

ADITYA COLLEGE OF ENGINEERING

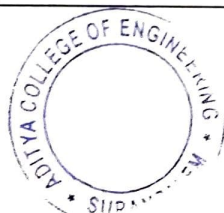
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Course Outcomes

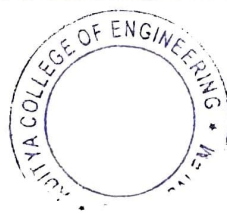
The institution has adopted OBE approach and accordingly Programme Educational Objectives (PEOs), Programme outcomes (POs), Programme Specific Outcome (PSOs) and Course outcomes (COs) are developed. Curriculum plan with deployment strategies will be prepared and implemented to attain the outcomes. The 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



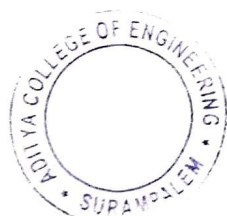

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	CO2	Evaluate integrals using Beta and Gamma functions
	CO3	Find areas, volumes, moment of inertia etc of regions on a plane or in space
	CO4	Discuss the physical quantities involved in engineering field related to the vector valued functions
	CO5	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 orthogonality.
	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.

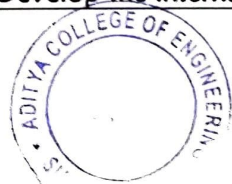



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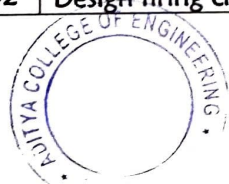
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	CO1	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
	CO2	One is also 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



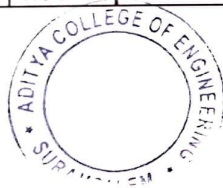
DIGITAL COMMUNICATIONS	CO1	Determine the performance of different waveform coding techniques for the generation and digital representation of the signals.
	CO2	Determine the probability of error for various digital modulation schemes
	CO3	Analyze different source coding techniques
	CO4	Compute and analyze 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 ETHICS AND HUMAN VALUES	CO1	It gives a comprehensive understanding of a variety of 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



	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 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 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.

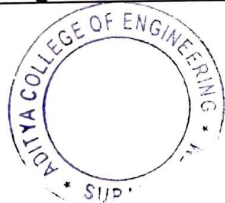



	CO3	Able to explain the operation of single phase half wave and full-wave converters
	CO4	Analyse the operation of different types of DC-DC converters.
	CO5	Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
	CO6	Analyse the operation of AC-AC converters.
	CO7	Able to explain switch mode power supplies operation and control
	CO1	This Course introduces Artificial Neural Networks and Learning Rules and Learning methods
	CO2	Feed forward and Feedback Neural Networks are introduced
ARTIFICIAL NEURAL NETWORKS OPEN ELECTIVE	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.



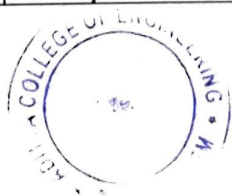

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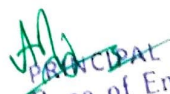
ELECTRONIC SWITCHING SYSTEMS (Elective- I)	CO1	Evaluate the time and space parameters of a switched signal
	CO2	Establish the digital signal path in time and space, between two terminals
	CO3	Evaluate the inherent facilities within the system to test some of the SLIC, CODEC and digital switch functions.
	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



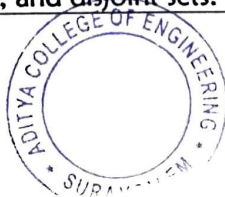

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SATELLITE COMMUNICATIONS	CO1	Understand the concepts, applications and subsystems of Satellite communications.
	CO2	Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
	CO3	Understand the various types 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.



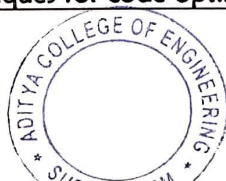

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	CO2	An ability to understand the different switching algebra theorems and apply them for logic functions.
	CO3	An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
	CO4	An ability to define 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.



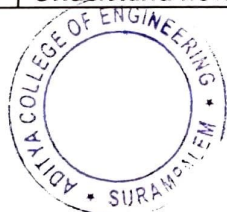
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	CO2	Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primality testing, max flow, discrete Fourier transform
	CO3	Have an idea of applications of algorithms in a variety of areas, including linear programming 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 for 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/DDDL 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 divide-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, 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



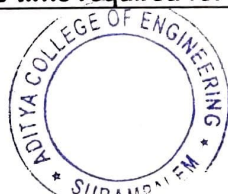

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		making
BIG DATA ANALYTICS (Elective - 1)	CO1	Preparing for data summarization, query, and analysis.
	CO2	Applying data modeling techniques to large data sets
	CO3	Creating applications for Big Data analytics
	CO4	Building a complete business data 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



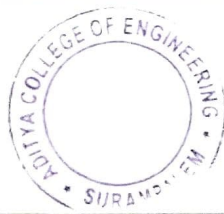
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	CO5	To develop the skills for tracking and controlling software deliverables, To create project plans that address real-world management challenges
SCRIPTING LANGUAGES (Elective - 2)	CO1	To master the theory behind scripting and its relationship to 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



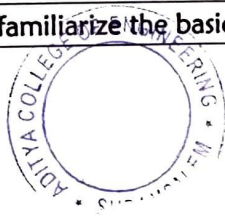

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	CO4	Compliance level with the new model of theoretical teaching
ARTIFICIAL NEURAL NETWORKS (Elective-3)	CO1	This course has been designed to offer as a graduate-level/ final year undergraduate level elective subject to the students of any branch of 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 introduces perceptrons, 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 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 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.



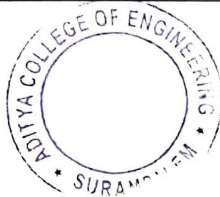

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	CO4	The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction.
SURVEYING	CO1	To demonstrate the basic surveying skills
	CO2	To perform different methods of surveying
	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 assess 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



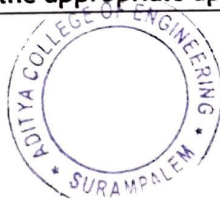
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	field.
	CO4 test the fresh concrete properties and the hardened concrete properties.
	CO5 evaluate the ingredients of concrete through lab test results. design the concrete mix by BIS method.
	CO6 familiarize the basic concepts of special concrete 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
	CO6 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



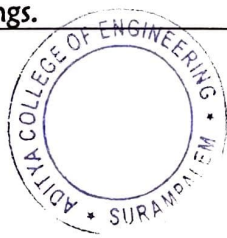

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WATER RESOURCES ENGINEERING-I	CO6	Selection of suitable treatment flow for raw water treatments
	CO1	have a thorough understanding of the theories and principles governing the hydrologic processes,
	CO2	be able to quantify major hydrologic components 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
	CO5	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



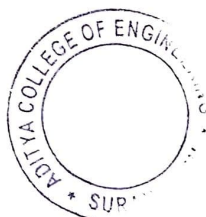

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	CO5	plan and design diversion head works
	CO6	analyse stability of gravity and earth dams
	CO7	design ogee spillways and energy dissipation works
GEOTECHNICAL ENGINEERING - II	CO1	The student must be able to understand the various types of shallow 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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