characteristics of DC generator. |
| | CO2 | Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DC motors |

| | CO3 | Ability to analyze the performance and speed – torque characteristics of a3- phase induction motor and understand starting methods of 3- phase induction motor |
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| | CO4 | Able to explain the operation of Synchronous Machines |
| | CO5 | Capability to understand the operation of various special machines |
| **BASIC ELECTRICAL ENGINEERING LAB** | CO1 | Determine and predetermine the performance of DC machine sand transformers. |
| | CO2 | Control the DC shunt machines. |
| | CO3 | Compute the performance of1-phasetransformer |
| | CO4 | Perform tests on 3-phase induction motor and alternator to determine their performance characteristics. |
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| **ENVIRONMENTAL SCIENCE** | CO1 | The student will learn how to visualize 2D & 3D objects. |
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| B.Tech3rdSem | | |
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| **Course Name** | | **Course Outcomes** |
| **ELECTRONIC DEVICES AND CIRCUITSSS** | CO1 | Applythebasicconceptsof semiconductor physics. Understandthe formationofp-n |
| | CO2 | . Understandthe formationofp-injunctionhowitcanbeuse asap |
| | CO3 | injunctions diodeindifferentmodes of operation. |
| | CO4 | Knowtheconstruction,workingprincipleofrectifierswith andwithoutfilterswi relevant expressions and necessary comparisons. |
| | CO5 | Understandtheconstruction,principleofoperationoftran |

| | | sistors,BJTandFETwiththe irV-Icharacteristicsindifferentconfigurations |
|---|---|---|
| **SWITCHING THEORYAND LOGIC D** | CO6 | Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions |
| | CO7 | Performtheanalysisofsmallsignallowfrequencytransist oramplifiercircuitsusingBJ Tand FET indifferent configurations Design of encoder, decoder ,multiplex eranddemultip |
| | CO1 | .Classify different number systems and apply to generatevariouscodes.. |
| | CO2 | Use the concept of Boolean algebra in minimization ofswitchingfunctions |
| | CO3 | Design different types of combinationallogiccircuits |
| | CO4 | Apply knowledge of flip-flops in designing of Registersandcounters |
| | CO5 | The operation and design methodology for synchronous sequential circuits and algorithmic state machines. |
| **RANDOM VARIABLES AND STOCHASTIC PROCESSES** | CO1 | Mathematically model her and Om phenomena and solve simple probabilistic problems. |
| | CO2 | Identify different types of random variables and compute statistical averages of the Sarandon variables. |
| | CO3 | Analyze the LTI systems with random inputs. |
| | | |
| SIGNALS AND SYSTEMS | CO1 | . Differentiate the various classifications of signals and systems |
| | CO2 | Analyze the frequency domain representation of signals using Fourier concepts |
| | CO3 | Classify the systems based on their properties and determine the response of LTISystems.<br>. Know the sampling process and various types of sampling techniques |
| | CO4 | Apply Laplace and z-transforms to analyze signals and Systems (continuous discrete). |
| | CO5 | |
| | CO1 | Interpret the physical meaning of different operators such as gradient, curl and divergence (L5) |

| MATHEMATICS-III | CO2 | Estimate the work done against a field, circulation and flux using vector calculus (L5 |
| | CO3 | Apply the Laplace transform for solving differential equations (L3 |
| | CO4 | Kneadable to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3) |
| | CO5 | Identify solution methods for partial differential equations that model physical processes (L3). |

| PYTHON LAB (SKILL ORIENTED COURSE) | CO1 | CO1: Know comprehensions, generators in python. |
| | CO2 | Know exception handling inpython |
| | CO3 | Know file I/O |
| | CO4 | Understand various data types like lists, tuples, strings |
| | CO5 | Know the usage of various pre-defined functions on the above data types |

| B.Tech4thSem | | |
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| **Course Name** | | **Course Outcomes** |
| ELECTRONIC CIRCUIT ANALYSISSSS | CO1 | Design and analysis ofsmall signal high frequency transistor amplifier using BJT and FET. |
| | CO2 | Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT |
| | CO3 | Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept. |
| | CO4 | Know the classification of the power and tuned amplifiers and their analysis with performance comparison |
| | CO5 | |
| DIGITAL IC DESIGN | CO1 | Understand the structure of commercially available digital integrated circuit families. |
| | CO2 | Learn the IEEE Standard 1076 Hardware Description Language (VHDL). |
| | CO3 | Model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping. |
| | CO4 | Analyze and design basic digital circuits with |

| | | combinatorial and sequential logic circuits using VHDL. |
|---|---|---|
| | CO5 | |
| **ANALOG COMMUNICATIONS** | CO1 | Differentiate various Analog modulation and demodulation schemes and their spectral characteristics . |
| | CO2 | Analyze noise characteristics of various analog modulation methods |
| | CO3 | Analyze various functional blocks of radiotransmitters and receivers |
| | CO4 | Design simple analog systems for various modulation techniques. |
| | | |
| **LINEAR CONTROL SYSTEMS** | CO1 | This course introduces the concepts of feedback and its advantages to various control systems |
| | CO2 | The performance metrics to design the control system intime-domain and frequency domain are introduced. |
| | CO3 | Controlsystems for various applications can be designed using time-domain and frequency domain analysis |
| | CO4 | In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced. |
| | | |
| **MANAGEMENT AND ORGANISATIONAL BEHAVIOUR** | CO1 | After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure. |
| | CO2 | Will familiarize with the concepts of functional management that is HR Mand Marketing of new product developments. |
| | CO3 | The learner sable to think in strategically through contemporary management practices. |
| | CO4 | The learner can develop positive attitude through personality development and can equip with motivational theories. |
| | CO5 | . The student can attain the group performance and grievance handling in managing the organizational culture. |
| **SOFT SKILLS (SKILL ORIENTED COURSE)** | CO1 | At the end of the Course, the Student will be able to: CO1 Use language fluently, accurately and appropriately in debates and group discussions CO2 Use their skills of listening comprehension to communicate effectively in cross-cultural contexts. CO3 Learn and use new vocabulary. CO 4 Write |

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| | | resumes, project reports and reviews. CO5 Exhibit interview skills and develop soft skills. |
| | CO2 | 1. Group Discussion–dynamics of group discussion, Lateral thinking, Brain storming. |
| | CO3 | Interview Skills– concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing. |
| | CO4 | Meetings-making meeting effective, chairing a meeting, decision making, seeking opinions, interrupting and handling interruptions, clarifications, closure, Negotiation skills. |
| | CO5 | Listening comprehension – Achieving ability to comprehend material delivered at relatively fastspeed; comprehending spoken material in Standard Indian English, British English, and American English. |
| | CO6 | Cross-Cultural Communication / Non-Verbal Communication, Problems of Language, Lack of Language equivalency/ difficulties in using English. |
| | CO7 | Vocabulary building, Creativity in using Advertisements, Case Studies etc. |
| | CO8 | Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking. |
| | CO9 | Resume writing –structure and presentation, planning, defining the career objective |
| | C10 | Writing Skills–Letter writing, Email etiquette; Essays for competitive examinations, Analyzing news paper articles. 1 Technical Report Writing/Project Proposals–Types of format |

| B.Tech5thSem | | |
|---|---|---|
| **Course Name** | | **Course Outcomes** |
| **ANALOG ICS AND APPLICATIONS** | CO1 | Describe the Op-Amp and internal Circuitry: 555 Timer, PLL . |
| | CO2 | Discuss the Applications of Operational amplifier: 555 Timer, PLL |
| | CO3 | Design the Active filters using Operational Amplified |
| | CO4 | Use the Op-Amp in A to D & D to A Converters |
| | CO5 | |
| **ELECTROMAGNETIC WAVES AND TRANSMISSION LINES** | CO1 | Determine E and H using various laws and applications of electric & magnetic fields . |
| | CO2 | Apply the Maxwell equations to analyze the time varying behavior of EM waves. |

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|---|---|---|---|
| | CO3 | Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media. | |
| | CO4 | Calculate Brewster angle, critical angle and total internal reflection | |
| | CO5 | Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart. | |
| DIGITAL COMMUNICATIONS | CO1 | Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system. | |
| | CO2 | Analyze various source coding techniques. | |
| | CO3 | . Compute and analyze Block codes, cyclic codes and convolution codes | |
| | CO4 | Design a coded communication system. | |
| | | | |
| ANTENNA AND WAVE PROPAGATION (PE1) | CO1 | Identify basic antenna parameters. | |
| | CO2 | Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas | |
| | CO3 | Quantify the fields radiated by various types of antennas | |
| | CO4 | Design and analyze antenna arrays | |
| | CO5 | . Analyze antenna measurements to assess antenna's performance | |
| | CO6 | Identify the characteristics of radio wave propagation | |
| ELECTRONIC MEASUREMENTS AND INSTRUMENTATION | CO1 | Select the instrument to be used based on the requirements. | |
| | CO2 | Understand and analyze different signal generators and analyzers. | |
| | CO3 | . Understand the design of oscilloscopes for different applications. | |
| | CO4 | Design different transducers for measurement of different parameters | |
| | | | |
| COMPUTER ARCHITECTURE & | CO1 | Students can understand the architecture of modern computer. | |

| ORGANIZATION | CO2 | They can analyze the Performance of a computer using performance equation |
| | CO3 | Understanding of different instruction types. |
| | CO4 | . Students can calculate the effective address of an operand by addressing modes |
| | CO5 | They can understand how computer stores positive and negative numbers |
| | CO6 | Understand the concepts of I/O Organization and Memory systems. |

| B.Tech6<sup>th</sup>Sem | | |
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| **Course Name** | **Course Outcomes** | |
| **MICROPROCESSOR AND MICROCONTROLLERSS S** | CO1 | Understand the architecture of microprocessor/ microcontroller and their operation. |
| | CO2 | Demonstrate programming skills in assembly language for processors and Controllers. |
| | CO3 | Analyze various interfacing techniques and apply them for the design of processor / Controller based systems. |
| | | |
| **VLSI DESIGN** | CO1 | Demonstrate a clear understanding of CMOS fabrication flow and technology scaling. 2. Apply the design Rules and draw layout of a given logic circuit. 3. Design basic building blocks in Analog IC design. 4. Analyze the behavior of amplifier circuits with various loads. 5. Design various CMOS logic circuits for design of Combinational logic circuits. 6. Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS. 7. Design various applications using FPGA. |
| | CO2 | . Apply the design Rules and draw layout of a given logic circuit |

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| | CO3 | Design basic building blocks in Analog IC design |
| | CO4 | Analyze the behavior of amplifier circuits with various loads. |
| | CO5 | . Design various CMOS logic circuits for design of Combinational logic circuits |
| | CO6 | Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS. |
| | CO7 | Design various applications using FPGA. |
| DIGITAL SIGNAL PROCESSING | CO1 | Apply the difference equations concept in the analysis of Discrete time systems . |
| | CO2 | Use the FFT algorithm for solving the DFT of a given signal. |
| | CO3 | . Design a Digital filter (FIR&IIR) from the given specifications. |
| | CO4 | . Realize the FIR and IIR structures from the designed digital filter. |
| | CO5 | Use the Multidate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems. |
| | CO6 | Apply the signal processing concepts on DSP Processor. |
| MICROWAVE ENGINEERING | CO1 | Design different modes in waveguide structures . |
| | CO2 | Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction. |
| | CO3 | Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices. |
| | CO4 | . Measure various microwave parameters using a Microwave test bench |
| | | |
| MOBILE & CELLULAR COMMUNICATION | CO1 | Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems. |
| | CO2 | Understand the frequency management, channel assignment strategies and antennas in cellular systems |
| | CO3 | Understand the frequency management, channel assignment strategies and antennas in cellular systems |
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| EMBEDDED SYSTEMS | CO1 | . Understand the basic concepts of an embedded |

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| | | system and able to know an embedded system design approach to perform a specific function. |
| | CO2 | The hardware components required for an embedded system and the design approach of an embedded hardware. |
| | CO3 | The various embedded firmware design approaches on embedded environment. |
| | CO4 | . Understand how to integrate hardware and firmware of an embedded system using real time operating system. |
| | | |
| CMOS ANALOG IC DESIGN | CO1 | Design MOSFET based analog integrated circuits. |
| | CO2 | Analyze analog circuits at least to the first order |
| | CO3 | Appreciate the trade-offs involved in analog integrated circuit design. |
| | CO4 | . Understand and appreciate the importance of noise and distortion in analog circuits |
| | CO5 | Analyze complex engineering problems critically in the domain of analog IC design for conducting research |
| ARM BASED/ AURDINO BASED PROGRAMMING | CO1 | Comprehend Microcontroller-Transducers Interface techniques . |
| | CO2 | Establish Serial Communication link with Arduino |
| | CO3 | Analyze basics of SPI interface |
| | CO4 | Interface Stepper Motor with Arduino |
| | CO5 | Analyze Accelerometer interface techniques |

| B.Tech 7th Sem | | |
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| **Course Name** | | **Course Outcomes** |
| OPTICAL COMMUNICATIONS | CO1 | Choose necessary components required in modern optical communications systems . |
| | CO2 | . Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers. |
| | CO3 | Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems. |

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| | CO4 | Choose the optical cables for better communication with minimum losses |
| | CO5 | Design, build, and demonstrate optical fiber experiments in the laboratory. |
| **DIGITAL IMAGE PROCESSING** | CO1 | Perform image manipulations and different digital image processing techniques . |
| | CO2 | Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image |
| | CO3 | transforms and restoration techniques on image. 3. Analyze pseudo and full color image processing techniques. |
| | CO4 | Apply various morphological operators on images. |
| | | |
| **LOW POWER VLSI DESIGN** | CO1 | Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon Technologies.. |
| | CO2 | . Students able to understand deep submicron CMOS technology and digital CMOS design styles. |
| | CO3 | To design chips used for battery-powered systems and high performance circuits. |
| | CO4 | Learn the design of various CMOS dynamic logic circuits. |
| | CO5 | Learn the design techniques low voltage and low power CMOS circuits for various applications. |
| | CO6 | Learn the different types of memory circuits and their design. |
| **SATELLITE COMMUNICATION** | CO1 | Understand the concepts, applications and subsystems of Satellite communications. |
| | CO2 | Derive the expression for G/T ratio and to solve some analytical problems on satellite link design. |
| | CO3 | Understand the various types of multiple access techniques and architecture of earth station design. |
| | CO4 | Understand the concepts of GPS and its architecture. |
| | | |
| **SOFT COMPUTING TECHNIQUES** | CO1 | Develop intelligent systems leveraging the paradigm of soft computing techniques. |
| | CO2 | Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions. |
| | CO3 | . Recognize the feasibility of applying a soft |

| | | computing methodology for a particular problem |
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| | CO4 | Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks |
| | CO5 | Design hybrid system to revise the principles of soft computing in various application |
| **DIGITAL IC DESIGN USING CMOS** | CO1 | Understand the concepts of MOS Design.. |
| | CO2 | Design and analysis of Combinational and Sequential MOS Circuits. |
| | CO3 | Extend the Digital IC Design to Different Applications. |
| | CO4 | . Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization. |
| | | |
| **RADAR ENGINEERING** | CO1 | Derive the radar range equation and to solve some analytical problems. the various components of radar receiver and its performance. |
| | CO2 | Understand the different types of radars and its applications. |
| | CO3 | Understand the concept of tracking and different tracking techniques |
| | CO4 | Understand the various components of radar receiver and its performance. |
| | | |
| **PATTERN RECOGNITION & MACHINE LEARNING** | CO1 | Study the parametric and linear models for classification |
| | CO2 | Design neural network and SVM for classification. |
| | CO3 | Develop machine independent and unsupervised learning techniques. |
| | | |
| **INTERNET OF THINGS** | CO1 | Understand internet of Things and its hardware and software components. |
| | CO2 | Interface I/O devices, sensors & communication modules. |
| | CO3 | Remotely monitor data and control devices. |
| | CO4 | Design real time IoT based applications |
| | | |
| **BASICS OF SIGNALS AND SYSTEMS** | CO1 | . Understand linear time invariant systems. |
| | CO2 | Apply the concepts of Fourier series |

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| | | representations to analyze continuous and discrete time periodic signals. |
| | CO3 | . Understand and apply the continuous time Fourier transform, discrete time Fourier transform |
| | CO4 | Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems |
| | | |
| **ELECTRONIC MEASUREMENTS AND INSTRUMENTATION** | CO1 | . Select the instrument to be used based on the requirements. |
| | CO2 | . Understand and analyze different signal generators and analyzers |
| | CO3 | Understand the design of oscilloscopes for different applications. |
| | CO4 | Design different transducers for measurement of different parameters. |
| | | |
| **PRINCIPLES OF SIGNAL PROCESSING** | CO1 | Use the FFT algorithm for solving the DFT of a given signal . |
| | CO2 | Design a Digital filter (FIR&IIR) from the given specifications. |
| | CO3 | Realize the FIR and IIR structures from the designed digital filter. |
| | CO4 | Use the Multidate Processing concepts in various applications. |
| | CO5 | Apply the Adaptive signal processing concepts to various signal processing applications. |
| **INDUSTRIAL ELECTRONICS** | CO1 | . Understand the concept of DC amplifiers. |
| | CO2 | Analyze and design different voltage regulators for real time applications. |
| | CO3 | Describe the basis of SCR and Thyristor. |
| | CO4 | Determine the performance of DIAC and TRIAC . |
| | CO5 | Develop real time application using electronics. |
| **CONSUMER ELECTRONICS** | CO1 | Understand the various type of microphones and loud speakers. |
| | CO2 | . To identify the various digital and analog signal. |
| | CO3 | . Describe the basis of television and composite video signal. |
| | CO4 | . Describe the various kind of color TV standards and system. |
| | CO5 | . Understand the various type of consumer goods. |

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| **FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS** | CO1 | . Understand the architecture of microprocessor/microcontroller and their operation. |
| | CO2 | Demonstrate programming skills in assembly language for processors and controllers. |
| | CO3 | . Analyze various interfacing techniques and apply them for the design of processor/Controller based systems. |
| | | |
| **TRANSDUCERS AND SENSORS** | CO1 | . Use concepts in common methods for converting a physical parameter into an electrical quantity |
| | CO2 | Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light. |
| | CO3 | Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc.. |
| | CO4 | . Predict correctly the expected performance of various sensors. |
| | CO5 | Locate different type of sensors used in real life applications and paraphrase their importance. |
| | CO6 | Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers. |
| | CO7 | develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system. |
| **IOT AND APPLICATIONS** | CO1 | Understand internet of Things and its hardware and software components. |
| | CO2 | . Interface I/O devices, sensors & communication modules. |
| | CO3 | Remotely monitor data and control devices. |
| | CO4 | . Design real time IoT based applications |
| | | |
| **SOFT COMPUTING TECHNIQUES** | CO1 | Develop intelligent systems leveraging the paradigm of soft computing techniques. |
| | CO2 | Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions. |
| | CO3 | . Recognize the feasibility of applying a soft |

| | | computing methodology for a particular problem. |
|---|---|---|
| | CO4 | . Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks. |
| | CO5 | Design hybrid system to revise the principles of soft computing in various application. |
| IC APPLICATIONS | CO1 | Analyze the Differential Amplifier with Discrete components |
| | CO2 | Describe the Op-Amp and internal Circuitry: .555 Timer, PLL. |
| | CO3 | Discuss the Applications of Operational amplifier: 555 Timer, PLL. |
| | CO4 | Design the digital application using digital ICs. |
| | CO5 | Use the Op-Amp in A to D & D to A Converters. |
| PRINCIPLES OF COMMUNICATIONS | CO1 | . Analyze the performance of analog modulation schemes in time and frequency domains. |
| | CO2 | . Analyze the performance of angle modulated signals. |
| | CO3 | Characterize analog signals in time domain as random processes and noise. |
| | CO4 | Determine the performance of analog communication systems in terms of SNR. |
| | CO5 | Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems. |
| BASIC ELECTRONICS | CO1 | Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation. |
| | CO2 | Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons. |
| | CO3 | . Understand the construction, principle of operation of transistors. |
| | | |
| DATA COMMUNICATIONS | CO1 | . Know the Categories and functions of various Data communication . |
| | CO2 | Design and analyze various error detection techniques. |
| | CO3 | Demonstrate the mechanism of routing the data in network layer. |
| | CO4 | Know the significance of various Flow control and |

| | | Congestion control Mechanisms. |
|---|---|---|
| **DIGITAL LOGIC DESIGN** | CO1 | Classify different number systems and apply togenerate various codes. |
| | CO2 | Use the concept of Boolean algebra in minimization of switching functions. |
| | CO3 | Design different types of combination illogic circuits. |
| | CO4 | Apply knowledge of flip-flops in designing of Registers and counters. |
| | CO5 | The operation and design methodology for synchronous sequential circuits and algorithmic state machines. |
| | CO6 | . Produce innovative designs by modifying the traditional design techniques. |
| **REMOTE SENSING ANDGIS** | CO1 | . Retrieve the information content of remotely sensed data . |
| | CO2 | . Analyze the energy interactions in the atmosphere and earth surface features. |
| | CO3 | Interpret the images for preparation of thematic maps. |
| | CO4 | Apply problem specific remote sensing data for engineering applications. |
| | CO5 | Analyze spatial and attribute data for solving spatial problems. |
| | CO6 | Create GIS and cartographic outputs for presentation. |
| **B.Tech 8th Sem** | | |
| **BIO MEDICAL INSTRUMENTATION** | CO1 | Apply principles and concepts of electronics to analyze input and output signals in medical electronics 2 |
| | CO2 | Apply principles and concepts of electronics to design filters for de-noising of medical measurements. |
| | CO3 | Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements. |
| | CO4 | Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in biofluids, and (ii) be able to evaluate quality of diagnostic devices. |
| | CO5 | Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of- |

| | | care diagnostic devices. |
|---|---|---|
| | | |
| **Data Acquisition Systems** | CO1 | 1. Be able to identity a data acquisition system. |
| | CO2 | Be able to prescribe a sensor type to measure a specific environmental change. |
| | CO3 | . Be able to determine what type of amplifier is needed for a specific sensor output. |
| | CO4 | . Be familiar with different forms of signal conditioning. |
| | CO5 | Be familiar with different methods of Analog-to-Digital conversion. |
| | CO6 | Be able to identify the type of interface used to get a digital signal into a microprocessor. |
| **ADAPTIVE CONTROL SYSTEMS** | CO1 | Design identifiers and adaptive controllers for linear systems . |
| | CO2 | . Design Adaptive feedback linearizing control systems for nonlinear systems. |
| | CO3 | : Apply the concept of different types of optimal control for solving problems. |
| | CO4 | Apply the concept of calculus of variation and principal of optimality for solving problems |
| | CO5 | Apply the concept of Linear Quadratic method for solving problems CO. |
| | CO6 | Apply the concept of adaptive control technique for solving problems. |
| **BIO-MEDICAL INSTRUMENTATION** | CO1 | Apply principles and concepts of electronics to analyze input and output signals in medical electronics |
| | CO2 | . . Apply principles and concepts of electronics to design filters for de-noising of medical measurements. |
| | CO3 | . Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements. |
| | CO4 | . Apply principles and concepts of engineering to quantify and model measurements of bio potentials. |
| | CO5 | Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in bio fluids, and (ii) be able to evaluate quality of diagnostic devices. |
| | CO6 | . Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of- |

| | | care diagnostic devices. |
|---|---|---|
| **DIGITAL CONTROL SYSTEMS** | CO1 | 1. Design a pure, two-pole system that satisfies specified performance specifications like percent overshoot, peak time, settling time, and DC gain. |
| | CO2 | Calculate the z-plane location of a pair of dominant poles given time-domain performance information like percent overshoot, settling time, and peak time. |
| | CO3 | Create discrete equivalents from given continuous-time systems. |
| | CO4 | . Able to Construct a discrete-time difference equation containing input variables and output variables at particular time instances from a system's discrete-time transfer function. |
| | CO5 | Numerically compute the value of any system variable (e.g., state variable or output variable) at any discrete, time instant given initial conditions and input waveforms. |
| | | |
| **PROCESS CONTROL INSTRUMENTATION** | CO1 | Understand the popular process automation technologies. |
| | CO2 | Design and development of different PLC programming for simple process applications. |
| | CO3 | Understand the different security design approaches, Engineering and operator interface issues for designing Distributed control system. |
| | CO4 | Know the latest communication technologies like HART and Field bus protocol. Mapping of Course Outcome with Programme Outcomes: |
| | | |
| **TRANSDUCERS AND SENSORS** | CO1 | Use concepts in common methods for converting a physical parameter into an electrical quantity. |
| | CO2 | Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light. |
| | CO3 | Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc.. |
| | CO4 | . Predict correctly the expected performance of various sensors. |
| | CO5 | . Locate different type of sensors used in real life applications and paraphrase their importance. |
| | CO6 | Set up testing strategies to evaluate performance |

| | | characteristics of different types of sensors and transducers. |
|---|---|---|
| | CO7 | develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system. |
| **MEMS** | CO1 | Understand the basic overview of MEMS and Microsystems with broad category of MEMS& Micro system applications. |
| | CO2 | Understanding the working principles of Microsystems. |
| | CO3 | Understand the Scaling Laws in Miniaturization and Materials for MEMS and Microsystems. |
| | CO4 | Understand the Micro system Fabrication Process and Analyze the different Micro manufacturing process and Applications. |
| | CO5 | Study and Analyze the different types of RF switches, Various Switching Mechanism and their applications. |
| | | |
| **Intelligent and Smart Instrumentation** | CO1 | To develop the design methodologies for measurement and instrumentation of real world problems. |
| | CO2 | To be study the concepts of intelligent sensor devices, their performance characteristics and signal and system dynamics. |
| | CO3 | To address the issues in dealing signal conditioning operations such as calibration, linearization and compensation. |
| | CO4 | To use artificial intelligence in sensor signal processing to solve real world problems. |
| | CO5 | To deal with interfacing protocols in wireless networking platform. |
| | | |
| **VLSI TECHNOLOGY AND DESIGN** | CO1 | . Understand the basics of MOS transistors and also the characteristics of MOS transistors. |
| | CO2 | . Learn about the MOS fabrication process and short channel effects. |
| | CO3 | Learn about the basic rules in layout designing. |
| | CO4 | Analyze various combinational logic networks and sequential systems. |
| | | |

| CMOS ANALOG IC DESIGN | CO1 | Design MOSFET based analog integrated circuits. |
|---|---|---|
| | CO2 | Analyze analog circuits at least to the first order. |
| | CO3 | Appreciate the trade-offs involved in analog integrated circuit design. |
| | CO4 | Understand and appreciate the importance of noise and distortion in analog circuits. |
| | | |
| CMOS DIGITAL IC DESIGN | CO1 | Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics, Estimation of Delay and Power, Adders Design. |
| | CO2 | Classify different semiconductor memories. |
| | CO3 | . . Analyze, design and implement combinational and sequential MOS logic circuits. |
| | CO4 | Solve engineering problems for feasible and optimal solutions in the core area of digital ICs. |
| | | |
| DESIGN OF TESTABILITY | CO1 | . apply the concepts in testing which can help them design a better yield in IC design. |
| | CO2 | . . tackle the problems associated with testing of semiconductor circuits at earlier design levels so as to significantly reduce the testing costs. |
| | CO3 | . analyses the various test generation methods for static & dynamic CMOS circuits. |
| | CO4 | identify the design for testability methods for combinational & sequential CMOS circuits. |
| | CO5 | recognize the BIST techniques for improving testability. |
| | CO1 | . apply the concepts in testing which can help them design a better yield in IC design. |
| | CO2 | . . tackle the problems associated with testing of semiconductor circuits at earlier design levels so as to significantly reduce the testing costs. |
| | CO3 | . analyses the various test generation methods for static & dynamic CMOS circuits. |
| | CO4 | identify the design for testability methods for combinational & sequential CMOS circuits. |
| | CO5 | recognize the BIST techniques for improving testability. |

# DEPARTMENT OF EEE Course Outcomes (R20)

## I YEAR SEMESTER-I

| Course Code | Course Name | | Course Outcomes |
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| R201102 | COMMUNICATIVE ENGLISH | CO1 | understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information |
| | | CO2 | ask and answer general questions on familiar topics and introduce oneself/others |
| | | CO3 | employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information |
| | | CO4 | recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs |
| | | CO5 | form sentences using proper grammatical structures and correct word forms |
| R201101 | MATHEMATICS-I | CO1 | utilize mean value theorems to real life problems (L3) |
| | | CO2 | solve the differential equations related to various engineering fields (L3) |
| | | CO3 | familiarize with functions of several variables which is useful in optimization (L3) |
| | | CO4 | apply double integration techniques in evaluating areas bounded by region (L3) |
| | | CO5 | students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3-dimensional coordinate systems (L5) |

| Course Code | Course Name | | Course Outcomes |
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| R201109 | MATHEMATICS-II (Linear Algebra and Numerical Methods) | CO1 | develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) |
| | | CO2 | solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3) |
| | | CO3 | evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5) |
| | | CO4 | apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) |
| | | CO5 | apply numerical integral techniques to different Engineering problems (L3) |
| R201110 | PROGRAMMING FOR PROBLEM SOLVING USING C | CO1 | 1.To write algorithms and to draw flowcharts for solving problems<br>2.To convert flowcharts/algorithms to C Programs, compile and debug programs |
| | | CO2 | 1.To use different operators, data types and write programs that use two-way/ multi-way selection<br>2.To select the best loop construct for a given problem |
| | | CO3 | To design and implement programs to analyze the different pointer applications |

| | | CO4 | To decompose a problem into functions and to develop modular reusable code |
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| | | CO5 | To apply file I/O operations |
| R201111 | **ENGINEERING DRAWING & DESIGN** | CO1 | Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections |
| | | CO2 | Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. |
| | | CO3 | Understand and draw projection of solids in various positions in first quadrant |
| | | CO4 | Explain principles behind development of surfaces |
| | | CO5 | Prepare isometric and perspective sections of simple solids. |
| R201112 | **ELECTRICAL ENGINEERING WORKSHOP** | CO1 | Explain the limitations, tolerances, safety aspects of electrical systems and wiring |
| | | CO2 | Select wires/cables and other accessories used in different types of wiring |
| | | CO3 | Make simple lighting and power circuits. |
| | | CO4 | Measure current, voltage and power in a circuit. |
| | | CO5 | Able to understand Assembling electronic components on bread board |
| R201113 | **PROGRAMMING FOR PROBLEM SOLVING USING C LAB** | CO1 | Gains Knowledge on various concepts of a C language. |
| | | CO2 | Draw flowcharts and write algorithms |
| | | CO3 | Design and development of C problem solving skills. |
| | | CO4 | Design and develop modular programming skills. |
| | | CO5 | Trace and debug a program |

## I YEAR  SEMESTER-II

| R201206 | **MATHEMATICS-III** | CO1 | 1.interpret the physical meaning of different operators such as gradient, curl and divergence (L5) 2. estimate the work done against a field, circulation and flux using vector calculus (L5 |
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| | | | apply the Laplace transform for solving differential |

| | | CO2 | equations (L3) |
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| | | CO3 | find or compute the Fourier series of periodic signals (L3) know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3) |
| | | CO4 | identify solution methods for partial differential equations that model physical processes (L3) |
| | | CO5 | identify solution methods for partial differential equations that model physical processes (L3) |
| R201207 | APPLIED PHYSICS | CO1 | Explain the need of coherent sources and the conditions for sustained interference (L2) |
| | | CO2 | 1.Understand the basic concepts of LASER light Sources (L2) 2.Explain the working principle of optical fibers (L2) |
| | | CO3 | 1.Interpret the concepts of classical and quantum free electron theories (L2) 2. Explain the importance of K-P mode |
| | | CO4 | 1.Explain the concept of dielectric constant and polarization in dielectric materials (L2) 2.Classify the magnetic materials based on susceptibility and their temperature dependence (L2) |
| | | CO5 | 1.Classify the energy bands of semiconductors (L2) 2. Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2) |

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| R201208 | DATA STRUCTURES THROUGH C | CO1 | data structures concepts with arrays, stacks, queues |
| | | CO2 | linked lists for stacks, queues and for other app |
| | | CO3 | traversal methods in the Trees |
| | | CO4 | various algorithms available for the graphs. |
| | | CO5 | sorting and searching in the data ret retrieval applications |
| R201209 | ELECTRICAL CIRCUIT ANALYSIS -I | CO1 | 1.Various electrical networks in presence of active and passive elements. 2.Electrical networks with network topology concepts |
| | | CO2 | Any magnetic circuit with various dot conventions |
| | | CO3 | Any R, L, C network with sinusoidal excitation |
| | | CO4 | 1.Any R, L, C network with sinusoidal excitation. 2.Any R, L, network with variation of any one of the parameters i.e., R, L, C and f. |
| | | CO5 | Electrical networks by using principles of network theorems. |
| R201227 | BASIC CIVIL AND MECHANICAL ENGINEERING | CO1 | Apply Shear force diagram & Bending moment diagram principles for Cantilever and Simply supported beams |
| | | CO2 | Apply concepts of Rosette analysis for strain measurements |
| | | CO3 | Analyse the characteristics of common building materials |
| | | CO4 | Compare the working characteristics of Internal Combustion engines |

| | | CO5 | Compare the differences between boiler mountings and accessories |
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| R201251 | BASIC CIVIL AND MECHANICAL ENGINEERING LAB | CO1 | Solve to arrive at finding constant speed and variable speed on IC engines and interpret their performance. |
| | | CO2 | Estimate energy distribution by conducting heat balance test on IC engines |
| | | CO3 | Determine fluid and flow properties. |
| | | CO4 | Solve for drag coefficients. |
| | | CO5 | Test for the performance of pumps and turbines |

| R201234 | DATA STRUCTURES THROUGH C LAB | CO1 | Be able to design and analyze the time and space efficiency of the data structure |
|---|---|---|---|
| | | CO2 | Be capable to identity the appropriate data structure for given problem |
| | | CO3 | Have practical knowledge on the applications of data structures |
| R201229 | CONSTITUTION OF INDIA | CO1 | Understand the concept of Indian constitution |
| | | CO2 | 1.Understand the structure of Indian government<br><br>2.Know the Structure of supreme court and High court |
| | | CO3 | 1.Understand the structure of state government<br>2. Analyze the role Governor and Chief Minister |
| | | CO4 | 1. Understand the local Administration<br>2. Evaluate Zilla panchayat block level organization |
| | | CO5 | 1. Know the role of Election Commission apply knowledge<br>2. Analyze role of state election commission |

<p align="center"><strong>B TECH -II YEAR- I SEM</strong></p>

| R2021021 | MATHEMATICS-IV | CO1 | apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3) |
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| | | CO2 | find the differentiation and integration of complex functions used in engineering problems (L5) |
| | | CO3 | make use of the Cauchy residue theorem to evaluate certain integrals (L3) |
| | | CO4 | design the components of a classical hypothesis test (L6) |
| | | CO5 | infer the statistical inferential methods based on small and large sampling tests (L4) |
| R2021022 | ELECTRONIC | | |

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| | **DEVICES AND CIRCUITS** | CO1 | Understand the basic concepts of semiconductor physics. | |
| | | CO2 | Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons. | |
| | | CO3 | Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations | |
| | | CO4 | Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions | |
| | | CO5 | Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations | |
| R2021023 | **ELECTRICAL CIRCUIT ANALYSIS - II** | CO1 | Understand the concepts of balanced and unbalanced three-phase circuits | |
| | | CO2 | Know the transient behavior of electrical networks with DC excitations | |
| | | CO3 | Learn the transient behavior of electrical networks with AC excitations | |
| | | CO4 | Estimate various parameters of a two port network. | |
| | | CO5 | Understand the significance of filters in electrical networks | |
| R2021024 | **DC MACHINES AND TRANSFORMERS** | CO1 | 1.Assimilate the concepts of electromechanical energy conversion. 2. Mitigate the ill-effects of armature reaction and improve commutation in dc machines | |
| | | CO2 | Understand the torque production mechanism and control the speed of dc motors | |
| | | CO3 | Analyze the performance of single phase transformers | |
| | | CO4 | Predetermine regulation, losses and efficiency of single phase transformers. | |
| | | CO5 | Parallel transformers, control voltages with tap changing methods and achieve three-phase to two-phase transformation | |
| R2021025 | **ELECTRO MAGNETIC FIELDS** | CO1 | Compute electric fields and potentials using Gauss law or solve Laplace's or Poisson's equations for various electric charge distributions | |
| | | CO2 | Calculate the capacitance and energy stored in dielectrics | |
| | | CO3 | Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law | |
| | | | Estimate self and mutual inductances and the energy stored | |

| | | CO4 | in the magnetic field |
|---|---|---|---|
| | | CO5 | Understand the concepts of displacement current and Poynting theorem and Poynting vector |
| R2021026 | ELECTRICAL CIRCUITS LAB | CO1 | Apply various theorems |
| | | CO2 | Determination of self and mutual inductances |
| | | CO3 | Two port parameters of a given electric circuits |
| | | CO4 | Draw locus diagram |
| | | CO5 | Draw Waveforms and phasor diagrams for lagging and leading networks |
| R2021027 | DC MACHINES AND TRANSFORMERS LAB | CO1 | Determine and predetermine the performance of DC machines and Transformers |
| | | CO2 | Control the speed of DC motor |
| | | CO3 | Obtain three phase to two phase transformation |
| R2021028 | ELECTRONIC DEVICES AND CIRCUITS LAB | CO1 | Analyze the characteristics of diodes, transistors and other devices |
| | | CO2 | Design and implement the rectifier circuits, SCR and UJT in the hardware circuits |
| | | CO3 | Design the biasing and amplifiers of BJT and FET amplifiers |
| | | CO4 | Measure electrical quantities using CRO in the experimentation |
| R2021029 | SKILL ORIENTED COURSE DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS | CO1 | write the MATLAB programs to simulate the electrical circuit problems |
| | | CO2 | simulate various circuits for electrical parameters |
| | | CO3 | simulate various wave form for determination of wave form parameters |
| | | CO4 | simulate RLC series and parallel resonance circuits for resonant parameters |
| | | CO5 | simulate magnetic circuits for determination of self and mutual inductances |
| R2021020 | PROFESSIONAL ETHICS & HUMAN VALUES | CO1 | Learn about morals, values & work ethics. |
| | | CO2 | Learn about the ethical responsibilities of the engineers |
| | | CO3 | Demonstrate knowledge to become a social experimenter |
| | | CO4 | Create awareness about safety, risk & risk benefit analysis. |
| | | CO5 | Create awareness on computer and environmental ethics |

| B.Tech – II Year II Semester | | | |
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| Course Code | Course Name | | Course Outcomes |
| | | CO1 | Develop essential programming skills in computer programming concepts like data types, containers |

| R2022021 | PYTHON PROGRAMMING | CO2 | Apply the basics of programming in the Python language Solve coding tasks related conditional execution, loops |
|----------|--------------------|-----|------------------------------------------------------------------------------------------------------------------|
|          |                    | CO3 | Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming |
| R2022022 | DIGITAL ELECTRONICS | CO1 | Classify different number systems and apply to generate various codes. |
|          |                    | CO2 | Use the concept of Boolean algebra in minimization of switching functions |
|          |                    | CO3 | Design different types of combinational logic circuits. |
|          |                    | CO4 | Apply knowledge of flip-flops in designing of Registers and counters |
|          |                    | CO5 | The operation and design methodology for synchronous sequential circuits and algorithmic state machines. |
| R2022023 | POWER SYSTEMS - I | CO1 | Identify the different components of thermal power plants. |
|          |                    | CO2 | Identify the different components of nuclear Power plants. |
|          |                    | CO3 | Identify the different components of air and gas insulated substations. |
|          |                    | CO4 | Identify single core and three core cables with different insulating materials. |
|          |                    | CO5 | Analyse the different economic factors of power generation and tariffs. |
| R2022024 | INDUCTION AND SYNCHRONOUS MACHINES | CO1 | Explain the operation and performance of three phase induction motor. |
|          |                    | CO2 | Analyze the torque-speed relation, performance of induction motor and induction generator. |
|          |                    | CO3 | Implement the starting of single phase induction motors. |

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| | | CO4 | Develop winding design and predetermine the regulation of synchronous generators. |
| | | CO5 | Explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor. |
| R2022015 | MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS | CO1 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product. |
| | | CO2 | The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. |
| | | CO3 | The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units. |
| | | CO4 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis. |
| | | CO5 | The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. |
| R2022025 | PYTHON PROGRAMMING LAB | CO1 | Write, Test and Debug Python Programs |
| | | CO2 | Use Conditionals and Loops for Python Programs |
| | | CO3 | Use functions and represent Compound data using Lists, Tuples |
| | | CO4 | Dictionaries Use various applications using python |
| R2022026 | INDUCTION AND SYNCHRONOUS MACHINES LAB | CO1 | Assess the performance of single phase and three phase induction motors. |
| | | CO2 | Control the speed of three phase induction motor. |
| | | CO3 | Predetermine the regulation of three–phase alternator by various methods. |
| | | CO4 | Find the Xd/Xq ratio of alternator and asses the performance of three–phase synchronous motor. |

| Course Code | Course Name | | Course Outcomes | |
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| | | CO5 | Determine the performance of single phase AC series motor. | |
| R2022027 | DIGITAL ELECTRONICS LAB | CO1 | Learn the basics of gates, filp-flops and counters. | |
| | | CO2 | Construct basic combinational circuits and verify their functionalities. | |
| | | CO3 | Apply the design procedures to design basic sequential circuits. | |
| | | CO4 | To understand the basic digital circuits and to verify their operation. | |
| | | CO5 | Apply Boolean laws to simplify the digital circuits. | |
| R2022028 | SKILL ORIENTED COURSE IOT APPLICATIONS OF ELECTRICAL ENGINEERING | CO1 | Apply various technologies of Internet of Things to real time applications. | |
| | | CO2 | Apply various communication technologies used in the Internet of Things. | |
| | | CO3 | Connect the devices using web and internet in the IoT environment. | |
| | | CO4 | Implement IoT to study Smart Home, Smart city, etc. | |

## B.Tech – III Year I Semester

| Course Code | Course Name | | Course Outcomes |
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| R2031021 | POWER SYSTEMS–II | CO1 | Calculate parameters of transmission lines for different circuit configurations. |
| | | CO2 | Determine the performance of short, medium and long transmission lines. |
| | | CO3 | Analyse the effect of travelling waves on transmission lines. |
| | | CO4 | Analyse the various voltage control methods and effect of corona. |

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| | | CO5 | Calculate sag/tension of transmission lines and performance of line insulators. |
| R2031022 | POWER ELECTRONICS | CO1 | Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT. |
| | | CO2 | Analyse the operation of phase-controlled rectifiers. |
| | | CO3 | Analyse the operation of three-phase full–wave converters, AC Voltage Controllers and Cyclo converters. |
| | | CO4 | Examine the operation and design of different types of DC-DC converters. |
| | | CO5 | Analyse the operation of PWM inverters for voltage control and harmonic mitigation. |
| R2031023 | CONTROL SYSTEMS | CO1 | Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs. |
| | | CO2 | Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and root locus method. |
| | | CO3 | Analyze the stability of LTI systems using frequency response methods. |
| | | CO4 | Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode diagrams. |
| | | CO5 | Represent physical systems as state models and determine the response. Understand the concepts of controllability and observability. |
| R203102B | UTILIZATION OF ELECTRICAL ENERGY | CO1 | Identify various illumination methods produced by different illuminating sources. |
| | | CO2 | Identify a suitable motor for electric drives and industrial applications |
| | | CO3 | Identify most appropriate heating and welding techniques for suitable applications. |
| | | CO4 | Distinguish various traction system and determine the tractive effort and specific energy consumption. |
| | | CO5 | Validate the necessity and usage of different energy storage schemes for different applications and comparisons. |

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| R2031024 | CONTROL SYSTEMS LABORATORY | CO1 | Analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros. |
| | | CO2 | Design P,PI,PD and PID controllers, Design lag, lead and lag–lead compensators & Evaluate temperature control of an oven using PID controller. |
| | | CO3 | Determine the transfer function of D.C Motor, Analyze the performance of D.C and A.C Servo Motor & Test the controllability and observability. |
| | | CO4 | Judge the stability in time and frequency domain. |
| | | CO5 | To examine different logic gates and Boolean expressions using PLC. |
| R2031025 | POWER ELECTRONICS LABORATORY | CO1 | Analyse characteristics of various power electronic devices and design firing circuits for SCR. |
| | | CO2 | Analyse the performance of single–phase dual, three–phase full--wave bridge converters and dual converter with both resistive and inductive loads. |
| | | CO3 | Examine the operation of Single-phase AC voltage regulator and Cyclo converter with resistive and inductive loads. |
| | | CO4 | Differentiate the working and control of Buck converter and Boost converter. |
| | | CO5 | Differentiate the working & control of Square wave inverter and PWM inverter. |
| R2031026 | SOFT SKILL COURSE EMPLOYABILITY SKILLS | CO1 | Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems |
| | | CO2 | Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. |
| | | CO3 | Analyze, summarize and present information in quantitative forms including table, graphs and formulas |
| | | CO4 | Understand the core competencies to succeed in professional and personal life |
| | | CO5 | Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc. |
| | | CO1 | Understanding of the natural resources. |

| Course Code | Course Name | | Course Outcomes |
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| R2031027 | ENVIRONMENTAL SCIENCE | CO2 | Understanding of the ecosystem and its diversity. |
| | | CO3 | Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. |
| | | CO4 | Understanding of the environmental impact of developmental activities. |
| | | CO5 | Awareness on the social issues, environmental legislation and global treaties. |

### B.Tech – III Year II Semester

| Course Code | Course Name | | Course Outcomes |
|---|---|---|---|
| R2032021 | MICROPROCESSORS AND MICROCONTROLLERS | CO1 | Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors. |
| | | CO2 | Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors |
| | | CO3 | Analyse the Microcontroller and interfacing capability |
| | | CO4 | Describe the architecture and interfacing of 8051 controller |
| | | CO5 | Know the concepts of PIC micro controller and its programming. |
| R2032022 | ELECTRICAL MEASUREMENTS AND INSTRUMENTATION | CO1 | Know the construction and working of various types of analog instruments. |
| | | CO2 | Describe the construction and working of wattmeter and power factor meters |
| | | CO3 | Know the construction and working various bridges for the measurement resistance - inductance and capacitance |
| | | CO4 | Know the operational concepts of various transducers |
| | | CO5 | Know the construction and operation digital meters |
| | | CO1 | Draw impedance diagram for a power system network and calculate per unit quantities. |

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| R2032023 | POWER SYSTEM ANALYSIS | CO2 | Apply the load flow solution to a power system using different methods. |
| | | CO3 | Form Zbus for a power system networks and analyse the effect of symmetrical faults. |
| | | CO4 | Find the sequence components for power system Components and analyse its effects of unsymmetrical faults. |
| | | CO5 | Analyse the stability concepts of a power system. |
| R203202D | SWITCHGEAR AND PROTECTION | CO1 | Illustrate the principles of arc interruption for application to high voltage circuit breakers of air - oil - vacuum - SF6 gas type. |
| | | CO2 | Analyse the working principle and operation of different types of electromagnetic protective relays. |
| | | CO3 | Acquire knowledge of protective schemes for generator and transformers for different fault conditions. |
| | | CO4 | Classify various types of protective schemes used for feeders and bus bar protection and Types of static relays. |
| | | CO5 | Analyse the operation of different types of over voltages protective schemes required for insulation co—ordination and types of neutral grounding. |
| R2032024 | ELECTRICAL MEASUREMENTS AND INSRUMENTATION LABORATORY | CO1 | Know about the phantom loading. & Learn the calibration process. |
| | | CO2 | Measure the electrical parameters voltage - current - power - energy and electrical characteristics of resistance - inductance and capacitance. |
| | | CO3 | Gain the skill knowledge of various brides and their applications. |
| | | CO4 | Learn the usage of CT's - PT's for measurement purpose. |
| | | CO5 | Know the characteristics of transducers. & Measure the strains - frequency and phase difference |
| R2032025 | MICRO PROCESSORS AND MICRO CONTROLLERS LAB | CO1 | Write assembly language program using 8086 microprocessor based on arithmetic - logical - number systems and shift operations. |
| | | CO2 | Write assembly language programs for numeric operations and array handling problems. |
| | | CO3 | Write a assembly program on string operations. & Interface 8086 with I/O and other devices. |

| | | CO4 | Do parallel and serial communication using 8051 & PIC 18 micro controllers. |
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| | | CO5 | Program microprocessors and microcontrollers for real world applications. |
| R2032026 | POWER SYSTEMS AND SIMULATION LAB | CO1 | Estimate the sequence impedances of 3-phase Transformer and Alternators. |
| | | CO2 | Evaluate the performance of transmission lines. |
| | | CO3 | Analyse and simulate power flow methods in power systems. |
| | | CO4 | Analyse and simulate the performance of PI controller for load frequency control. |
| | | CO5 | Analyse and simulate stability studies of power systems. |
| R2032027 | SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON | CO1 | Illustrate and comprehend the basics of Machine Learning with Python |
| | | CO2 | Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions |
| | | CO3 | Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms |
| | | CO4 | Evaluate the concepts of binning, pipeline Interfaces with examples |
| | | CO5 | Apply the sentiment analysis for various case studies |
| R2032028 | RESEARCH METHODOLOGY | CO1 | Understand objectives and characteristics of a research problem |
| | | CO2 | Analyze research related information and to follow research ethics. |
| | | CO3 | Understand the types of intellectual property rights. |
| | | CO4 | Learn about the scope of IPR. |
| | | CO5 | Understand the new developments in IPR. |

| B.Tech – IV Year I Semester |||| |
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| **Course Code** | **Course Name** || **Course Outcomes** |
| R204102E | DATA BASE MANAGEMENT SYSTEMS | CO1 | Illustrate the concept of databases, database management systems, database languages, database structures and their work |
| | | CO2 | Apply ER modeling and Relational modeling for designing simple databases. |
| | | CO3 | Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language. |
| | | CO4 | Design and develop databases from the real world by applying the concepts of Normalization. |
| | | CO5 | Outline the issues associated with Transaction Management and Recovery, Tree Structured Indexing |
| R204102F | HYBRID ELECTRIC VEHICLES | CO1 | Know the concept of electric vehicles and hybrid electric vehicles. |
| | | CO2 | Familiar with different configuration of hybrid electric vehicles. |
| | | CO3 | Choose an effective motor for EV and HEV application |
| | | CO4 | Understand the power converters used in hybrid electric vehicles |
| | | CO5 | Know different batteries and other energy storage systems. |
| R204102I | POWER SYSTEM OPERATION AND CONTROL | CO1 | Compute optimal load scheduling of Generators. |
| | | CO2 | Formulate hydrothermal scheduling and unit commitment problem.. |
| | | CO3 | Analyse effect of Load Frequency Control for single area systems |
| | | CO4 | Analyse effect of Load Frequency Control for two area systems |
| | | CO5 | Describe the effect of reactive power control for transmission lines. |

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| R2041011 | UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY | CO1 | Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field |
| | | CO2 | Identify the multiple ethical interests at stake in a real-world situation or practice |
| | | CO3 | Articulate what makes a particular course of action ethically defensible |
| | | CO4 | Assess their own ethical values and the social context of problems |
| | | CO5 | Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects. |
| R204102Q | SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON LAB | CO1 | Illustrate and comprehend the basics of Machine Learning with Python |
| | | CO2 | Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions |
| | | CO3 | Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms |
| | | CO4 | Evaluate the concepts of binning, pipeline Interfaces with examples |
| | | CO5 | Apply the sentiment analysis for various case studies |
| R204105T | Internet of things | CO1 | Review Internet of Things (IoT). |
| | | CO2 | Demonstrate various business models relevant to IoT. |
| | | CO3 | Construct designs for web connectivity |
| | | CO4 | Organize sources of data acquisition related to IoT, integrate to enterprise systems. |
| | | CO5 | Describe IoT with Cloud technologies. |
| R20 R2041057 | Machine learning | CO1 | Explain the definition and usage of the term &#39;the internet of things&#39; in different Contexts |
| | | CO2 | Demonstrate on various network protocols used in IoT |
| | | CO3 | Analyze on various key wireless technologies used in IoT systems, such as WiFi, 6LoWPAN, Bluetooth and ZigBee. |
| | | CO4 | Illustrate on the role of big data, cloud computing and data analytics in IoT system |
| | | | Design a simple IoT system made up of sensors, |

| | | CO5 | wireless network connection, data analytics and display/actuators, and write the necessary control software |
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| **IV-YEAR SEMESTER-II** | | | |
| R204202P | Project, Seminar, Internship | CO1 | Demonstrate the technical knowledge to identify problems in the field of Electrical &Electronics Engineering and its allied areas |
| | | CO2 | Analyze and formulate technical projects with a comprehensive and systematic approach. |
| | | CO3 | Identify the modern tools to implement technical projects |
| | | CO4 | Design engineering solutions for solving complex engineering problems |
| | | CO5 | Develop effective communication skills, professional behavior and team work |

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VIKAS COLLEGE OF ENGG. TECH.
NUNNA - 521 212
Vijayawada Rural, NTR Dist., A.P.

# B.TECH MECHANICAL ENGINEERING
## (R20)

| Course Code | Course Name | Course Outcomes |
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| colspan I-I | | |
| R201104 | Engineering Drawing | Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. |
| | | Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. |
| | | Understand and draw projection of solids in various positions in first quadrant. |
| | | Explain principles behind development of surfaces. |
| | | Prepare isometric and perspective sections of simple solids. |
| I-II | | |
| R201210 | Engineering Mechanics | The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters. |
| | | The student should be able to determine centroid for lines, areas and center of gravity for volumes and their composites. |
| | | The student should be able to determine area and mass movement of inertia for composite sections |
| | | The student should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum. |
| R201254 | Thermodynamics | After undergoing the course the student is expected to learn Basic concepts of thermodynamics |
| | | After undergoing the course the student is expected to learn Laws of thermodynamics |
| | | After undergoing the course the student is expected to learn Concept of entropy |
| | | After undergoing the course the student is expected to learn Property evaluation of vapors and their depiction in tables and charts |
| | | After undergoing the course the student is expected to learn Evaluation of properties of perfect gas mixtures |
| R2012032 | Workshop Practice Lab | Identify workshop tools and their operational capabilities. |
| | | Practice on manufacturing of components using workshop trades including fitting, carpentry, and foundry and welding. |
| | | Apply fitting operations in various applications. |
| | | Apply basic electrical engineering knowledge for House Wiring Practice |

| Course Code | Course Name | | Course Outcomes |
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| | | II-I | |
| R2021011 | VECTOR CALCULUS FOURIER TRANSFORMS and PDE (M-III) | CO1 | The student will be able to interpret the physical meaning of different operators such as gradient, curl and divergence |
| | | CO2 | The student will be able to estimate the work done against a field, circulation and flux using vector calculus and apply the Laplace transform for solving differential equations |
| | | CO3 | The student will be able to find or compute the Fourier series of periodic signals |
| | | CO4 | The student will be able to know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms |
| | | CO5 | The student will be able to identify solution methods for partial differential equations that model physical processes |
| R2021031 | MECHANICS OF SOLIDS | CO1 | Model & Analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium. |
| | | CO2 | Understand the apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment. |
| | | CO3 | Students will learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyze beams and draw correct and complete shear and bending moment diagrams for beams. |
| | | CO4 | Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior |
| | | CO5 | Design and analysis of Industrial components like pressure vessels. |
| R2021032 | FLUID MECHANICS & HYDRAULIC MACHINES | CO1 | The basic concepts of fluid properties. |
| | | CO2 | The mechanics of fluids in static and dynamic conditions. |
| | | CO3 | Boundary layer theory, flow separation and dimensional analysis. |
| | | CO4 | Hydrodynamic forces of jet on vanes in different positions. |
| | | CO5 | Working Principles and performance evaluation of hydraulic pump and turbines. |
| R2021033 | PRODUCTION TECHNOLOGY | CO1 | Able to design the patterns and core boxes for metal casting processes |
| | | CO2 | Able to design the gating system for different metallic components |
| | | CO3 | Know the different types of manufacturing processes |
| | | CO4 | Be able to use forging, extrusion processes |
| | | CO5 | Learn about the different types of welding processes |

| | | | used for special fabrication. |
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| R2021034 | KINEMATICS OF MACHINERY | C01 | The student should be able to Contrive a mechanism for a given plane motion with single degree of freedom. |
| | | C02 | The student should be able to Suggest and analyze a mechanism for a given straight line motion and automobile steering motion. |
| | | C03 | The student should be able to Analyze the motion (velocity and acceleration) of a plane mechanism. |
| | | C04 | The student should be able to Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc. |
| | | C05 | The student should be able to Select a power transmission system for a given application and analyze motion of different transmission systems |
| R2021035 | COMPUTER AIDED ENGINEERING DRAWING PRACTICE | C01 | Student gets exposed on working of sheet metal with help of development of surfaces. |
| | | C02 | Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids. |
| | | C03 | Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis. |
| R2021036 | FLUID MECHANICS & HYDRAULIC MACHINERY LAB | C01 | The student will be able to identify importance of various fluid properties at rest and in transit. |
| | | C02 | The student will be able to derive and apply general governing equations for various fluid flows. |
| | | C03 | The student will be able to evaluate the performance characteristics of hydraulic turbines and pumps. |
| R2021037 | PRODUCTION TECHNOLOGY LAB | C01 | To apply some of the manufactures process directly in the industry for preparation of complicated jobs. |
| | | C02 | At the end of the lab learn preparation of various jobs using various manufacturing process |
| | | C03 | The student will be trained to implement similar features in preparation of jobs can be extended to implement in the preparation of complicated jobs |
| R2021038 | DRAFTING AND MODELING LAB | C01 | Learned basic concept to drawing, edit, dimension, hatching etc. to develop 2&3D Modeling. |
| | | C02 | Able to make 3D modeling, Assembling, modification & manipulation along with detailing. |
| | | C03 | Able to prepare surface modeling and sheet metal operations through various exercises |
| R2021039 | ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE | C01 | After completion of the course, students will be able to Understand the concept of Traditional knowledge and its importance |
| | | C02 | After completion of the course, students will be able to Know the need and importance of protecting traditional knowledge |
| | | C03 | After completion of the course, students will be able to Know the various enactments related to the protection of traditional knowledge |
| | | C04 | After completion of the course, students will be able to Understand the concepts of Intellectual property to protect the traditional knowledge |

| Course Code | Course Name | | Course Outcomes | |
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| | | | **II-II** | |
| R2022031 | MATERIALS SCIENCE & METALLURGY | C01 | Understand the crystalline structure of different metals and study the stability of phases in different alloy systems. | |
| | | C02 | Study the behavior of ferrous and non ferrous metals and alloys and their application in different domains | |
| | | C03 | Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals. | |
| | | C04 | Grasp the methods of making of metal powders and applications of powder metallurgy | |
| | | C05 | Comprehend the properties and applications of ceramic, composites and other advanced methods. | |
| R2022011 | COMPLEX VARIABLES AND STATISTICAL METHODS | C01 | the course students will be able to apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic | |
| | | C02 | the course students will be able to find the differentiation and integration of complex functions used in engineering problems | |
| | | C03 | the course students will be able to make use of the Cauchy residue theorem to evaluate certain integrals | |
| | | C04 | the course students will be able to apply discrete and continuous probability distributions | |
| | | C05 | the course students will be able to design the components of a classical hypothesis test and infer the statistical inferential methods based on small and large sampling tests | |
| R2022032 | DYNAMICS OF MACHINERY | C01 | To compute the frictional losses and transmission in clutches, brakes and dynamometers | |
| | | C02 | To analyze the forces in four bar and slider crank mechanisms and design a flywheel | |
| | | C03 | To determine the effect of gyroscopic couple in motor vehicles, ships and aero planes. To determine the rotary unbalanced mass in reciprocating equipment | |
| | | C04 | To determine the unbalanced forces and couples in reciprocating and radial engines | |
| | | C05 | To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations. | |
| R2022033 | THERMAL ENGINEERING - I | C01 | Student must able to Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications | |
| | | C02 | Student must able to Explain working principle and various components of IC engine | |
| | | C03 | Student must able to Explain combustion phenomenon of CI and SI engines and their impact on engine variables. Analyze the performance of an IC engine based on the performance parameters. | |
| | | C04 | Student must able to Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine | |
| | | C05 | Student must able to Explain the applications and working principle of rockets and jet propulsion | |
| R2022034 | INDUSTRIAL | C01 | Design and conduct experiments, analyse, interpret | |

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| | ENGINEERING AND MANAGEMENT | | data and synthesize valid conclusions |
| | | C02 | Design a system, component, or process, and synthesize solutions to achieve desired needs |
| | | C03 | Use the techniques, skills, and modern engineering tools necessary for engineering practice |
| | | C04 | Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints |
| | | C05 | Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management |
| R2022035 | MECHANICS OF SOLIDS & METALLURGY LAB | CO1 | Determination of mechanical properties of different materials AND Establish the constitutive relations in metals using destructive methods |
| | | CO2 | Understand the behavior of members during twisting and transverse loading and Familiarize with standard test specimens |
| | | CO3 | The material properties and testing methods along with crystal structures and deformations, Hardenability of steels by Jominy End Quench Test and Prepare samples for investigating micro structure of different materials. |
| R2022036 | MACHINE DRAWING PRACTICE | C01 | Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings. |
| | | C02 | Draw different types of bearings showing different components. |
| | | C03 | Assemble components of a machine part and draw the sectional assembly drawing showing the dimensions of all the components of the assembly as per bill of materials |
| | | C04 | Select and represent fits and geometrical form of different mating parts in assembly drawings. |
| | | C05 | To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements. |
| R2022037 | THEORY OF MACHINES LAB | CO1 | understand the kinematics and rigid- body dynamics of kinematically driven machine components |
| | | CO2 | understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link |
| | | CO3 | Students can understand the Gear terminology and able to analyze the spur gear trains. |
| R2022038 | PYTHON -PROGRAMMING LAB | C01 | student will be able to Solve the different methods for linear, non-linear and differential equations |
| | | C02 | student will be able to Learn the PYTHON Programming language |
| | | C03 | student will be able to Familiar with the strings and matrices in PYTHON |
| | | C04 | student will be able to Write the Program scripts and functions in PYTHON to solve the methods |

| Course Code | Course Name | | Course Outcomes | |
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| **III-I** | | | | |
| R2031031 | Thermal Engineering-II | CO1 | Student will be able to Explain the basic concepts of thermal engineering and boilers | |
| | | CO2 | Student will be able to Discuss the concepts of steam nozzles and steam turbines. | |
| | | CO3 | Student will be able to Gain knowledge about the concepts of reaction turbine and steam condensers. | |
| | | CO4 | Student will be able to Discuss the concepts of reciprocating and rotary type of compressors. | |
| | | CO5 | Student will be able to Acquire knowledge about the centrifugal and axial flow compressors. | |
| R2031032 | Design of Machine Members-I | CO1 | Student will be able to Judge about materials and their properties along with manufacturing considerations. | |
| | | CO2 | Student will be able to Gain knowledge about the strength of machine elements | |
| | | CO3 | Student will be able to Apply the knowledge in designing the riveted and welded joints, keys, cotters and knuckle joints. | |
| | | CO4 | Student will be able to Apply the knowledge in designing the shafts and shaft couplings. | |
| | | CO5 | Student will be able to Apply the knowledge in designing the mechanical springs. | |
| R2031033 | MACHINING, MACHINE TOOLS & METROLOGY | CO1 | Student will be able to Discuss the concepts of machining processes. | |
| | | CO2 | Student will be able to Apply the principles of lathe, shaping, slotting and planning machines. | |
| | | CO3 | Student will be able to Apply the principles of drilling, milling and boring processes. | |
| | | CO4 | Student will be able to Analyze the concepts of finishing processes and the system of limits and fits. | |
| | | CO5 | Student will be able to Learn the concepts of surface roughness and optical measuring instruments | |
| R203102F | RENEWABLE ENERGY SOURCES(OE-I) | CO1 | Student will be able to Explain the importance of, solar energy collection and storage. | |
| | | CO2 | Student will be able to Discuss the wind energy principles. | |
| | | CO3 | Student will be able to Analyze about biomass energy concepts. | |
| | | CO4 | Student will be able to Apply the principles of tidal energy. | |
| | | CO5 | Student will be able to Utilize the concepts of geothermal energy. | |
| R203103C | ADVANCED MATERIALS (PE-1) | CO1 | Student will be able to Justify the knowledge about metals and alloys and their utility in different environments. | |

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| | | CO2 | Student will be able to Judge about polymers and ceramics and their applications. |
| | | CO3 | Student will be able to Analyze composite materials along with reinforcements and their applications. |
| | | CO4 | Student will be able to Utilize shape memory alloys and functionally graded materials for different applications |
| | | CO5 | Student will be able to Justify about the nano materials and their applications |
| R2031034 | MACHINE TOOLS LABORATORY | CO1 | Student will be able to Demonstrate about general purpose machine tools in the machine shop. |
| | | CO2 | Student will be able to Perform various operations on lathe machine. |
| | | CO3 | Student will be able to Perceive different operations on drilling machine. |
| | | CO4 | Student will be able to Experiment with basic operations on shaping machine. |
| | | CO5 | Student will be able to Utilize slotting machine to make keyways. |
| | | C06 | Student will be able to Experiment with the basic operations on milling machine. |
| R2031035 | Thermal Engineering Lab | CO1 | Student will be able to Experiment with two stroke and four stroke compression and spark ignition engines for various characteristics. |
| | | CO2 | Student will be able to Perceive flash point, fire point, calorific value of different fuels using various apparatus. |
| | | CO3 | Student will be able to Perform engine friction, heat balance test, volumetric efficiency, load test of petrol and diesel engines. |
| | | C04 | Student will be able to Perform speed test, performance test and cooling temperature on petrol and diesel engines. |
| | | C05 | Student will be able to Utilize air compressor for its performance test and to determine efficiency. |
| | | C06 | Student will be able to Discuss the principles through assembly and disassembly of 2/3 wheelers, 2/4 stroke engines, tractor, heavy duty engines, boilers and their mountings and accessories. |
| R2031036 | ADVANCED COMMUNICATION SKILLS LAB | C01 | Students will be able to Acquire vocabulary and use it contextually |
| | | C02 | Students will be able to Listen and speak effectively |
| | | C03 | Students will be able to Develop proficiency in academic reading and writing |
| | | C04 | Students will be able to Increase possibilities of job prospects |
| R2031037 | PROFESSIONAL ETHICS AND HUMAN VALUES | C01 | At the end of the course, student will be able to Judge the concepts of human values. |
| | | C02 | At the end of the course, student will be able to Justify knowledge about the principles of engineering ethics. |
| | | C03 | At the end of the course, student will be able to Interpret engineering as social |

| | | | experimentation |
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| | | C04 | At the end of the course, student will be able to Realize engineers' responsibility for safety and risk. |
| | | C05 | At the end of the course, student will be able to Learn about the engineers' rights and responsibilities |

| Course Code | Course Name | | Course Outcomes |
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| | | **III-II** | |
| R2032031 | Heat Transfer | CO1 | Student will be able to Apply knowledge about mechanism and modes of heat transfer. |
| | | CO2 | Student will be able to Understand the concepts of conduction and convective heat transfer. |
| | | CO3 | Student will be able to Learn about forced and free convection. |
| | | CO4 | Student will be able to Analyze the concepts of heat transfer with phase change and condensation along with heat exchangers. |
| | | CO5 | student will be able to Interpret the knowledge about radiation mode of heat transfer |
| R2032032 | Design of Machine Members-II | CO1 | Student will be able to Apply knowledge about the design of bearings. |
| | | CO2 | Student will be able to Explain the concepts in designing various engine parts. |
| | | CO3 | Student will be able to Utilize the knowledge to design curved beams and power screws. |
| | | CO4 | Student will be able to Justify power transmission systems and to design pulleys and gear drives. |
| | | CO5 | Student will be able to Apply the concepts in designing various machine tool elements. |
| R2032033 | INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING | CO1 | Student will be able to Discuss basic concepts of artificial intelligence, neural networks and genetic algorithms. |
| | | CO2 | Student will be able to Apply the principles of knowledge representation and reasoning. |
| | | CO3 | Student will be able to Learn about bayesian and computational learning and machine learning. |
| | | CO4 | Student will be able to Utilize various machine learning techniques. |
| | | CO5 | Student will be able to Apply the machine learning analytics and deep learning techniques. |
| R203203A | AUTOMOBILE ENGINEERING (PE-2) | CO1 | Student will be able to Discuss various components of four wheeler automobile. |
| | | CO2 | Student will be able to Apply the knowledge of different parts of transmission system. |
| | | CO3 | Student will be able to Judge about steering and suspension systems. |
| | | CO4 | Student will be able to Justify the braking system and electrical system used in automobiles. |
| | | CO5 | Student will be able to Analyze the concepts about engine specifications and service, safety and electronic system used in automobiles |
| R203201E | ELEMENTS OF CIVIL ENGINEERING(OE-2) | CO1 | Student will be able to basics of Civil Engineering concepts. |
| | | CO2 | Student will be able to the surveying the elevations and mapping. |

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| | | CO3 | Student will be able to the construction materials and elements. |
| | | CO4 | Student will be able to water resource development. |
| | | CO5 | Student will be able to overall infrastructure development. |
| R2032034 | HEAT TRANSFER LAB | CO1 | Students are expected to learn the concepts and to Determine the heat transfer rate and coefficient. |
| | | CO2 | Students are expected to learn the concepts and to Determine the thermal conductivity, efficiency and effectiveness. |
| | | CO3 | Students are expected to learn the concepts and to Determine the emissivity and Stefan-Boltzman constant. |
| | | CO4 | Students are expected to learn the concepts and to Determine critical heat flux and investigate Lambert's cosine law. |
| | | CO5 | Students are expected to learn the concepts and to Experiment with Virtual labs and analyse conduction, HT coefficient |
| | | C06 | Students are expected to learn the concepts and to Experiment with Virtual labs and investigate Lambert's laws. |
| R2032035 | CAE & CAM Lab | CO1 | Students are expected to learn the concepts and should be able to Experiment with trusses and beams to determine stress, deflection, natural frequencies, harmonic analysis, HT analysis and buckling analysis. |
| | | CO2 | Students are expected to learn the concepts and should be able to Create part programmes using FANUC controller. |
| | | CO3 | Students are expected to learn the concepts and should be able to Apply G-codes for automated tool path using CAM software. |
| | | C04 | Students are expected to learn the concepts and should be able to Analyze about rapid prototyping machine and to print simple parts. |
| | | C05 | Students are expected to learn the concepts and should be able to Experiment with virtual 3D printing simulation using V labs |
| R2032036 | Measurements & Metrology lab | C01 | Student will be able to Demonstrate the calibration experiments with different gauges, transducers, thermocouple and temperature detector. |
| | | C02 | Demonstrate the calibration experiments with rotameter, seismic apparatus. |
| | | C03 | Demonstrate the calibration experiments with vernier calipers, micrometer, height and dial gauges. |
| | | C04 | Analyze various machine tools for their alignment. |
| | | C05 | Measure angular and taper measurements, straightness, surface roughness |
| R2032037 | Artificial Intelligence and | C01 | At the end of the course, student will be able to apply the knowledge of artificial intelligence and machine learning models along with image |

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| | Machine Learning Lab | | classifiers and automatic facial recognition using various software tools. |
| R2032038 | Research Methodology and IPR | C01 | Student will be able to Understand objectives and characteristics of a research problem. |
| | | C02 | Student will be able to Analyze research related information and to follow research ethics. |
| | | C03 | Student will be able to Understand the types of intellectual property rights. |
| | | C04 | Student will be able to Learn about the scope of IPR. |
| | | C05 | student will be able to Understand the new developments in IPR. |

| Course Code | Course Name | | Course Outcomes |
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| | | IV-I | |
| R2041011 | Universal Human Values: Understanding Harmony | CO1 | Students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. |
| | | CO2 | They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). |
| | | CO3 | It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. |
| | | CO4 | This is only an introductory foundational input. It would be desirable to follow it up by a) faculty-student or mentor-mentee programs throughout their time with the institution b) Higher level courses on human values in every aspect of living. E.g. as a professional |
| R204103C | UNCONVENTIONAL MACHINING PROCESSES (PE-3) | CO1 | Student will be able to Understand the concepts of modern machining processes. |
| | | CO2 | Student will be able to Learn the principles of ultrasonic machining. |
| | | CO3 | Student will be able to Apply the principles and procedure of electro chemical and chemical machining processes. |
| | | CO4 | Student will be able to Apply the principles and procedure of thermal metal removal processes. |
| | | C05 | Student will be able to Illustrate the principles and procedure of electron beam machining, laser beam machining and plasma machining. |
| R204103H | POWER PLANT ENGINEERING (PE-4) | CO1 | Student will be able to Identify the different components of the steam power plant for power production. |
| | | CO2 | Student will be able to Illustrate the component used in the diesel and gas power plant for power production. |
| | | CO3 | Student will be able to Understand how the power is produced by hydro-electric and nuclear power plants. |
| | | CO4 | Student will be able to Interpret the power production by combined power plants and operating principles of different instruments used in power plants. |
| | | C05 | Student will be able to Analyze power plant economics and implementation of pollution |

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| | | | | standards and control of pollution caused by the power plants. |
| R204103Q | NON DESTRUCTIVE EVALUATION (PE-5) | CO1 | | Student will be able to Understand the concepts of various NDE techniques and the requirements of radiographytechniques and safety aspects. CO2: CO3: CO4: CO5: |
| | | CO2 | | Student will be able to Interpret the principles and procedure of ultrasonic testing (BL-2). |
| | | CO3 | | Student will be able to Understand the principles and procedure of Liquid penetration and eddy current testing. |
| | | CO4 | | Student will be able to Illustrate the principles and procedure of Magnetic particle testing. |
| | | C05 | | Student will be able to Interpret the principles and procedure of infrared testing and thermal testing. |
| R204101V | DISASTER MANAGEMENT(OE-3) | CO1 | | students will be able to Affirm the usefulness of integrating management principles in disaster mitigation work b. c. d. |
| | | CO2 | | Students will be able to Distinguish between the different approaches needed to manage pre- during and post- disaster periods. |
| | | CO3 | | Students will be able to Explain the process of risk management. |
| | | CO4 | | Students will be able to Relate to risk transfer. |
| R204101R | ENVIRONMENTAL MANAGEMENT(OE-4) | CO1 | | Students will be able to a. Plan and design the water and wastewater systems. |
| | | CO2 | | Students will be able Identify the source of emissions and select proper control systems. |
| | | CO3 | | Students will be able Design & estimation of water supply system for a city. |
| | | CO4 | | Students will be able to get knowledge about various environmental aspects. |
| | | C05 | | Students will be able Selection of suitable treatment flow for raw water treatments. |
| R204103Y | Mechatronics Lab | CO1 | | Student will be able to Understand the Characteristics of LVDT |
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| | | CO2 | | Student will be able to Measure load, displacement and temperature using analogue and digital sensors. |
| | | CO3 | | Student will be able to Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts. |
| | | CO4 | | Student will be able to Simulate and analyze PID controllers for a physical system using MATLAB. |
| | | CO5 | | Student will be able to Develop pneumatic and hydraulic circuits using Automaton studio. |

| Course Code | Course Name | Course Outcomes | |
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| | | **IV-II** | |
| R2042031 | Project work | CO1 | The purpose of Project in Mechanical Engineering is to develop the necessary knowledge, understanding Practical knowedlege |
| | | CO2 | Demonstrated the ability to analyze, design and improve practical thermal and/or mechanical systems. |
| | | CO3 | To understand the mechanical behavior of understanding of designing process by gating data from actual project. |
| | | CO4 | Shown the ability to communicate effectively and work well on team based engineering projects |
| | | CO5 | Mechanical Engineering plays a vital role in the various field like thermal, production, design etc |

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