# ADITYA COLLEGE OF ENGINEERING

Approved by AICTE, Permanently Affiliated to JNTUK & Accredited by NAAC
Recognized by UGC under Sections 2(f) and 12(B) of UGC Act, 1956
Aditya Nagar, ADB Road, Surampalem - 533 437, E.G.Dist., Ph: 99631 76662.


## Course Outcomes

The institution hasadopted OBE approach and accordingly Programme Educational Objectives (PEOs), Programme outcomes (POs), Programme Specific Outcome (PSOs) andCourse outcomes (COs) are developed. Curriculum plan with deployment strategies will be prepared and implemented to attain the outcomes. The following table lists the course outcomes for the courses developed for the curriculum being implemented from the academic year 2016-17.

| SUBJECT NAME | CO | COURSE OUTCOMES – R16 |
|---|---|---|
| MATHEMATICS-I | CO1 | Applying the theory of differential equations to the real world problem |
| | CO2 | Classify types of matrix and find the solutions of system of equations |
| | CO3 | Find the Eigen values and Eigen vectors which come across under linear transformations |
| | CO4 | Determine the extreme values of functions of two variables with/without constraints |
| | CO5 | Solve linear and non-linear first order partial differential equations |
| ENGINEERING CHEMISTRY | CO1 | Illustrate the knowledge of water treatment and its advanced techniques applicable at industrial and domestic levels with regard to environmental concern |
| | CO2 | Categorize the basic types of electrodes, batteries, fuel cells based on the concept of electro chemistry with the importance of electrochemical series and $P^H$ evaluations |
| | CO3 | Develop interest about polymers and unique polymeric materials with outstanding applications as a function of their properties. |
| | CO4 | Relate the various fuels and fuel composition with their synthetic methods, analysis and importance |

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| | CO5 | Importance of exclusive properties and applications of engineering materials like cement, refractories, lubricants and composite with significance |
| ENGINEERING PHYSICS-I | CO1 | Understanding the interaction of light with matter through interference and diffraction |
| | CO2 | Summarizing the light phenomenon of polarization and various types of lasing systems |
| | CO3 | Applying laws of light propagation through the optical fibers. |
| | CO4 | Distinguishing the various crystal systems and their structures. |
| | CO5 | Analyzing the various crystal imperfections through XRD methods |
| BASIC ELECTRICAL AND ELECTRONICS ENGINEERING | CO1 | Understand the concept of basic circuit parameters, network reduction techniques and single phase circuits |
| | CO2 | Apply the reduction techniques to solve various DC and AC circuits |
| | CO3 | To identify and characterize diodes and various types of transistors |
| | CO4 | Analyze the BJT characteristics and biasing circuits. |
| | CO5 | Design and analyze the FET characteristics and biasing circuits. |
| PROFESSIONAL COMMUNICATION IN ENGLISH | CO1 | To Read and relate with a variety of texts critically and proficiently. |
| | CO2 | To Comprehend and respond appropriately by using Communicative English in Professional contexts. |
| | CO3 | To Apply different strategies for writing different types of texts, both literary and non literary texts. |
| | CO4 | To Analyze behaviour and attitudes appropriately and set goals for progress for continuous learning. |
| | CO5 | To develop study skills and communication skills in formal and informal situations |
| ENGINEERING MECHANICS | CO1 | Understand the significance of resolution of forces & moments for a given system. |
| | CO2 | Analyze the friction for the moving bodies on different planes. |
| | CO3 | Identify the centroid & second moment of area for the given bodies. |
| | CO4 | Summarize global environmental problems and come out with best possible solutions. |
| | CO5 | Define the problems on kinetics with the help of their principles. |
| ENGINEERING PHYSICS – II | CO1 | Understanding Quantum mechanical behavior of particles |
| | CO2 | Remembering the basic concepts of semiconductor , formation and application of P-N junctions |
| | CO3 | Illustration of various Dielectric properties of materials |
| | CO4 | Application of Magnetic materials in engineering and technology |
| | CO5 | Analyzing the properties and characterization of Nano materials |
| MATHEMATICS-II | CO1 | Apply Laplace transform techniques for solving differential equations |

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| | CO2 | Evaluate integrals using Beta and Gamma functions |
| | CO3 | Find areas, volumes, moment of inertia etc of regions on a plane or in space |
| | CO4 | Discuss the physical quantities involved in engineering field related to the vector valued functions |
| | CO5 | Analyze the basic properties of vector valued functions and their applications to line, surface and volume integrals |
| MATHEMATICS-III | CO1 | Classify the types of random variables and calculate mean and variance. |
| | CO2 | Find mean proportions and variance of sampling distributions and to make important decisions for few samples which are taken from a large data. |
| | CO3 | Solve the tests of ANOVA for classified data. |
| | CO4 | Evaluate the root of a given equations and solution of system of equations |
| | CO5 | Analyze the numerical solutions for a given first order initial value problem |
| COMPUTER PROGRAMMING | CO1 | Develop algorithms and flowcharts for solving mathematical and engineering problems. |
| | CO2 | Define basic terminologies of C programming. |
| | CO3 | Develop programs involving decision structures, loops and functions. |
| | CO4 | Illustrate structured data types and the concept of arrays in simple data processing applications. |
| | CO5 | Understand static and dynamic memory allocation. |
| ENGINEERING GRAPHICS | CO1 | Define the conventions and methods of engineering drawing. |
| | CO2 | Demonstrate drafting practices, visualization and projection skills useful for Conveying ideas, design and production of components and assemblies in engineering Applications. |
| | CO3 | Determine the basic sketching techniques for projecting solids. |
| | CO4 | Analyze the problem to architectural and develop the surfaces. |
| | CO5 | Developing the orthographic and pictorial views of a given engineering component |
| ELECTRONIC DEVICES AND CIRCUITS | CO1 | Understand the basic concepts of semiconductor physics. |
| | CO2 | 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. |
| | CO3 | Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons. |
| | CO4 | Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations. |
| | CO5 | Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with |

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| | | necessary expressions. |
| | CO6 | Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations. |
| SWITCHING THEORY AND LOGIC DESIGN | CO1 | Interpret numeric information in different representations. |
| | CO2 | Illustrate Logic expressions using Boolean algebra. |
| | CO3 | Minimize the given Switching functions using K-Map & Tabular minimization methods. |
| | CO4 | Develop combinational logic circuits as per the given specifications. |
| | CO5 | Build Programmable Logic Devices & Basic Flip-flops. |
| | CO6 | Classify Counters and Finite State Machines using Flip-flops. |
| SIGNALS & SYSTEMS | CO1 | Characterize the signals and systems and principles of vector spaces, Concept of orthgonality. |
| | CO2 | Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform. |
| | CO3 | Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back. |
| | CO4 | Understand the relationships among the various representations of LTI systems |
| | CO5 | Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships. |
| | CO6 | Apply z-transform to analyze discrete-time signals and systems. |
| NETWORK ANALYSIS | CO1 | gain the knowledge on basic network elements. |
| | 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. |
| RANDOM VARIABLES & STOCHASTIC PROCESSES | CO1 | Mathematically model the random phenomena and solve simple probabilistic problems. |
| | CO2 | Identify different types of random variables and compute statistical averages of these random variables. |
| | CO3 | Characterize the random processes in the time and frequency domains. |
| | CO4 | Analyze the LTI systems with random inputs. |
| | CO5 | Apply these techniques to analyze the systems in the presence of different types of noise. |

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| MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS | CO1 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. |
| | CO2 | One 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. |
| | CO3 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. |
| NETWORKS & ELECTRICAL TECHNOLOGY LAB | CO1 | Able to analyse RLC circuits and understand resonant frequency and Q-factor. |
| | CO2 | Able to determine first order RC/RL networks of periodic non- sinusoidal waveforms. |
| | CO3 | Able to apply network theorems to analyze the electrical network. |
| | CO4 | Able to describe the performance of dc shunt machine. |
| | CO5 | Able to investigate the performance of 1-phase transformer. |
| | CO6 | Able to perform tests on 3-phase induction motor and alternator to determine their performance characteristic |
| ELECTRONIC CIRCUIT ANALYSIS | CO1 | Design and analysis of small signal high frequency transistor amplifier using BJT and FET. |
| | CO2 | Design and analysis of multi stage 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 |
| 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 in time-domain and frequency domain are introduced. |
| | CO3 | Control systems 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. |
| EM 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 |
| | 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 the expressions for input impedance of transmission lines |

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| DIGITAL COMMUNICATIONS | CO1 | Determine the performance of different waveform coding techniques for the generation and digital representation of the signals. |
| | CO2 | Determine the probability of error for various digital modulation schemes |
| | CO3 | Analyze different source coding techniques |
| | CO4 | Compute and analyze different error control coding schemes for the reliable transmission of digital information over the channel. |
| ANTENNA AND WAVE PROPAGATION | CO1 | Identify basic antenna parameters. |
| | CO2 | Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and microstrip 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 |
| PROFESSIONAL ETHICSAND HUMAN VALUES | CO1 | It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties. |
| | CO2 | It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively. |
| 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 |
| MICROPROCESSORS AND MICROCONTROLLERS | CO1 | Illustrate the basic concepts of microprocessors. |
| | CO2 | Demonstrate the basic concepts of interfacing memory and peripheral devices to a microprocessor. |
| | CO3 | Explain different advanced microprocessor architectures. |
| | CO4 | Develop the internal architecture of microcontroller systems, including counters, timers, ports, and memory |

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| | CO5 | Explain the working of PIC microcontroller and its programming. |
| VLSI DESIGN | CO1 | Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon. |
| | CO2 | Know three sets of design rules with which nMOS and CMOS designs may be fabricated. |
| | CO3 | Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon. |
| DIGITAL SIGNAL PROCESSING | CO1 | Apply the difference equations concept in the anayziation 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 Multirate Processing concepts in various applications(eg: Design of phase shifters, Interfacing of digital systems...) |
| | CO6 | Apply the signal processing concepts on DSP Processor. |
| OOPS THROUGH JAVA OPEN ELECTIVE | CO1 | Understand Java programming concepts and utilize Java Graphical User Interface in Program writing. |
| | CO2 | Write, compile, execute and troubleshoot Java programming for networking concepts. |
| | CO3 | Build Java Application for distributed environment. |
| | CO4 | Design and Develop multi-tier application |
| DATA MINING OPEN ELECTIVE | CO1 | Understand stages in building a Data Warehouse |
| | CO2 | Understand the need and importance of preprocessing techniques |
| | CO3 | Understand the need and importance of Similarity and dissimilarity techniques |
| | CO4 | Analyze and evaluate performance of algorithms for Association Rules. |
| | CO5 | Analyze Classification and Clustering algorithms |
| INDUSTRIAL ROBOTICS OPEN ELECTIVE | CO1 | Identify various robot configuration and components. |
| | CO2 | Select appropriate actuators and sensors for a robot based on specific application |
| | CO3 | Carry out kinematic and dynamic analysis for simple serial kinematic chains |
| | CO4 | Perform trajectory planning for a manipulator by avoiding obstacles. |
| POWER ELECTRONICS (Open Elective) | CO1 | Explain the characteristics of various power semiconductor devices and analyse the static and dynamic characteristics of SCR's. |
| | CO2 | Design firing circuits for SCR. |

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| | CO3 | Able to explain the operation of single phase half wave and full–wave converters |
| | CO4 | Analyse the operation of different types of DC-DC converters. |
| | CO5 | Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation. |
| | CO6 | Analyse the operation of AC-AC converters. |
| | CO7 | Able to explain switch mode power supplies operation and control |
| ARTIFICIAL NEURAL NETWORKS OPEN ELECTIVE | CO1 | This Course introduces Artificial Neural Networks and Learning Rules and Learning methods |
| | CO2 | Feed forward and Feedback Neural Networks are introduced |
| | CO3 | Applications of Neural Networks in different areas are introduced |
| RADAR SYSTEMS | CO1 | Derive the radar range equation and to solve some analytical problems. |
| | 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. |
| 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 | Analyze pseudo and fullcolor image processing technique |
| COMPUTER NETWORKS | CO1 | Understand OSI and TCP/IP models |
| | CO2 | Analyze MAC layer protocols and LAN technologies |
| | CO3 | Design applications using internet protocols |
| | CO4 | Understand routing and congestion control algorithms |
| | CO5 | Understand how internet works |
| 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. |
| | CO4 | Choose the optical cables for better communication with minimum losses Design, build, and demonstrate optical fiber experiments in the laboratory. |

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| ELECTRONIC SWITCHING SYSTEMS (Elective- I) | CO1 | Evaluate the time and space parameters of a switched signal |
| | CO2 | Establish the digital signal path in time and space, between two terminals |
| | CO3 | Evaluate the inherent facilities within the system to test some of the SLIC, CODEC and digital switch functions. |
| | CO4 | Investigate the traffic capacity of the system. |
| | CO5 | Evaluate methods of collecting traffic data. |
| | CO6 | Evaluate the method of interconnecting two separate digital switches. |
| EMBEDDED SYSTEMS ELECTIVE - II | CO1 | Understand the basic concepts of an embedded 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. |
| ANALOG IC DESIGN ELECTIVE - II | CO1 | Understand the concepts of MOS Devices and Modeling. |
| | CO2 | Design and analyze any Analog Circuits in real time applications. |
| | CO3 | Extend the Analog Circuit Design to Different Applications in Real Time. |
| | CO4 | Understand of Open-Loop Comparators and Different Types of Oscillators. |
| NETWORK SECURITY AND CRYPTOGRAPHY ELECTIVE - II | CO1 | To be familiarity with information security awareness and a clear understanding of its importance. |
| | CO2 | To master fundamentals of secret and public cryptography |
| | CO3 | To master protocols for security services |
| | CO4 | To be familiar with network security threats and countermeasures |
| | CO5 | To be familiar with network security designs using available secure solutions (such asPGP, • SSL, IPSec, etc) |
| CELLULAR AND MOBILE COMMUNICATIONS | 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 concepts of handoff and architectures of various cellular 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 |

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| SATELLITE COMMUNICATIONS | 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. |
| DIGITAL IC DESIGN ELECTIVE-III | 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. |
| OPERATING SYSTEMS ELECTIVE-III | CO1 | Design various Scheduling algorithms. |
| | CO2 | Apply the principles of concurrency. |
| | CO3 | Design deadlock, prevention and avoidance algorithms. |
| | CO4 | Compare and contrast various memory management schemes. |
| | CO5 | Design and Implement a prototype file systems. |
| | CO6 | Perform administrative tasks on Linux Servers |
| | CO7 | Introduction to Android Operating System Internals |
| STATISTICS WITH R PROGRAMMING | CO1 | List motivation for learning a programming language |
| | CO2 | Access online resources for R and import new function packages into the R workspace |
| | CO3 | Import, review, manipulate and summarize data-sets in R |
| | CO4 | Explore data-sets to create testable hypotheses and identify appropriate statistical tests |
| | CO5 | Perform appropriate statistical tests using R Create and edit visualizations |
| MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE | CO1 | Student will be able to demonstrate skills in solving mathematical problems |
| | CO2 | Student will be able to comprehend mathematical principles and logic |
| | CO3 | Student will be able to demonstrate knowledge of mathematical modeling and proficiency in using mathematical software |
| | CO4 | Student will be able to manipulate and analyze data numerically and/or graphically using appropriate Software |
| | CO5 | Student will be able to communicate effectively mathematical ideas/results verbally or in writing |
| DIGITAL LOGIC DESIGN | CO1 | An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. |

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| | 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 | An ability to define the other minimization methods for any number of variables Variable Entered Mapping (VEM) and Quine-McCluskey (QM) Techniques and perform an algorithmic reduction of logic functions. |
| PYTHON PROGRAMMING | CO1 | Making Software easily right out of the box. |
| | CO2 | Experience with an interpreted Language |
| | CO3 | To build software for real needs |
| | CO4 | Prior Introduction to testing software |
| DATA STRUCTURES THROUGH C++ | CO1 | Distinguish between procedures and object oriented programming. |
| | CO2 | Apply advanced data structure strategies for exploring complex data structures |
| | CO3 | Compare and contrast various data structures and design techniques in the area of Performance |
| | CO4 | Implement data structure algorithms through C++. • Incorporate data structures into the applications such as binary search trees, AVL and B Trees |
| | CO5 | Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs |
| COMPUTER GRAPHICS | 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 |
| SOFTWARE ENGINEERING | CO1 | Define and develop a software project from requirement gathering to implementation. |
| | CO2 | Obtain knowledge about principles and practices of software engineering |
| | CO3 | Focus on the fundamentals of modeling a software project |
| | CO4 | Obtain knowledge about estimation and maintenance of software systems |
| JAVA PROGRAMMING | CO1 | Understand Java programming concepts and utilize Java Graphical User Interface in Program writing. |
| | CO2 | Write, compile, execute and troubleshoot Java programming for networking concepts |
| | CO3 | Build Java Application for distributed environment |
| | CO4 | Design and Develop multi-tier applications. |
| | CO5 | Identify and Analyze Enterprise applications |
| ADVANCED DATA STRUCTURES | CO1 | Be able to understand and apply amortised analysis on data structures, including binary search trees, mergable heaps, and disjoint sets. |

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| | CO2 | Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primality testing, max flow, discrete Fourier transform |
| | CO3 | Have an idea of applications of algorithms in a variety of areas, including linear programming and duality, string matching, game-theory |
| COMPUTER ORGANIZATION | CO1 | Students can understand the architecture of modern computer. |
| | 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 | Understanding of how a computer performs arithmetic operation of positive and negative numbers. |
| FORMAL LANGUAGE AND AUTOMATA THEORY | CO1 | Classify machines by their power to recognize languages. |
| | CO2 | Employ finite state machines to solve problems in computing. |
| | CO3 | Explain deterministic and non-deterministic machines. |
| | CO4 | Comprehend the hierarchy of problems arising in the computer science |
| PRINCIPLES OF PROGRAMMING LANGUAGES | CO1 | Describe syntax and semantics of programming languages |
| | CO2 | Explain data, data types, and basic statements of programming languages |
| | CO3 | Design and implement subprogram constructs. Apply object - oriented, concurrency, and event handling programming constructs |
| | CO4 | Develop programs in Scheme, ML, and Prolog |
| | CO5 | Understand and adopt new programming languages |
| ADVANCED DATA STRUCTURES LAB | CO1 | Implement heap and various tree structure like AVL, Red-black, B and Segment trees |
| | CO2 | Solve the problems such as line segment intersection, convex shell and Voronoi diagram |
| COMPILER DESIGN | CO1 | Acquire knowledge in different phases and passes of Compiler, and specifying different types of tokens by lexical analyzer, and also able to use the Compiler tools like LEX, YACC, etc. |
| | CO2 | Parser and its types i.e. Top-down and Bottom-up parsers. |
| | CO3 | Construction of LL, SLR, CLR and LALR parse table. |
| | CO4 | Syntax directed translation, synthesized and inherited attributes. |
| | CO5 | Techniques for code optimization. |


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| UNIX PROGRAMMING | CO1 | Documentation will demonstrate good organization and readability. |
| | CO2 | File processing projects will require data organization, problem solving and research. |
| | CO3 | Scripts and programs will demonstrate simple effective user interfaces. |
| | CO4 | Scripts and programs will demonstrate effective use of structured programming. |
| | CO5 | Scripts and programs will be accompanied by printed output demonstrating completion of a test plan. |
| | CO6 | Testing will demonstrate both black and glass box testing strategies. |
| | CO7 | Project work will involve group participation. |
| OBJECT ORIENTED ANALYSIS AND DESIGN USING UML | CO1 | Ability to find solutions to the complex problems using object oriented approach |
| | CO2 | Represent classes, responsibilities and states using UML notation |
| | CO3 | Identify classes and responsibilities of the problem domain |
| 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 f or database design. |
| | CO4 | Examine issues in data storage and query processing and can formulate appropriate solutions. |
| | CO5 | Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage. |
| | CO6 | Design and build database system for a given real world problem |
| OPERATING SYSTEMS | CO1 | Design various Scheduling algorithms. |
| | CO2 | Apply the principles of concurrency. |
| | CO3 | Design deadlock, prevention and avoidance algorithms. |
| | CO4 | Compare and contrast various memory management schemes. |
| | CO5 | Design and Implement a prototype file systems. |
| | CO6 | Perform administrative tasks on Linux Servers |
| | CO7 | Introduction to Android Operating System Internals |
| UNIFIED MODELING LAB | CO1 | Understand the Case studies and design the Model. |
| | CO2 | Understand how design patterns solve design problems. |

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| | CO3 | Develop design solutions using creational patterns. |
| OPERATING SYSTEM & LINUX PROGRAMMING 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 |
| | CO6 | Will be able to implement algorithms to solve data mining problems using weka tool |
| DATABASE MANAGEMENT SYSTEM LAB | CO1 | Understand, appreciate and effectively explain the underlying concepts of database technologies |
| | CO2 | Design and implement a database schema for a given problem-domain |
| | CO3 | Normalize a database |
| | CO4 | Populate and query a database using SQL DML/DDL commands. |
| | CO5 | Declare and enforce integrity constraints on a database using a state-of-the-artRDBMS |
| | CO6 | Programming PL/SQL including stored procedures, stored functions, cursors, packages. |
| | CO7 | Design and build a GUI application using a 4GL |
| PROFESSIONAL ETHICS & HUMAN VALUES | CO1 | It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties. |
| | CO2 | It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively. |
| COMPUTER NETWORKS | CO1 | Understand OSI and TCP/IP models |
| | CO2 | Analyze MAC layer protocols and LAN technologies |
| | CO3 | Design applications using internet protocols |
| | CO4 | Understand routing and congestion control algorithms |
| | CO5 | Understand how internet works |
| DATA WAREHOUSING AND MINING | CO1 | Understand stages in building a Data Warehouse |
| | CO2 | Understand the need and importance of preprocessing techniques |
| | CO3 | Understand the need and importance of Similarity and dissimilarity techniques |
| | CO4 | Understand the need and importance of Similarity and dissimilarity techniques |

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| | CO5 | Analyze Classification and Clustering algorithms |
| DESIGN AND ANALYSIS OF ALGORITHMS | CO1 | Argue the correctness of algorithms using inductive proofs and invariants. |
| | CO2 | Analyze worst-case running times of algorithms using asymptotic analysis. |
| | CO3 | Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of vide and-conquer algorithms. |
| | CO4 | Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms. and analyze them. |
| | CO5 | Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them. |
| Software Testing Methodologies | CO1 | Understand the basic testing procedures. |
| | CO2 | Able to support in generating test cases and test suites. |
| | CO3 | Able to test the applications manually by applying different testing methods and automation tools. |
| | CO4 | Apply tools to resolve the problems in Real time environment. |
| Artificial Intelligence | CO1 | Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem. |
| | CO2 | Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc). |
| | CO3 | Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming). |
| | CO4 | Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports. |
| Internet of Things | CO1 | Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things |
| | CO2 | Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things |

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| | CO3 | Develop critical thinking skills |
| | CO4 | Compare and contrast the threat environment based on industry and/or device type |
| Cyber Security | CO1 | Cyber Security architecture principles |
| | CO2 | Identifying System and application security threats and vulnerabilities |
| | CO3 | Identifying different classes of attacks |
| | CO4 | Cyber Security incidents to apply appropriate response |
| | CO5 | Describing risk management processes and practices |
| | CO6 | Evaluation of decision making outcomes of Cyber Security scenarios |
| Digital Signal Processing | CO1 | an ability to apply knowledge of Mathematics, science, and engineering |
| | CO2 | an ability to design and conduct experiments and interpret data |
| | CO3 | an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety,manufacturability, and sustainability |
| | CO4 | an ability to function as part of a multi-disciplinary team |
| EMBEDDED SYSTEMS | CO1 | Program an embedded system |
| | CO2 | Design, implement and test an embedded system. |
| | CO3 | Identify the unique characteristics of real-time systems |
| | CO4 | Explain the general structure of a real-time system |
| | CO5 | Define the unique design problems and challenges of real-time systems |
| ROBOTICS | CO1 | The Student must be able to design automatic manufacturing cells with robotic control using |
| | CO2 | The principle behind robotic drive system, end effectors, sensor, machine vision robot Kinematics and programming. |
| Network Programming Lab | CO1 | Understand and explain the basic concepts of Grid Computing; |
| | CO2 | Explain the advantages of using Grid Computing within a given environment; |
| | CO3 | Prepare for any upcoming Grid deployments and be able to get started with a potentially available Grid setup. |
| | CO4 | Discuss some of the enabling technologies e.g. high-speed links and storage area networks. |
| | CO5 | Build computer grids. |
| Software Testing Lab | CO1 | Find practical solutions to the problems |

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| | CO2 | Solve specific problems alone or in teams |
| | CO3 | Manage a project from beginning to end |
| | CO4 | Work independently as well as in teams |
| Data Warehousing and Mining Lab | CO1 | The data mining process and important issues around data cleaning, pre-processing and integration. |
| | CO2 | The principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.. |
| IPR & Patents | CO1 | IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents. |
| | CO2 | Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements. |
| CRYPTOGRAPHY AND NETWORK SECURITY | CO1 | To be familiarity with information security awareness and a clear understanding of its importance. |
| | CO2 | To master fundamentals of secret and public cryptography |
| | CO3 | To master protocols for security services |
| | CO4 | To be familiar with network security threats and countermeasures |
| | CO5 | To be familiar with network security designs using available secure solutions (suchasPGP,SSL, IPSec, etc) |
| WEB TECHNOLOGIES | CO1 | Analyze a web page and identify its elements and attributes. |
| | CO2 | Create web pages using XHTML and Cascading Styles sheets. |
| | CO3 | Build dynamic web pages |
| | CO4 | Build web applications using PHP |
| | CO5 | Programming through PERL and Ruby,<br>Write simple client-side scripts using AJAX. |
| MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to all Branches) | CO1 | One 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. |
| | CO2 | The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs. |
| | CO3 | The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision |

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| BIG DATA ANALYTICS (Elective - 1) | CO1 | Preparing for data summarization, query, and analysis. |
| | CO2 | Applying data modeling techniques to large data sets |
| | CO3 | Creating applications for Big Data analytics |
| | CO4 | Building a complete business data analytic solution |
| INFORMATION RETRIEVAL SYSTEMS (Elective - 1) | CO1 | Identify basic theories in information retrieval systems |
| | CO2 | Identify the analysis tools as they apply to information retrieval systems |
| | CO3 | Understands the problems solved in current IR systems, Describes the advantages of current IR systems. |
| | CO4 | Understand the difficulty of representing and retrieving documents. |
| | CO5 | Understand the latest technologies for linking, describing and searching the web. |
| MOBILE COMPUTING (Elective - 1) | CO1 | Able to think and develop new mobile application. |
| | CO2 | Able to take any new technical issue related to this new paradigm and come up with a solution(s). |
| | CO3 | Able to develop new ad hoc network applications and/or algorithms/protocols. |
| | CO4 | Able to understand & develop any existing or new protocol related to mobile environment |
| CLOUD COMPUTING | CO1 | Understanding the key dimensions of the challenge of Cloud Computing |
| | CO2 | Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization |
| | CO3 | Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications. |
| | CO4 | Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas |
| SOFTWARE PROJECT MANAGEMENT (Elective - 2) | CO1 | To match organizational needs to the most effective software development model |
| | CO2 | To understand the basic concepts and issues of software project management, To effectively Planning the software projects |
| | CO3 | To implement the project plans through managing people, communications and change, To select and employ mechanisms for tracking the software projects |
| | CO4 | To conduct activities necessary to successfully complete and close the Software projects |

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| | CO5 | To develop the skills for tracking and controlling software deliverables, To create project plans that address real-world management challenges |
| SCRIPTING LANGUAGES (Elective - 2) | CO1 | To master the theory behind scripting and its relationship to classic programming. |
| | CO2 | To survey many of the modern and way cool language features that show up frequently in scripting languages. |
| | CO3 | To gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages. |
| | CO4 | To design and implement one's own scripting language. |
| WEB TECHNOLOGIES LAB | CO1 | Students will be able to develop static web sites using XHTML and Java Scripts |
| | CO2 | To implement XML and XSLT for web applications |
| | CO3 | Develop Dynamic web content using Java Servlets and JSP |
| | CO4 | To develop JDBC connections and implement a complete Dynamic web application |
| DISTRIBUTED SYSTEMS | CO1 | Develop a familiarity with distributed file systems. |
| | CO2 | Describe important characteristics of distributed systems and the salient architectural features of such systems. |
| | CO3 | Describe the features and applications of important standard protocols which are used in distributed systems. |
| | CO4 | Gaining practical experience of inter-process communication in a distributed environment |
| MANAGEMENT SCIENCE | CO1 | After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior. |
| | CO2 | Will familiarize with the concepts of functional management project management and strategic management. |
| MACHINE LEARNING | CO1 | Recognize the characteristics of machine learning that make it useful to real-world and Problems. |
| | CO2 | Characterize machine learning algorithms as supervised, semi-supervised, and Unsupervised. |
| | CO3 | Have heard of a few machine learning toolboxes, Be able to use support vector machines. |
| | CO4 | Be able to use regularized regression algorithms. |
| | CO5 | Understand the concept behind neural networks for learning non-linear functions. |
| CONCURRENT AND PARALLEL PROGRAMMING (Elective - 3) | CO1 | Understanding improvement of CPP concepts presented |
| | CO2 | The number of reinforcement–exercises assigned |
| | CO3 | The time required for the resolution of exercises |

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| | CO4 | Compliance level with the new model of theoretical teaching |
| ARTIFICIAL NEURAL NETWORKS (Elective-3) | CO1 | This course has been designed to offer as a graduate-level/ final year undergraduate level elective subject to the students of any branch of engineering/ science, having basic foundations of matrix algebra, calculus and preferably (not essential) with a basic knowledge of optimization. |
| | CO2 | Students and researchers desirous of working on pattern recognition and classification, regression and interpolation from sparse observations; control and optimization are expected to find this course useful. |
| | CO3 | The course covers theories and usage of artificial neural networks (ANN) for problems pertaining to classification/unsupervised) and regression. |
| | CO4 | The course starts with some mathematical foundations and the structures of artificial neurons, which mimics biological neurons in a grossly scaled down version. It offers mathematical basis of learning mechanisms through ANN. |
| | CO5 | The course introducesperceptrons, discusses its capabilities and limitations as a pattern classifier and later develops concepts of multilayer perceptrons with back propagation learning. |
| OPERATION RESEARCH (Elective - 3) | CO1 | Methodology of Operations Research. |
| | CO2 | Linear programming: solving methods, duality, and sensitivity analysis. |
| | CO3 | Integer Programming.Network flows. |
| | CO4 | Multi-criteria decision techniques. |
| | CO5 | Decision making under uncertainty and risk, Game theory. Dynamic programming. |
| Strength of Materilas-1 | 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 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. |
| BUILDING MATERIALS AND CONSTRUCTION | CO1 | The student should be able to identify different building materials and their importance in building construction. |
| | CO2 | The student is expected to differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions. |
| | CO3 | The student should have learnt the importance of building components and finishings. |

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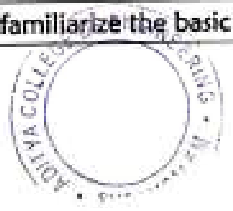
| | CO4 | The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction. |
| SURVEYING | CO1 | To demonstrate the basic surveying skills |
| | CO2 | To perform different methods of surveying |
| | CO3 | To compute various data required for various methods of surveying. |
| | CO4 | To integrate the knowledge and produce topographical map. |
| FLUID MECHANICS | CO1 | Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics. |
| | CO2 | Calculate the forces that act on submerged planes and curves. |
| | CO3 | Identify and analyse various types of fluid flows. |
| | CO4 | 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. |
| | CO5 | Draw simple hydraulic and energy gradient lines. |
| | CO6 | Measure the quantities of fluid flowing in pipes, tanks and channels. |
| BUILDING PLANNING AND DRAWING | CO1 | Upon successful completion of the course: |
| | CO2 | Student should be able to plan various buildings as per the building by-laws. |
| | CO3 | The student should be able to distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings |
| | CO4 | The student is expected to learn the skills of drawing building elements and plan the buildings as per requirements |
| 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 asses stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions |
| | CO3 | The student will be able to assess forces in different types of trusses used in construction. |
| 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. |
| CONCRETE TECHNOLOGY | CO1 | understand the basic concepts of concrete. |
| | CO2 | realize the importance of quality of concrete. |
| | CO3 | familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour in the |



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| | | field. |
| | CO4 | test the fresh concrete properties and the hardened concrete properties. |
| | CO5 | evaluate the ingredients of concrete through lab test results. design the concrete mix by BIS method. |
| | CO6 | familiarize the basic concepts of special concrete and their production and applications. understand the behaviour of concrete in various environments. |
| STRUCTURAL ANALYSIS - I | CO1 | Distinguish between the determinate and indeterminate structures. |
| | CO2 | Identify the behaviour 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 moving 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. |
| TRANSPORTATION ENGINEERING – I | 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 |
| | CO5 | Construct and maintain highways |
| MANAGEMENT SCIENCE | CO1 | After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior. |
| | CO2 | Will familiarize with the concepts of functional management project management and strategic management. |
| ENGINEERING GEOLOGY | CO1 | Identify and classify the geological minerals |
| | CO2 | Measure the rock strengths of various rocks |
| | 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 |
| | C06 | Analyses the ground conditions through geophysical surveys. |
| | CO7 | Test the geological material and ground to check the suitability of civil engineering project construction. |
| | CO8 | Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc... |


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| STRUCTURAL ANALYSIS – II | CO1 | Differentiate Determinate and Indeterminate Structures |
| | CO2 | Carryout lateral Load analysis of structures |
| | CO3 | Analyze Cable and Suspension Bridge structures |
| | CO4 | Analyze structures using Moment Distribution, Kani's Method and Matrix methods |
| DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES | CO1 | Work on different types of design philosophies |
| | 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 |
| TRANSPORTATION ENGINEERING – II | CO1 | Design geometrics in a railway track. |
| | CO2 | Design airport geometrics and airfield pavements |
| | CO3 | Plan, construct and maintain Docks and Harbours. |
| DESIGN AND DRAWING OF STEEL STRUCTURES | 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 |
| GEOTECHNICAL ENGINEERING – I | CO1 | The student must know the definition of the various parameters 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. |
| ENVIRONMENTAL ENGINEERING – I | CO1 | Plan and design the water and distribution networks and sewerage systems |
| | CO2 | Identify the water source and select proper intake structure |
| | CO3 | Characterisation of water |
| | CO4 | Characterisation of water |
| | CO5 | Select the appropriate appurtenances in the water supply |

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| | CO6 | Selection of suitable treatment flow for raw water treatments |
| WATER RESOURCES ENGINEERING–I | CO1 | have a thorough understanding of the theories and principles governing the hydrologic processes, |
| | CO2 | be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects |
| | CO3 | develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures. |
| | CO4 | e able to develop design storms and carry out frequency analysis |
| | CO5 | be able to determine storage capacity and life of reservoirs. |
| | CO6 | develop unit hydrograph and synthetic hydrograph |
| | CO7 | be able to estimate flood magnitude and carry out flood routing. |
| | CO8 | be able to determine aquifer parameters and yield of wells. |
| | CO9 | be able to model hydrologic processes |
| WASTE WATER MANAGEMENT OPEN ELECTIVE | CO1 | Plan and design the sewerage systems |
| | CO2 | Characterization of sewage |
| | CO3 | Select the appropriate appurtenances in the sewerage systems |
| | CO4 | Select the suitable treatment flow for sewage treatment |
| | CO5 | Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river |
| ENVIRONMENTAL ENGINEERING -II | CO1 | Plan and design the sewerage systems |
| | CO2 | Select the appropriate appurtenances in the sewerage systems |
| | CO3 | Analyze sewage and suggest and design suitable treatment system for sewage treatment |
| | CO4 | Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river |
| | C05 | Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river |
| WATER RESOURCES ENGINEERING–II | CO1 | estimate irrigation water requirements |
| | CO2 | design irrigation canals and canal network |
| | CO3 | plan an irrigation system |
| | CO4 | design irrigation canal structures |

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| | CO5 | plan and design diversion head works |
| | CO6 | analyse stability of gravity and earth dams |
| | CO7 | design ogee spillways and energy dissipation works |
| 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 to decide the size of the foundation. |
| | CO3 | The student must be able to compute the magnitude of foundation settlement to decide the size of the foundation. |
| | CO4 | The student must be able to design Piles based on the principles of bearing capacity. |
| REMOTE SENSING AND GIS APPLICATIONS | 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 in water resources engineering |
| | CO5 | applications of various satellite data |
| 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. |
| | 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 Geosynthetics and their applications in Civil Engineering practice |
| | CO4 | The student should be able to understand the concepts and applications of grouting. |
| ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT | CO1 | Prepare EMP, EIS, and EIA report |
| | CO2 | Identify the risks and impacts of a project |
| | CO3 | Selection of an appropriate EIA methodology |
| | CO4 | Evaluation the EIA report |
| | CO5 | Estimate the cost benefit ratio of a project |
| | CO6 | Know the role of stakeholder and public hearing in the preparation of EIA |
| ESTIMATION SPECIFICATION & CONTRACTS | CO1 | The student should be able to determine the quantities of different components of buildings. |

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| | 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. |
| CONSTRUCTION TECHNOLOGY AND MANAGEMENT | CO1 | appreciate the importance of construction planning |
| | CO2 | understand the functioning of various earth moving equipment |
| | CO3 | know the methods of production of aggregate products and concreting and usage of machinery required for the works. |
| | CO4 | apply the gained knowledge to project management and construction techniques |
| PRESTRESSED CONCRETE | CO1 | Understand the different methods of prestressing |
| | CO2 | Estimate effective prestress including the short and long term losses |
| | CO3 | Analyze and design prestressed concrete beams under flexure and shear |
| | CO4 | Understand the relevant IS Codal provisions for prestressed concrete |
| SOLID AND HAZARDOUS WASTE MANAGEMENT | CO1 | Design the collection systems of solid waste of a town |
| | CO2 | Design treatment of municipal solid waste and landfill |
| | CO3 | Know the criteria for selection of landfill |
| | CO4 | Characterize the solid waste and design a composting facility |
| | CO5 | Know the Method of treatment and disposal of Hazardous wastes. |

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Approved by AICTE, Permanently Affiliated to JNTUK & Accredited by NAAC
Recognized by UGC under Sections 2(f) and 12(B) of UGC Act, 1956
Aditya Nagar, ADB Road, Surampalem - 533 437, E.G.Dist., Ph: 99631 76662.


## Course Outcomes

The institution hasadopted OBE approach and accordingly Programme Educational Objectives (PEOs), Programme outcomes (POs), Programme Specific Outcome (PSOs) andCourse outcomes (COs) are developed. Curriculum plan with deployment strategies will be prepared and implemented to attain the outcomes. The following table lists the course outcomes for the courses developed for the curriculum being implemented from the academic year 2019-20.

| SUBJECT NAME | CO | COURSE OUTCOMES – R19 |
|---|---|---|
| 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 (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 ) |

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| APPLIED CHEMISTRY (BS1106) | CO1 | Outline the properties of polymers and various additives added and different methods of forming plastic materials.<br>Explain the preparation, properties and applications of some plastic materials.<br>Interpret the mechanism of conduction in conducting polymers .<br>Discuss natural and synthetic rubbers and their applications. |
| | CO2 | Explain the theory of construction of battery and fuel cells.<br>Categorize the reasons for corrosion and study some methods of corrosion control. |
| | CO3 | Understand the importance of materials like nanomaterials and fullerenes and their uses.<br>Understand liquid crystals and superconductors.<br>Understand the preparation of semiconductors. |
| | CO4 | Obtain the knowledge of computational chemistry<br>Understand importance molecular machines |
| | CO5 | Understand the principles of different analytical instruments.<br>Explain the different applications of analytical instruments.<br>Design sources of energy by different natural sources. |
| PROGRAMMING FOR PROBLEM SOLVING USING C (ES1101) | CO1 | Acquires skills to write, compile and debug programs in C language. |
| | CO2 | Be able to use different operators, data types and write programs that use two-way/ multi-way selection. |
| | CO3 | Acquire knowledge to select the best loop construct for a given problem. |
| | CO4 | Design and implements programs to analyze the different pointer applications |
| | CO5 | Design and implements C programs with functions, File I/O operations |
| ENGINEERING DRAWING (ES1103) | CO1 | The student will learn how to visualize 2D & 3D objects. |
| APPLIED CHEMISTRY LAB (BS1107) | 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 | 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. |


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| (ES1102) | CO5 | Able to trace and debug a program |
| MATHEMATICS - II (BS1202) | 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 approximating the 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 to its analytical computations (L3) |
| MATHEMATICS - III (BS1203) | 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 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) |
| APPLIED PHYSICS (BS1204) | CO1 | Explain the need of coherent sources and the conditions for sustained interference.<br>Analyze the differences between interference and diffraction with applications.<br>Illustrate the resolving power of various optical instruments. |
| | CO2 | Explain the fundamental concepts of quantum mechanics.<br>Analyze the physical significance of wave function.<br>Apply Schrödinger's wave equation for energy values of a free particle . |
| | CO3 | Explain the various electron theories.<br>Calculate the Fermi energy.<br>Analyze the physical significance of wave function .<br>Interpret the effects of temperature on Fermi Dirac distribution function.<br>Summarise various types of solids based on band theory. |
| | CO4 | Classify the energy bands of semiconductors.<br>Outline the properties of n-type and p-type semiconductors.<br>Identify the type of semiconductor using Hall effect. |


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| | CO5 | explain the concept of polarization in dielectric materials.<br>Summarize various types of polarization of dielectrics .<br>Interpret Lorentz field and Claussius- Mosotti relation in dielectrics.<br>Classify the magnetic materials based on susceptibility and their temperature dependence.<br>Explain the applications of dielectric and magnetic materials .<br>Apply the concept of magnetism to magnetic devices. |
| NETWORK ANALYSIS (ES1209) | CO1 | Gain the knowledge on basic network elements. |
| | 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 (ES1211) | 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 a 3-phase induction motor and understand starting methods of 3-phase induction motor. |
| | CO4 | Able to explain the operation of Synchronous Machines |
| | CO5 | Capability to understand the operation of various special machines. |
| BASIC ELECTRICAL ENGINEERING LAB (ES1208) | CO1 | Determine and predetermine the performance of DC machines and transformers. |
| | CO2 | Control the DC shunt machines. |
| | CO3 | Compute the performance of 1-phase transformer. |
| | CO4 | Perform tests on 3-phase induction motor and alternator to determine their performance characteristics. |

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## Course Outcomes (R20)

**AY: 2020-21**

| COURSE NAME WITH CODE | | COURSE OUTCOMES |
|---|---|---|
| COMMUNICATIVE ENGLISH C111 | CO1 | Understand past culture, tradition, speaking English in real life situations, identify kinds of nouns |
| | CO2 | Recall Nehru's intention in his letter to Indira Priyadarshini, answering a series of questions, greetings and leave takings, articles, prepositions |
| | CO3 | Recognize Stephen Hacking's contribution, his life and goals, speaking, writing letters on various contexts , writing cover letters, CVs, E-mail etiquette |
| | CO4 | Understand Wangari Maathai's hardwork, Role plays for academic conversations, understand. permissions, requesting, Inviting. |
| | CO5 | Understand formal oral presentations writing academic proposals, research articles, Technical Vocabulary |
| | CO6 | Understand the importance of soft skills, comprehend Scientific and Technical English |
| MATHEMATICS-1 C112 | CO1 | Discuss the Ratio test and Mean value theorems |
| | CO2 | Solve First order Linear differential equations |
| | CO3 | Solve the Higher order non-homogeneous Differential Equations |
| | CO4 | Model physical phenomina of LCR series circuit and Simple Hormonic Motion. |
| | CO5 | Determine the extreme values for the function of two variables. |
| | CO6 | Compute double and triple integrals to find Area and Volume. |
| APPLIED CHEMISTRY C113 | CO1 | Explain about fabrication of plastic and recycling of e waste. |
| | CO2 | Explain types of batteries and control methods of corrosion. |
| | CO3 | Determine the preparation of Non elemental semiconducting materials |
| | CO4 | Determine the synthesis of nano materials and its applications. |

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| | CO5 | Analyse spectroscopic instrumentations and compare sources of energy. |
| | CO6 | Discuss molecular machines and molecular motors |
| PROGRAMMING FOR PROBLEM SOLVING USING C C114 | CO1 | To Discuss machine language with the help of numbering system and recognize variables, statements and storage classes to write a program |
| | CO2 | To Predict the problem solution using decision statements and loops |
| | CO3 | To Classify the data by storing data in the formats of arrays structures and unions |
| | CO4 | To Analyse applications of pointers to access values of memory locations through address and variable |
| | CO5 | To Subdivide the problem into functions |
| | CO6 | To Operate data in file information using file operations |
| ENGINEERING DRAWING C115 | CO1 | **Understand** the knowledge of basic geometries, geometric tools, and procedures used in engineering drawing. |
| | CO2 | **Draw** simple curves of ellipse, cycloid and involutes. |
| | CO3 | **Construct** projections of points, straight lines & planes inclined to one or both the planes. |
| | CO4 | **Construct** Projections of planes inclined to one or both the planes. |
| | CO5 | **Construct** projection of solids on different orientations |
| | CO6 | **Transform** multi-views to isometric views and vice-versa |
| ENGLISH COMMUNICATION SKILLS LABORAORY C116 | CO1 | Identify 44 sounds of language and develop correct pronunciation learning Phonetics |
| | CO2 | Demonstrate language functions: LSRW Skills |
| | CO3 | Develop and practice correct accent, intonation, and rhythm to get acquaintance with language. |
| | CO4 | Develop speaking skills through participation in activities and vocabulary |
| APPLIED CHEMISTRY LAB C117 | CO1 | Explain volumetric analysis with different indicators |
| | CO2 | Calculate the Hardness of water by EDTA |
| | CO3 | Determine the concentration of acids by using different instruments |
| | CO4 | Analyse the quantity of ions in organic solutions |
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| PROGRAMMING FOR PROBLEM SOLVING USING C C118 | CO1 | Knowledge on various concepts of C language. |
| | CO2 | Draw flowcharts and write algorithms. |
| | CO3 | Design and development of C problem solving skills |
| | CO4 | Design and develop modular programming skills |

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