

SESHADRI RAO GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)

Seshadri Rao Knowledge Village, Gudlavalleru – 521356

Krishna District, Andhra Pradesh



Program and Course Outcomes

R-20**CE**

S.No.	Course Name	Course Outcomes
1	Functional English	CO1. listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately;
		CO2. speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture;
		CO3. reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes;
		CO4. writing for academic purposes (e.g. assignments, examination answers) in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately;
		CO5. To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.
2	Linear Algebra and Calculus	CO1. To understand the procedure to solve the system of linear equations.
		CO2. To know the method for finding eigenvalues and eigenvectors.
		CO3. To familiar with the knowledge of differential calculus to support their concurrent and subsequent engineering studies.
		CO4. To know how to find maxima and/or minima for a given surface
		CO5. To understand the methods to evaluate areas and volumes using integrals.
3	Engineering Physics	CO1. To Impart the concept of periodic motion
		CO2. To apply principles of optics for engineering applications.
		CO3. To explore various NDT using ultrasonic's
		CO4. To characterize sound propagation in buildings
4	Problem Solving Using C	CO1. To emphasize the use of flowcharts and pseudo code in problem solving.
		CO2. To apply C Programming in problem solving.
		CO1. To highlight the significance of universal language of engineers

5	Engineering Graphics	CO2. To introduce the concepts of drawing 3-D objects in 2-D planes.
		CO3. To impart computer aided drafting skills.
6	Functional English Lab	CO1. Functional English (Lab) seeks to develop in the students the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English
		CO2. It seeks to develop in them a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.
7	Engineering Physics Lab	relate with the theoretical studies.
		CO2. To impart skills in measurements.
		CO3. To design and plan the experimental procedure and to record and process the results.
8	Environmental Studies	CO1. To impart the basic knowledge about the environment and ecology.
		CO2. To develop an attitude of concern for biodiversity and its conservation
		CO3. To create awareness on environmental pollution and waste management.
9	Professional Communication	CO1. To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length and complexity.
		CO2. To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication.
10	Integral Transforms and Vector Calculus	CO1. To gain the knowledge of Laplace and inverse transforms.
		CO2. To understand the concepts of Fourier series and Fourier Transforms
		CO3. To know about vector differentiation and integration.
11	Engineering Chemistry	CO1. To impart the knowledge of bonding in molecules, adsorption, electrochemistry, corrosion and its prevention.
		CO2. To impart the knowledge of water treatment, green chemistry, manufacture and setting of cement, nano materials and spectroscopic techniques.
		CO1. To impart the basic concepts of force systems, free body diagrams and equilibrium conditions.

12	Applied Mechanics	CO2. To introduce the concept of friction and virtual work principle and to familiarize on calculating the geometric properties like centroid, centre of gravity and moment of inertia of various sectional areas and masses.
		CO3. To develop the knowledge on basic principles of kinematics and kinetics with simple applications.
		CO4. To introduce applications on using work-energy principle and Impulse momentum methods.
13	Universal Human Values 2: Understanding Harmony	CO1. To help students understand the need, basic guidelines, content and process of value education
		CO2. To help students initiate a process of dialog with in themselves to know what they really want to be in their life and profession.
		CO3. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
		CO4. To understand the harmony in nature and existence
		CO5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.
14	Professional Communication Lab	CO1. Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.
15	Engineering Chemistry Lab	CO1. To develop the skill on chemical and instrumental methods of analysis.
		CO2. To acquire the skill in preparation of synthetic materials.
16	Applied Mechanics Lab & Building Trade Practice	CO1. To impart knowledge on basic engineering applications.
		CO2. To impart hands-on training on basic engineering trades.
17	Constitution of India	CO1. To impart knowledge on basic engineering applications
		CO2. To enable the student to understand the importance of constitution.
		CO3. To understand the structure of Executive, Legislature and Judiciary.
		CO4. To understand Philosophy of fundamental rights and duties.
		CO5. To understand the autonomous nature of constitution bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India

		CO6. To understand the Central and State relation, financial and administrative.
18	Building Materials and Building Construction	CO1. To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
		CO2. To impart the knowledge of building components, finishings
19	Elements of Mechanical and Electrical Engineering	CO1. To familiarize with the basic concepts of transmission systems, machine tools and internal combustion engines
		CO2. To introduce the basic concepts of electrical circuits.
		CO3. To familiarize with the operation of DC machines and Induction Motor.
20	Mechanics of Solids	CO1. Assess the internal properties of materials such as simple stresses, strains, thermal stresses and elastic constants.
		CO2. Derive the flexure equation and evaluate the flexural stresses and determine the principal stresses and apply the energy theorems to beams.
		CO3. Draw shear stress distribution for rectangular, circular, triangular, I, T and angle sections and application of the torsion equation
21	Fluid Mechanics	CO1. To familiarize with static and dynamic aspects of fluids
		CO2. To impart knowledge on laminar flow, turbulent flow and Boundary layer.
		CO3. To introduce the concept of flow through closed conduits and measurement of flow.
22	Surveying	CO1. To make understand the importance of surveying in civil engineering field
		CO2. To create awareness on various types of surveying and their instruments
		setting
23	Engineering Geology & Geospatial Applications	CO1. To understand the importance of Geology for selection of site materials and design of Civil Engineering Projects.
		CO2. To know about the principles of remote sensing and to introduce working principle of GIS and its importance.
		CO3. To impart the knowledge on air-borne and space-based imaging technologies and their working principles.
24	Mechanics of Solids Lab	CO1. To introduce various stress and strain measuring equipment.
		CO2. To familiarize with various physical, mechanical and strength properties of various engineering materials.
25	Survey Field Work	CO1. To familiarize with surveying equipments/instruments like chain, compass, level, theodolite and total station.
		CO2. To impart knowledge on linear and angular measurement

26	Numerical & Statistical Methods	CO1. To introduce the concepts of numerical and statistical methods for solving engineering problems.
27	Structural Analysis	CO1. To impart the knowledge on obtaining the slopes and deflections of determinate beams and to know about the deflection of helical springs.
		CO2. To familiarize with the calculations of crippling loads in columns, struts and the resultant stresses in thin cylinders.
		CO3. To familiarize with the analysis of indeterminate beams by using various methods.
28	Hydraulics & Hydraulic Machines	CO1. To impart knowledge on concepts and the design principles of Uniform and Non-Uniform flow in open channels.
		CO2. To understand the analysis of jet on vanes
		CO3. To familiarize with working and analysis of hydraulic turbines and centrifugal pump.
29	Concrete Technology	CO1. To introduce types, properties and applications of cements and admixtures
		CO2. To build the knowledge on different types of aggregates.
		CO3. To impart knowledge on setting, hardening and rheological characteristics of concretes and to familiarize with BIS method of Mix Design.
30	Python Programming	CO1. To introduce Scripting Language.
		CO2. To explore various problems solving approaches of computer science.
		CO3. To be familiarized with general coding techniques to solve object-oriented programming concepts.
31	Fluid Mechanics & Hydraulic Machines Lab	CO1. To impart the knowledge on flow measurement through closed conduit/tank/ channel.
		CO2. To understand the working principles of various types of hydraulic machines by conducting laboratory experiments
		CO3. To verify the principles of channel flow and to draw the performance curves for various hydraulic machines
32	Concrete Technology Lab	CO1. To develop the skill of testing the building materials like cement & aggregates
		CO2. To impart the knowledge on properties of fresh concrete.
		CO3. To familiarize with the strength properties of hardened Concrete and to introduce the concepts of non-destructive testing.
		CO1. To provide coherent concepts on dynamic loading, earthquake mechanism and earthquake effects.

33	Introduction to Earthquake Engineering	<p>CO2. To introduce concepts on structural dynamics, formation of equation of motion for single and multi-degree freedom systems and obtaining natural frequencies and mode shapes</p> <p>CO3. To impart knowledge on elastic and inelastic analyses against earthquake forces.</p> <p>CO4. To familiarize on base isolation systems, seismic dampers and other special topics related to Earthquake Engineering.</p>
34	Theory of Structures	<p>CO1. To introduce the concept of analyzing the three hinged and two hinged parabolic arches.</p> <p>CO2. To impart knowledge on solving indeterminate structures by Moment distribution method and Kani's method.</p> <p>CO3. To impart knowledge on influence lines and moving loads.</p> <p>CO4. To familiarize with lateral load analysis by using approximate methods and Matrix methods</p>
35	Soil Mechanics	<p>CO1. To impart knowledge on the basic and engineering properties of soils</p> <p>CO2. To familiarize with stress distribution due to self-weight of soils and due to externally applied loads</p>
36	Water and Waste Water Engineering	<p>CO1. To make the students conversant with sources, demand, quality of water, water treatment processes and its design</p> <p>CO2. To provide adequate knowledge on Pumps, conveyance, distribution of water and sewage treatment processes in primary treatment.</p> <p>CO3. To have adequate knowledge about various sewage treatment processes in secondary treatment.</p>
37	Advanced Concrete Technology	<p>CO1. To understand the structure of hydrated cement paste and mechanism of admixtures</p> <p>CO2. To familiarize with the mix design procedure for given grade of concrete.</p> <p>CO3. To impart the knowledge about durability of concrete and special concretes</p>
38	Project Planning & Control	<p>CO1. To define the importance of project management (PM) for construction projects.</p> <p>CO2. To identify the need of economics, management aspects and construction process.</p>
39	Air Pollutions and Control	<p>CO1. To study sources and classification of air pollution and understand fundamentals of meteorology and stability of atmosphere</p> <p>CO2. To learn about the different air pollutants and control</p>

		CO3. To know the air pollution legislation and regulations
40	Advanced Surveying Techniques	CO1. To know the significance of advanced surveying in field measurements in terms of utility and precision of data collection.
		CO2. To learn the principles of Electromagnetic distance measurement and their accuracy.
		CO3. To get introduced to the concept of Topographic, Aerial and project survey
41	Geotechnical Engineering Lab	CO1. To introduce the tests for determining the dry density of soils.
		CO2. To evaluate the engineering properties of the soil.
		CO3. To familiarize with different test procedures for obtaining shear strength of soils.
42	Water and Waste Water Engineering Lab	CO1. To analyze physical, chemical characteristics of water and wastewater
		CO2. To determine optimum dosage of coagulant, and residual chlorine.
		CO3. To estimate organic strength of wastewater
43	Building Drafting Studio Lab	CO1. To analyze physical, chemical characteristics of water and wastewater
		CO2. To define the role of different software that appreciates the drafting process for construction buildings.
		CO3. To familiarize with drafting commands in the software platform that support and complete the drafting of the desired building/elements.
44	Theory of Elasticity and Plasticity	CO1. To determine the stress and strain relations and in Cartesian coordinate systems
		CO2. To solve 2D Cartesian coordinate system using generalized Hooks law and Airy's stress functions.
		CO3. To determine the stress and strain relations and in polar coordinate systems.
		CO4. To solve elementary problems of axi-symetry and 3D Coordinate systems
		CO5. To understand and relate simple plasticity theory concepts.
		CO6. To correlate and apply the theory of elasticity to solve civil engineering solutions
45	Foundation Engineering	CO1. To introduce the soil exploration techniques
		CO2. To familiarize with lateral earth pressure.
		CO3. To impart the knowledge on load carrying capacity of shallow and deep foundations.
	Hydrology and Irrigation	CO1. To study occurrence movement and distribution of water that is a prime resource for development of a civilization.

46	Hydrology and Irrigation Engineering	CO2. To provide an overview and understanding of Unit Hydrograph theory and its analysis.
		CO3. To discuss the relationships between soil, water and plant and their significance in planning an irrigation system
47	Design and Drawing of R C Structural Elements	CO1. To familiarize with the different types of design philosophies and IS:456-2000 provisions.
		CO2. To introduce the concepts of shear, torsion, bond and limit state of collapse and serviceability for analysis and design of structural elements for flexure along with detailing and drawings.
		CO3. To enable the students to learn design of different compression members and footings.
48	Highway Engineering	CO1. To familiarize with different concepts in the field of highway engineering
		CO2. To acquire design principles of highway geometric and pavements
		CO3. To understand causes and types of failures in pavements
49	Finite Element Analysis	CO1. To familiarize with the fundamentals of finite element method.
		CO2. To prepare for solving one dimensional and two-dimensional problems by FEM.
		CO3. To introduce the concepts of axi-symmetric and iso-parametric formulation.
50	Ground Improvement Techniques	CO1. To impart the need of ground improvement techniques in improving the strength parameters of soils.
		CO2. To familiarize with various dewatering methods
		CO3. To introduce the applications of reinforced earth, confinement systems and geo-synthetics.
51	Water Shed Management	CO1. To introduce the concept of watershed management and understand the watershed characteristics
		CO2. To learn the principles of soil erosion and measures to control erosion and to appreciate various water harvesting techniques
		CO3. To learn land management practices for various land use/land cover
52	Solid Waste Management	CO1. To understand sources and characteristics and acquire an understanding reduction, storage, recycling of solid waste.
		CO2. To familiarise the different waste collection systems, transfer and transport, and study the importance of processing techniques
		CO3. To describe different disposal methods
		CO1. To impart the knowledge of aggregate properties and develop testing skills

53	Highway Materials Lab	CO2. To impart the knowledge of bitumen properties and develop testing skills
		CO3. To study the traffic characteristics
54	Structural Engineering Lab	CO1. To develop the drawing skills by using Software
		CO2. To introduce various concepts of non-destructive testing
		CO3. To familiarize with effect of dynamic forces on structures
55	Structural Engineering Lab	CO1. To impart knowledge on degrees of freedom, dynamic loading and ability to formulate dynamic equation of motion and apply them to simple dynamic problems.
		CO2. To introduce the methodology for determining the natural frequencies and mode shapes for un-damped multi-degree freedom systems- Examples on applying up to two-degrees of freedom systems.
		CO3. To create experimental knowledge on spring-mass model, obtaining frequencies and mode shapes using shake table and demonstration of important earthquake tips
56	Engineering Economics and Financial Analysis	CO1. To familiarize with the concepts of Managerial economics and its significance in achieving business objectives
		CO2. To acquire knowledge on basic financial management aspects and develop the skills to analyze financial performance of a business unit.
57	Estimation, Costing and Valuation	CO1. To introduce the concept of estimate, types of estimate and estimating a Work.
		CO2. To build ability of calculating road and canal work quantities.
		CO3. To impart knowledge on different specifications of civil works, rate analysis, contracts and valuation
58	Design and Drawing of Steel Structures	CO1. To familiarize with the types of structural steel sections, Plastic Analysis and IS code provisions.
		CO2. To introduce the principles for design of tension members, compression members and elements of truss using I.S. code.
		CO3. To impart the design aspects of laterally supported beams, unsupported beams and welded plate girder in accordance with I.S. code provisions.
59	Prestressed Concrete Structures	CO1. To familiarize with the concept of prestressing and IS code provisions
		CO2. To impart the knowledge on analysis and losses of prestress
		CO3. To introduce design procedures of pre-stressed concrete members under flexure and shear and Deflection.

60	Advanced Foundation Engineering	CO1. To familiarize with advanced knowledge of foundations in various practices.
		CO2. To understand different foundation practices in difficult soil conditions under different loading conditions.
61	Hydraulic Structures	CO1. To know the principles of design of hydraulic structures on permeable foundations.
		CO2. To familiarize with various types of dams and selection of suitable type depending on site conditions.
		CO3. To impart the knowledge on design criteria of gravity dams and modes of failure.
		CO4. To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators and structures involved in cross drainage works.
62	Industrial Waste Water Treatment	CO1. To know the principles of design of hydraulic structures on permeable foundations.
		CO2. To study Characteristics and primary treatment methods for industrial wastewater.
		CO3. To learn physic-chemical and biological treatment techniques.
		CO4. To understand food and material industries waste treatment.
63	Advanced Designed R C Structure	CO1. To familiarize with the Designs of Flat slabs and retaining walls
		CO2. To understand the loading pattern and design procedure for silos bunkers water tanks.
		CO3. To familiarize with I.R.C loads and their application on designing the R.C Bridges.
64	Construction Technology and Practices	CO1. To be acquainted with different construction practices used in building construction.
		CO2. To familiarize with the various construction equipment used in the construction industry.
65	Earthquake Resistant Design	CO1. To introduce the basics of earthquake & structural dynamics
		CO2. To familiarize with damages of RC buildings due to earthquakes
		CO3. To impart the knowledge of analyzing of earthquake resistant structures and design principles of shear wall.
66	Railways, Harbours and Airport Engineering	CO1. To introduce the basics of earthquake & structural dynamics.
		CO2. To familiarize with various components, functions and design principles of railway track geometry
		CO3. To introduce the basic components of airport and basic runway length

		CO4. To familiarize with the classifications, requirements and components of harbours & docks
67	Repairs, Retrofitting and Rehabilitation of Structures	CO1. To impart the knowledge on maintenance, inspection and assessment of distressed concrete structures.
		CO2. To assess the damage to concrete structures using various tests and strengthen measures.
		CO3. To familiarize with durability aspects, quality of concrete causes of deterioration.
		CO4. To study the various types and properties of repair materials and various precautions during retrofitting.
		CO5. To learn various repair techniques of damaged structures and corroded structures.
68	Precast Concrete Structures	CO1. To impart the knowledge on maintenance, inspection and assessment of distressed concrete structures.
		CO2. To familiarize the concept of precast concrete construction.
		CO3. To impart knowledge on transport, stability and joints in precast concrete structures.
		CO4. To impart the design aspects of various precast elements.
69	Earth Retaining Structures	CO1. To understand the concept on stability of retaining walls
		CO2. To impart knowledge on concepts of sheet piles, braced cuts and cofferdams.
70	Design and Drawing of Irrigation Structures	CO1. To impart design concepts relating to various structures
		CO2. To familiarize in the design and drawing of hydraulic structures such as surplus weir, canal regulator, trapezoidal
71	Computer Applications in Civil Engineering Lab	CO1. To familiarize with programming languages to solve the civil engineering Problems.
		CO2. To introduce the concept of designing structures by using software.
		CO3. To impart the knowledge on Arc GIS software in solving civil engineering Problems.
72	Seismic Resistant Design of Structures	CO1. To familiarize with the damages of RC buildings and masonry buildings due to earthquakes
		CO2. To introduce the concepts on analyzing of earthquake resistant structures
		CO3. To impart knowledge on seismic soil- structure interaction and reliability analysis
EEE		
S.No.	Course Name	Course Outcomes

1	Functional English	CO 1: speak with a reasonable degree of fluency using communication strategies as well conventions of politeness and courtesy
		CO 2: speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing.
		CO3:listen to short audio and video clips .
		CO4:read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meaning.
		CO5: write coherent paragraphs with attention to elements of writing such as content, organization, language, style and mechanics and the conventions of academic writing.
		CO6: write survey reports with attention to conventions of report writing.
		CO7: guard against mistakes Indians typically make in their speech and writing in English.
2	Linear Algebra and Calculus	CO1: solve the system of linear equations in various engineering problems.
		CO2: evaluate the eigenvalues and eigenvectors.
		CO 3: solve linear ordinary differential equations
		CO4: apply the techniques of partial differentiation in optimization problems and solve first order partial differential equations.
		CO5: compute areas and volumes using double and triple integrals
3	Applied Chemistry	CO1: explain the electro chemistry of batteries and sensors
		CO2: discuss various techniques used in making of thin films, properties and applications of nanomaterials
		CO3: explain the properties and applications of polymers used in making of electronic devices
		CO4:solve the numerical problems on hardness of water, discuss the boiler troubles and explain water treatment methods and their significance in industry and daily life
		CO5: interpret the spectral data to analyse the structure of simple molecules
4	Problem Solving Using C	CO 1: Outline problem solving steps and solve sample problems.
		CO 2: Use control statements for writing the programs.
		CO 3: Apply the concepts of arrays, strings and pointers in problem solving.
		CO 4: Decompose a problem into functions to develop modular reusable code.
		CO 5: Use structures and files for efficient handling of data.

5	Universal Human Values 2: Understanding Harmony	CO1:be aware of themselves and surroundings
		CO2:be responsible in life
		CO3:develop personality to be happy continuously and prosper
		CO4:handle the problems with sustainable solutions
		CO5:possess human nature in mind
		CO6:apply what they have learnt to their own self in real life situations
6	Functional English Lab	CO1:give short impromptu speeches with confidence and fluency.
		CO2: take part in conversations in different functional contexts using English following appropriate communication strategies.
		CO3:use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English.
		CO4: articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy.
		CO 5:check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
		CO6: pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication.
		CO7: speak English with adequate attention to stress, rhythm, and intonation.
		CO 8:speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.
7	Applied Chemistry Lab	CO1: perform quantitative analysis by using chemical and instrumental methods.
		CO2: operate the pH meter, conductivity meter for analyzing the water quality.
		CO3: analyze the corrosion rate of a given metal in a given environment by gravimetric method.
		CO4: prepare printed circuit board by electroless plating.
		CO5: synthesize polymers and obtain cell potential by construction of an electrochemical cell.
		CO1: understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties

8	Constitution Of India	CO2: understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System.
		CO3: structure of the state government, Secretariat, Governor and Chief Minister and their functions.
		CO4: learn local administration viz. Panchayat, Block, Municipality and Corporation.
		CO5: learn about Election Commission and the process and about SC, ST, OBC and women.
9	Professional Communication	CO1:speak with a reasonable degree of fluency and accuracy in professional communication situations.
		CO2: add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress and intonation.
		CO3:listen to short audio and video clips in native English accent and gain both understanding of messages and sensitivity to native speaker accents.
		CO4:read fluently, comprehending texts of different kinds using multiple strategies and higher-order skills.
		CO5:produce written discourses of different kinds with attention to elements of writing such as content, organization, language, style and mechanics.
		CO6: guard against grammatical errors Indians typically make in their speech and writing in English.
10	Integral Transforms and Vector Calculus	CO1: evaluate improper integrals using Laplace Transforms
		CO2: apply Laplace transforms to find the solutions of initial and boundary value problems
		CO 3: find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems
		CO4: apply the concepts of vector differentiation in their engineering fields
		CO5: verify the relation between line, surface and volume integrals using integral theorems
11	Solid State Physics	CO1: explain construction and working of laser
		CO2: relate the principles of propagation of light in optical fibers for applications in communications
		CO 3: differentiate classical , quantum free electron theories
		CO4: identify conductivity mechanism in semiconductors
		CO5: Interpret polarization in dielectrics and magnetic properties of materials

12	Circuit Theory - I	CO1: apply various circuit laws to analyze the electrical circuits.
		CO2: solve electrical networks using the principles of network topology.
		CO3: analyze the steady state behavior of DC and AC circuits,
		CO4: analyze the behavior of electrical resonance
		CO5: apply network theorems to analyze and design the electrical circuits.
		CO6: apply the concepts of magnetic circuits to various Physical Systems.
13	Discrete Mathematics	CO1 : Verify whether the set of statements gives a valid conclusion or not
		CO2 : Draw Hasse diagram and verify whether a given lattice is distributive or modular
		CO3 : Analyse different types of the algebraic structures
		CO4: Use the concepts of graph theory in analysing electrical circuits
		CO5 : Solve the recurrence relations
14	Engineering Drawing	CO1: construct polygons and conic sections.
		CO: draw projections of points, lines, planes and solids in different positions.
		CO3: draw orthographic and isometric views of different parts.
15	Professional Communication Lab	CO1: enhance the effectiveness of their communication through body language;
		CO2: take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency
		CO3: take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency
		CO4: speak professionally in telephone conversations
		CO5: make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point,
		CO6: take part in group discussions and debates successfully

		<p>CO7: answer questions at an elementary level in job interviews (e.g. Can you tell us something about yourself? What kinds of things do you worry about? What are your key skills? What skills do you need to improve? What do you see as your strengths? What do you like doing in your spare time? How would you describe the way you work? Tell us about a time when you showed strong leadership skills. Tell us about a time when you had to make a difficult decision. How do you see yourself in five years' time?)</p> <p>CO8: use team-building skills with impact in different situations</p>
16	Solid State Physics Lab	<p>CO1: identify the semiconductor from the obtained energy gap and Hall coefficient</p> <p>CO2: draw characteristic curves to estimate thermal coefficient of a thermistor.</p> <p>CO3: verify magnetic field along the axis of a circular coil.</p> <p>CO4: 4. recognize the coercivity and retentivity from B-H curve</p> <p>CO5: determine dielectric constant of a dielectric material</p> <p>CO6: 6. calculate light gathering power of optical fiber and bending losses</p> <p>CO7: estimate wavelength of unknown light source</p>
17	Environmental Studies	<p>CO1: create awareness among the people in protection of environment.</p> <p>CO2: analyze structure and functional attributes of an ecosystem.</p> <p>CO3: explain the values of biodiversity</p> <p>CO4: identify the sources of environmental pollution, assess their effects and suggest suitable control measures.</p> <p>CO5: adopt sustainable waste management practices</p>
18	Python Programming	<p>CO1: solve coding tasks related to fundamental and control statements</p> <p>CO2: design structured programs using functions</p> <p>CO3: differentiate mutable and immutable data types.</p> <p>CO4: understand and apply the concepts of exceptions and file handling.</p> <p>CO5: analyze the importance of object-oriented programming over structured programming</p>
19	Circuit Theory-II	<p>CO1: Evaluate different two port network parameters.</p> <p>CO2: Analyze three phase circuits with both balanced and unbalanced loads.</p> <p>CO3: Analyze the transient behavior of R-L, R-C and R-L-C circuits for different excitations</p>

		CO4: Synthesize the given network using Foster form or Cauer form of realizations
20	Control Systems	CO1: Develop mathematical models for physical systems.
		CO2: Employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
		CO3: Quantify time and frequency domain specifications to determine stability margins.
		CO4: Apply state variable theory to determine the dynamic behavior of linear control systems.
21	DC Machines And Transformers	CO1: enumerate constructional details, principle of operation and the performance of D.C.machines for various operating conditions
		CO2: suggest suitable starting, speed control and testing methods of D.C. motor for various applications
		CO3: describe the operation of single phase and three phase transformers for various operating conditions
		CO4: find the performance specifications of a single-phase and three phase transformer for various loading conditions.
		CO5: select suitable type of single phase and three phase transformers for various applications.
22	Electronics Devices And Circuits	CO1: Identify V-I characteristics of Diodes, BJT, MOSFET
		CO2: analyze the biasing circuits of BJT and MOSFETs.
		CO3: develop small signal models for BJT and MOSFET. □
		CO4: Differentiate various Feedback connection types
		CO5: design oscillator circuits using BJTs
23	Digital Circuits	CO1: perform conversion between different number systems
		CO2: realize Boolean expressions using k-maps
		CO3: design combinational logic circuits.
		CO4: apply different models of Finite State Machines (FSM) for design of synchronous sequential circuits.
		CO5: implement registers and counters using flip-flops.
24	Electronic Devices and Circuits Lab	CO1: Identify various electronic components and basic electronic measuring instruments and other lab equipment
		CO2: Verify the I-V characteristics of junction diode, zener diode, MOSFET, BJT. □
		CO3: Test the Zener voltage as voltage regulator, BJT voltage-divider bias and using it as an amplifier.
		CO4: Verify the functionality of feedback amplifiers and oscillator circuits.
25	Digital Circuits Lab	CO1: apply Boolean laws and K-map to simplify the digital circuits.
		CO2: draw the digital circuits using gate level implementation.
		CO3: demonstrate the flow of Electronic Workbench

		CO4: develop digital circuits using Electronic Workbench
		CO5: make oral presentations and prepare written reports
26	Numerical Methods With Computer Applications	CO1: demonstrate various commands in MATLAB programming
		CO2: apply appropriate numerical technique to find root of an equation through MATLAB
		CO3: Demonstrate the use of interpolation methods , determine approximate derivatives by using appropriate numerical techniques with MATLAB
		CO4: Evaluate integrals ,determine numerical solution of an ODE by using appropriate numerical techniques with MATLAB
		CO5: fit a curve for the given data using MATLAB
27	Induction And Synchronous Machines	CO1: enumerate constructional details, principle of operation and the performance of three-phase and single-phase induction motors
		CO2: suggest various starting/speed control methods of three-phase induction motor for various applications
		CO3: elucidate the construction and operation of synchronous machines
		CO4: determine the performance of synchronous machines under various operating conditions
		CO5: analyze effect of various parameters on the load sharing between alternators in parallel
28	Power Generation Systems	CO1: Describe the working of a thermal power station.
		CO2: Identify different components of a nuclear power station .
		CO3: Illustrate the working principle and operation of hydro and gas power plants
		CO4: Elucidate the process of power generation by solar and wind energy
		CO5: Enumerate various economic aspects of power generation
29	Signals and Systems	CO1: Classify the signals and various operations on signals
		CO2: Perform Fourier analysis on the signals
		CO3: Analyze the various systems
		CO4: Perform correlation operational on signals
		CO5: Apply the various sampling techniques on continuous time signals
		CO6: Analyze the various continuous time signals through transformation (Fourier and Laplace) techniq
		CO1: describe the properties of liquid, gaseous and solid dielectric materials used in electrical applications

30	Electrical Materials	CO2: analyze the properties of Ferro electric, Peizo electric and Pyro electric materials
		CO3: classify different magnetic materials and examine the effects of aging and impurities on magnets
		CO4: elucidate various semiconductor materials and their applications in integrated circuits.
		CO5: choose appropriate material for a given electrical and special purpose application
31	Control Systems Engineering	CO1:Apply the basic concepts, properties of feedback and mathematical modeling of control systems and frequency domain approach to engineering systems.
		CO2:Explore the transfer function analysis using signal flow graph representation of control systems
		CO3:Employ the time domain analysis to quantify the performance of linear control systems to identify suitable controller
		CO4:Perform frequency domain analysis of control systems required for stability analysis
		CO5:Use the concept of state variable theory to determine the dynamic behavior of linear control systems
32	DC Machines And Transformers Lab	CO1:Select the appropriate apparatus for determining the performance of DC machines and transformers based on the capacity experimentally
		CO2:Determine the equivalent circuit parameters of transformers experimentally
		CO3:Compute the performance characteristics of transformers and DC machines through suitable tests.
33	Electrical Circuits Lab	CO1:verify the applicability of network theorems to practical electrical circuits
		CO2:specify and test RLC series and parallel resonant circuits
		CO3:evaluate the two port parameters for a two port network
		CO4:interpret /correlate physical observations and measurements involving electrical circuits to theoretical principles
34	Simulation of Electrical Engineering Systems	CO1:Analyze the behaviour of the passive circuits and verify network theorems using MATLAB.
		CO2: Design and model the electrical systems in simulation environment.
		CO3: Develop electrical systems using MATLAB/SIMULINK Tool
		CO 1: describe the operation and range extension of various types of ammeters and voltmeters

35	Electrical Measurements and Instrumentation	CO 2: describe the operation and range extension of Watt meter, and operation of Energy Meter and its Calibration.
		CO3:determine the parameters of electrical circuits using potentiometer, suitable bridges and also calibrate the measuring instruments
		CO4:select a suitable transducer for measuring non-electrical physical quantities.
		CO5: analyse the operation of various digital meters
36	Power Transmission Systems	CO 1: estimate the inductance for different conductor configurations of transmission lines.
		CO 2: calculate the capacitance of transmission lines for different conductor configurations.
		CO3:determine the performance of short, medium and long transmission lines.
		CO4:select a suitable insulator for given specifications of the line and illustrate the effect of corona.
		CO5: evaluate the sag of a transmission line under the effect of wind and ice.
37	Analog and Digital IC Applications	CO 1: analyze the characteristics of op-amps.
		CO 2: apply op-amps concepts for various applications.
		CO3:understand A to D and D to A Conversion techniques.
		CO4:design various combinational and sequential circuits using MSI ICs.
		CO5: understand different types of memories and timing signals.
38	Electrical Distribution Systems	CO 1: describe various load models in the distribution system
		CO 2: describe the primary feeder ratings and voltage levels of primary feeder
		CO3:design an optimum location of the substation
		CO4:analyze various protective devices in the distribution system for coordination process
		CO5: select appropriate voltage control method in the distribution systems
39	Advanced Control Systems (Professional Elective - I)	CO 1: design a controller for linear systems using frequency dom
		CO 2: develop different canonical forms to examine controllability
		CO3:describe the behaviour of non-linear systems.
		CO4:determine the stability of a given systems using Lypunov's t
		CO5: design a state feedback controller and/or observer.
40	Engineering Electro Magnetics (Professional Elective - I)	CO 1: determine electric field for symmetrical charge configurations.
		CO 2: estimate Potential and capacitance of a parallel plate capacitor with composite dielectrics
		CO3:compute magnetic fields for symmetric current distributions.

		CO4:apply ampere's law to determine magnetic field and compute the self-inductance of solenoid and toroid
		CO5: apply maxwell's equations for time variant fields.
41	Modeling And Simulation Of Engineering Systems	CO 1: create, modify and work with variables and its related operations
		CO 2: develop MATLAB program to solve real time engineering problems.
		CO3:solve and visualize the dynamic performance of engineering systems through MATLAB plotting features.
		CO4:compute and analyze the numerical data of a physical system using advanced features in MATLAB.
		CO5: analyze the performance of physical system using toolboxes and GUI.
42	Control Systems Lab	CO 1: compute the characteristics of d.c. servo motors, a.c. servo motors, synchros.
		CO 2: employ p, pi, pd and pid controllers, lag, lead and lag-lead compensators for process control systems.
		CO3:determine the transfer function of d.c. motor and d.c. generator.
		CO4:verify the truth tables of logic gates, simple boolean expressions using programmable logic controller.
		CO5: apply the programming skills to analyze the behavior of linear control system using MATLAB/Simulink environment.
43	AC Machines Lab	CO 1: estimate the performance of induction motors and synchronous machines.
		CO 2: describe the operational behavior of the induction motor under various loading conditions.
		CO3:determine the parameters of synchronous machine.
		CO4:operate an alternator in parallel with infinite bus bar.
		CO5: find operational characteristics of three phase transformer.
44	Electrical Measurements And Instrumentation Lab	CO 1: develop the fundamental knowledge and demonstrate various electrical measuring instruments.
		CO 2: co-relate the theoretical knowledge with the practical electrical measuring system.
		CO3:standardize various measuring instruments with the help of standard meters.
		CO4:measure unknown values of resistance, inductance and capacitance by balancing the bridges.
		CO5: measure various physical quantities using appropriate transducers.
		MICROPROCESSORS, MICROCONTROLLERS AND ITS
		CO 1: identify a detailed s/w & h/w structure of the microprocessor and microcontroller

		CO 2: illustrate how the different peripherals (8255) are interfaced with Microprocessor
		CO3: design and develop various interfacing circuits with 8086 using 8255
		CO4: develop applications using 8051 microcontroller
		CO5: Illustrate the architecture of ARM processor
45	Power Electronics	CO 1: describe the characteristics of power semiconductor devices.
		CO 2: analyze single phase-controlled converters for different loads
		CO3:analyze three phase-controlled converters for different loads & operation of AC voltage controllers.
		CO4:realize dc-dc converters with and without electrical isolation
		CO5: analyze single phase and three phase inverters for different loads
46	Power System Analysis	CO 1: apply the concept of the per unit system in power system analysis.
		CO 2: formulate and solve the power flow problem of power system.
		CO3:develop and solve the positive, negative, and zero sequence networks for systems consisting of machines, transmission lines and transformers.
		CO4:determine the fault voltages and currents for various faults.
		CO5: analyze the stability of power system under various disturbances.
47	Switch Gear and Protection	CO 1: describe the operating principles of various types of circuit breakers
		CO 2: identify suitable relay for a particular application
		CO3:select an appropriate protection scheme for the protection of generator and transformer
		CO4:apply an appropriate protection scheme for transmission line and bus-bar.
		CO5: Illustrate different operational procedures to protect equipment from over voltages.
48	Electrical and Hybrid Vehicles	CO 1: analyze the impact of electric vehicles on energy, environment and economy
		CO 2: describe different hybrid drive train topologies and their performance
		CO3:analyze various power converter configurations of hybrid electric drives.
		CO4:analyze and suggest possible energy storage systems for different applications.

		CO5: choose the appropriate energy management strategies for various applications
49	Digital Control Systems	CO 1: describe the components of digital control systems.
		CO 2: evaluate the Z- Transforms and mathematical models of linear discrete-time control systems using pulse transfer functions.
		CO3:determine the stability of digital control systems.
		CO4:employ the state-space models and tests for controllability and observability.
		CO5: design a state feedback controller for the desired specifications.
50	Principles of Special Electric Machines	CO 1: describe the constructional and operating principles, control schemes and applications of various types of Stepper Motors.
		CO 2: explain the constructional details, working principles, control practices and applications of Switched Reluctance Motors.
		CO3:analyze the speed-torque characteristics, construction and principle of operation, control techniques and applications of Permanent Magnet Brushless D.C. Motors .
		CO4:acquire the knowledge of operating principles, constructional details and applications of Servomotors and Tachometers.
		CO5: compare the constructional details, principle of operation and applications of various single phase special electrical machines.
51	Electrical Instrumentation	CO 1: analyze various types of signals, and errors in digital instruments.
		CO 2: measure various parameters like amplitude, phase and frequency of a signal using CRO
		CO3:select a suitable transducer working on electrical principles to measure non electrical quantities
		CO4:select a suitable transducer working on non-electrical principles to measure physical parameters
		CO5: analyse the operation of various digital meters
52	Microprocessors, Microcontrollers And Its Applications Lab	CO 1: Acquire the knowledge of assembly language programming using 8086 microprocessor.
		CO 2: Perform various arithmetic and shift operations with 8086 based system.
		CO3:Interface various I/O modules with 8086 based system.
		CO4:Implement various real time applications using 8051.
53	Automation Of Electrical Systems Using IoT /Skill	CO 1: Interface different sensors to Arduino/ Raspberry Pi
		CO 2: Interface Bluetooth to Arduino/ Raspberry Pi and communicate data to Smartphone.

53	Systems Using IoT (Skill Development Course)	CO3: Operate a motor, relay, monitor data and detect faults using IoT. CO4: create servers for IoT applications.
54	Utilization of Electrical Energy	CO 1: describe various electric heating methods. CO 2: identify a suitable welding method for a given application. CO3: design illumination systems for residential, commercial and industrial environments. CO4: analyze various speed time curves of electric traction. CO5: determine the tractive effort, power and specific energy consumption of electric traction.
55	Digital Image Processing (Professional Elective - III)	CO 1: review the fundamental concepts of a digital image processing system. CO 2: evaluate the techniques for image enhancement CO3: differentiate various image restoration techniques. CO4: interpret image segmentation and representation techniques. CO5: categorize various compression techniques
56	Digital Signal Processing (Professional Elective - III)	CO 1: distinguish the signals, perform various operations on signals and process signals in the discrete domain. CO 2: compute the Fourier series coefficients and z-transform of discrete time signals. CO3: apply various transform techniques on discrete time signals. CO4: design IIR filters for a given specifications. CO5: Categorize various windowing techniques to design FIR filters.
57	Principles of VLSI Design (Professional Elective - III)	CO 1: disseminate various IC fabrication technology and various electrical properties of MOS, CMOS and BiCMOS circuits. CO 2: realize various logic circuits using nMOS, CMOS, and BiCMOS logic. CO3: apply scaling models to MOS circuit CO4: design subsystem components using different logic styles in CMOS CO5: construct CMOS static and dynamic circuits
58	CMOS Digital IC Design (Professional Elective - III)	CO 1: characterize the behaviour of CMOS inverter CO 2: design various combinational and sequential circuits using CMOS logic CO3: identify different components contributing to delay offered by interconnects CO4: design complex digital circuits CO5: design memory based array structures.

59	Power System Operation And Control (Professional Elective - IV)	CO 1: evaluate optimal generation schedule with and without losses and to compute loss coefficients and transmission losses
		CO 2: find the solution for short term hydrothermal scheduling problems.
		CO3:determine the steady state changes in frequency in single area load frequency control.
		CO4:determine the steady state changes in frequency in two area load frequency control.
		CO5: suggest suitable voltage control method for different applications.
60	Power Semiconductor Drives (Professional Elective - IV)	CO 1: select an appropriate converter for speed control of dc drive to meet the requirements of application in Industry
		CO 2: describe the operational characteristics of DC drive in all four quadrants.
		CO3:analyze the concepts of Chopper controlled DC drives.
		CO4:select an appropriate speed control method for Induction motor drive to meet the requirements of application in Industry.
		CO5: select an appropriate speed control scheme for Synchronous motor drive to meet the requirements of application in Industry
61	Special Electrical Machines (Professional Elective - IV)	CO 1: demonstrate the knowledge and understanding of constructional details, working principles and control practices and applications of Switched Reluctance Motors
		CO 2: describe the operating principles , constructional details , phasor diagram,voltage ,torque equation and applications of Synchronous Reluctance Motors
		CO3:analyze the speed-torque characteristics , construction and principle of operation ,control and applications of Permanent Magnet Brushless D.C. Motors
		CO4:demonstrate the types of stepper motors ,constructional and operating principles ,control schemes and applications of various Stepper Motors
		CO5: explain the importance of various linear motors , constructional details and principle of operation and applications of linear motors
62	High Voltage Engineering (Professional Elective - V)	CO 1: analyze the behavior of gases, liquid and solid dielectric material under different circumstances.
		CO 2: expound principles of theory of high voltage generation and impulse currents
		CO3:expound principles of theory of measurement of high voltages and currents.
		CO4:identify the testing techniques for high voltage apparatus.

		CO5: apply the high voltage engineering to industry.
63	Flexible Ac Transmission Systems (Professional Elective -V)	CO 1: demonstrate the role of FACTS devices for enhancing power handling capacity in the transmission network. CO 2: apply the knowledge of voltage source converters and / or current converter in FACTS concepts CO3:demonstrate the knowledge of static shunt compensation using various FACTS devices. CO4:describe the operation of SVC and STATCOM CO5: select suitable controller of series compensation
64	Introduction to Artificial Intelligence Techniques (Professional Elective -V)	CO 1: describe fundamental principles of Artificial Intelligent Techniques (AIT). CO 2: explain learning tasks and algorithms for Neural Networks CO3: analyze different architectures of artificial neural networks and/or discuss ANN applications. CO4:create, analyze and work with fuzzy sets. CO5: design fuzzy logic controller for an appropriate system with fuzzy logic components
65	Engineering Economics And Project Management	CO 1: apply managerial economic concepts in business decision making and identify the influencing factors of demand for a product. CO 2: categorize production with respect to time and cost. CO3:relate the market structures and pricing to a product CO4:establish the suitable business organization with available resources. CO5: plan and evaluate a project and also apply network concepts
66	Power Systems Lab	CO 1: Carryout experiments ensuring the safety of equipment and personnel. CO 2: Determine the sub transient reactance of a Salient Pole Machine CO3:Verify the characteristics of the over voltage and over current relay CO4:Plot the characteristics of PV Module in the laboratory environment CO5: Analyze the load flow for a given power system by using Gauss seidel method. CO6: Verify the load frequency control of single area system with and without controller.
67	Power Electronics Lab	CO 1: plot the characteristics of various power semiconductor switches CO 2: trigger the SCR using various methods CO3:analyze and test the operation of simple power electronic circuits

		CO4:operate the given drive in all four quadrants
		CO5: analyze the performance of PWM converter
		CO6: perform closed loop control of DC motor
68	Computer Aided Electrical Drawing	CO 1: draw the circuit diagram of Godown wiring
		CO 2: draw the single line diagrams of substations
		CO3:design the dimensions of the DC machines
		CO4:draw the sectional views and line diagrams of single phase transformers and Induction Machines.
		CO5: draw the transmission tower diagrams

ME

S.No.	Course Name	Course Outcomes
1	Functional English	CO1.listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately;
		CO2. speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture;
		CO3. reading a wide range of informational and functional texts, including coursebooks and reference materials, from print and non-print sources and using them for a variety of purposes; and
		CO4.writing for academic purposes (e.g. assignments, examination answers) in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately; and
		CO5.To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.
2	Linear Algebra and Calculus	CO1.To understand the procedure to solve the system of linear equations
		CO2.To know the method for finding eigenvalues and eigenvectors.
		CO3.To familiar with the knowledge of differential calculus to support their concurrent and subsequent engineering studies.
		CO4.To know how to find maxima and/or minima for a given surface
		CO5.To understand the methods to evaluate areas and volumes using integrals.
3	Physics for Engineers	CO1.To impart the concept of periodic motion.
		CO2.To apply principles of optics for engineering applications

3	Physics for Engineers	CO3.To analyze crystal parameters to investigate crystal structures.
		CO4.To explore various Non Destructive Techniques.
4	Problem Solving Using C	CO1.To emphasize the use of flowcharts and pseudo code in problem solving CO2.To apply C Programming in problem solving
5	Engineering Graphics	CO1.To highlight the significance of universal language of engineers CO2.To introduce the concepts of drawing 3-D objects in 2-D planes. CO3.To impart computer aided drafting skills.
6	Functional English Lab	CO1.Functional English (Lab) seeks to develop in the students the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English; and CO2. It seeks to develop in them a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.
7	Engineering Physics Lab	CO1. To make the students gain practical knowledge to correlate with the theoretical studies CO2. To impart skills in measurements. CO3. To design and plan the experimental procedure and to record and process the results.
8	Environmental Studies (Mandatory Non-Credit Course)	CO1. To impart the basic knowledge about the environment and ecology CO2.To develop an attitude of concern for biodiversity and its conservation CO3. To create awareness on environmental pollution and waste management.
9	Professional Communication	CO1.To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length and complexity. CO2. To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication.
10	Integral Transforms and	CO1. To gain the knowledge of Laplace and inverse transforms To gain the knowledge of Laplace and inverse transforms

10	Vector Calculus	CO2.To understand the concepts of Fourier series and Fourier Transforms CO3:To know about vector differentiation and integration.
11	Chemistry for Engineers	CO1. To impart knowledge of electrochemical energy systems, corrosion and its prevention and water treatment methods. CO2. To impart the knowledge of chemical methods of synthesis and analysis of plastics, nanomaterials, fuels and lubricants.
12	Engineering Mechanics	CO1. To impart the basic concepts of force systems, free body diagram and equilibrium conditions and effect of friction in various systems. CO2.To familiarize with the calculation of the geometric properties like centroid, centre of gravity, moment of inertia of various sectional areas and bodies. CO3. To develop the knowledge on basic principles of kinematics and kinetics of a particle and rigid bodies.
13	Universal Human Values 2: Understanding Harmony	CO1. To help students understand the need, basic guidelines, content and process of value education. CO2. To help students initiate a process of dialog with in themselves to know what they really want to be in their life and profession CO3. To facilitate the students to understand harmony at all the levels of human living, and live accordingly. CO4. To understand the harmony in nature and existence. CO5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.
14	Professional Communication Lab	CO1. Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.
15	Engineering Workshop	CO1.To impart hands-on training on basic engineering trades.
16	Engineering Mechanics Lab and Fules & Lubricants Lab	CO1. To impart knowledge on basic engineering applications
	Constitution of India	CO1.To impart knowledge on basic engineering applications. CO2.To enable the student to understand the importance of constitution. CO3.To understand the structure of Executive, Legislature and Judiciary.

17	(Mandatory Non-Credit Course)	CO4.To understand Philosophy of fundamental rights and duties.
		CO5. To understand the autonomous nature of constitution bodies like SupremeCourt and High Court Controller and Auditor General of India and ElectionCommission of India.
		CO6.To understand the Central and State relation, financial and administrative.
18	Python Programming	CO1. To introduce Scripting Language.
		CO2. To explore various problems solving approaches of computer science
		CO3. To be familiarized with general coding techniques to solve object-oriented programming concepts
19	Elements of Electrical and Electronics Engineering	CO1. To introduce the basic concepts of electrical circuits
		CO2. To familiarize with the constructional details, working principles of DC and AC machines.
		CO3. To familiarize with the operation of diode and transistors
20	Engineering Thermodynamics	CO1.To introduce the laws of thermodynamics and their applications to various thermodynamic processes and cycles.
		CO2. To familiarize with various thermodynamic properties of a pure substance and the laws governing the ideal gases and their mixtures
21	Kinematics of Machines	CO1. To familiarize with the concepts of kinematic analysis of mechanisms.
22	Mechanics of Solids	CO1. To impart knowledge on behavior of mechanical elements under the action of different loads.
23	Materials Engineering	CO1. To familiarize with the fundamentals of solidification, phase diagrams, heat treatment and properties of metallic and non metallic materials.
24	Electrical and Electronics Engineering Lab	CO1. To conduct tests on various electrical & electronic circuits and to familiarize experimental procedures of those Circuits.
25	Mechanics of Solids Lab and Materials Lab	CO1. To impart hands on training to examine the mechanical properties of materials
		CO2. To impart hands on training in preparation of metal specimen so as to observe the microstructure
26	Numerical and Statistical Methods	CO1.To introduce the concepts of numerical and statistical methods for solving engineering problems.
27	Manufacturing Science	CO1. To introduce the principles of manufacturing Science to convert materials into desired shapes and sizes.
28	Applied Thermodynamics	CO1. To introduce the principles of operation of I.C engines and compressors and their performance metrics.
		cycles and air conditioning processes

29	Fluid Mechanics and Hydraulic Machines	CO1. To introduce the fluid properties, basic laws, principles of conservation of mass, momentum and energy and their application in the study of fluid flow.
		CO2. To introduce the principles of hydraulic turbines and pumps, along with their performance characteristics.
30	Advanced Mechanics of Solids	CO1. To familiarize with the concepts of stresses and strains in un-symmetric bending and torsion using classical methods.
31	Metal Cutting and Machine Tools	CO1. To expose the students to the mechanics of metal cutting, so as to equip them with adequate knowledge about elements of metal cutting process.
		CO2. To emphasize upon the prominent theories, concepts and constructional features of machine tools related to turning, shaping, planning, drilling, milling and grinding operations
32	Industrial Engineering	CO1. To familiarize the learner with the concepts of Industrial Engineering and its tools to enhance productivity of the systems
		CO2. To introduce the principles and techniques for effective project management and personal management.
33	Steam and Gas Turbines	CO1. To introduce and analyze the Rankine steam power cycle and basic components of steam power plant such as boilers, nozzles, condensers and turbines.
		CO2. To familiarize with the analysis of gas turbine cycles and introduce the principle of operation of jet and rocket engines
34	Automobile Engineering	CO1. To introduce various automobile systems such as transmission, steering, suspension, braking and safety systems.
		CO2. To familiarize with combustion in SI and CI engines, emission control techniques, electric and hybrid vehicles.
35	Non Destructive Testing	CO1. To familiarize with the concepts of various NDT techniques to identify the defect in a mechanical component.
36	Mechanical Vibrations	CO1. To familiarize with the concepts of mathematical model and solution methods for vibrations of the mechanical systems
37	Operations Research	CO1. To impart the concepts of operations research
		CO1. To impart the concepts of force analysis of mechanisms

38	Analysis and Synthesis of Mechanisms	CO2. To familiarize with the concepts of synthesis of mechanisms.
		CO3. To impart hands on training on analysis and synthesis of mechanisms using software packages
39	Artificial Intelligence and Machine Learning	CO1. To familiarize with the concepts of Artificial Intelligence and Machine Learning.
40	Measurements and Mechatronics	CO1. To instruct the principles of interchangeable manufacture.
		CO2. To introduce basic principles of mechanical measurements.
		CO3. To impart knowledge on mechatronics systems.
41	Artificial Intelligence and Machine Learning	CO1. To familiarize with the concepts of Artificial Intelligence and Machine Learning.
42	Heat Transfer	CO1. To introduce modes of heat transfer and their significance in the design of heat transfer equipment.
43	Design of Machine Elements	CO1. To impart the knowledge of the basic engineering design against static and fluctuating loads by considering strength and rigidity.
44	Non Conventional Sources of Energy	CO1. To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and biomass.
		CO2. To introduce direct energy conversion systems such as thermo electric, MHD and Fuel Cells.
45	Automation in Manufacturing	CO1. To introduce various strategies of automation in manufacturing.
46	Finite Element Method	CO1. To familiarize with the concepts of finite element method for structural , thermal and dynamic analysis.
47	Quality Governance	CO1. To familiarize with the concepts of quality management and total quality Management
48	Fracture Mechanics	CO1. To familiarize with the basic concepts of fracture mechanics and its applications.
49	CAD / CAM	CO1. To present the role of computers and technology that drives the modern industry.

50	Design of Transmission Elements	CO1. To familiarize with the design of various machine elements for effective power transmission.
51	Design of Heat Transfer Equipment	CO1. To introduce basic methods of design of heat exchangers CO2. To familiarize with the design procedures of various heat transfer equipment.
52	Robotics	CO1. To familiarize with anatomy, kinematics, sensors and dynamics of a programmable machine, robot.
53	Tribology	CO1. To familiarize with the selection of lubricating system for different machine components. CO2. To impart knowledge on design of bearings for a given application.
54	Computational Fluid Dynamics	CO1. To solve fluid flow/ heat transfer problems by the application of finite difference and finite volume methods.
55	Refrigeration & Air Conditioning	CO1. To introduce the basic cycles of various refrigeration systems, their performance evaluation along with details of system components and refrigerants used. CO2. To impart knowledge on psychrometric properties and processes and design of air-conditioning systems
56	Unconventional Machining Processes	CO1. To impart the principles of non-traditional machining methods
57	Design for Manufacturing and Assembly	CO1. To familiarize with the design factors used in manufacturing and assembly.
58	Entrepreneurship	CO1. To familiarize the learner with the concepts of Entrepreneurship.
59	Power Plant Engineering	CO1. To introduce the working of various power plants. CO2. To familiarize with power plant effluents and power plant economics.
60	Additive Manufacturing	CO1. To present the various 3D printing technologies for manufacturing.
61	Condition Monitoring	CO1. To familiarize with the importance of types of maintenance with their limitations and the methods of condition monitoring in different industrial sectors.
62	Operations Management	CO1. To emphasize the students on the objectives and functions of PPC department for effective running of a Production system

		CO2. To impart the knowledge on various planning tools used in PPC department.
63	Measurements and Mechatronics Lab	CO1. To impart hands on training on measuring methods and metrology instruments and calibration of various measuring instruments. CO2. To train the students in PLC programming.
64	Computer Aided Engineering Analysis & Manufacturing Lab	CO1. To impart hands on training for analysis of using analysis package. CO2. To demonstrate the working principle and operation of CNC Machines
65	Mechanics of Composite Materials	CO1. To familiarize with the composite materials and their mechanical behaviour
ECE		
S.No.	Course Name	Course Outcomes
1	Functional English	CO1. speak with a reasonable degree of fluency using communication strategies (i.e. using language appropriately to carry out functions such as greeting, requesting information, seeking confirmation, disagreeing) as well conventions of politeness and courtesy CO2. speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing CO3. listen to short audio and video clips - in standard Indian accent with understanding of the types listed in D (1) (a) below; and - in native English accent (British and American), especially clips in which the speakers or voice actors speak slowly, and gain both understanding of messages and sensitivity to native-speaker accents CO4. read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meanings CO5. read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meanings CO5. write survey reports with attention to conventions of report writing CO6. guard against mistakes Indians typically make in their speech and writing in English
2	Linear Algebra And Calculus	CO1. solve the system of linear equations in various engineering CO2. evaluate the eigenvalues and eigenvectors. CO3. solve linear ordinary differential equations . CO4. apply the techniques of partial differentiation in optimizati CO5. solve first order partial differential equations. CO6. compute areas and volumes using double and triple integral

3	Applied Chemistry	CO1. explain the electrochemistry of batteries and sensors.
		CO2. discuss various techniques used in making thin films, properties and applications of nanomaterials.
		CO3. explain the properties and applications of polymers used in making electronic devices.
		CO4. solve the numerical problems on hardness of water, discuss boiler troubles and explain water treatment methods and their significance in industry and daily life.
		CO5. interpret the spectral data to analyse the structure of simple molecules.
4	Problem Solving Using C	CO1. outline problem solving steps and solve sample problems.
		CO2. use control statements for writing the programs.
		CO3. apply the concepts of arrays, strings and pointers in problem
		CO4. decompose a problem into functions to develop modular re
		CO5. use structures and files for efficient handling of data.
5	Universal Human Values 2: Understanding Harmony	CO1. be aware of themselves and surroundings
		CO2. be responsible in life
		CO3. develop personality to be happy continuously and prosper
		CO4. handle the problems with sustainable solutions.
		CO5. possess human nature in mind
		CO6. apply what they have learnt to their own self in real life situ
6	Electronic Workshop	CO1. identify, test various passive and active electronic compone
		CO2. assemble, test and troubleshoot the circuits using various tools and instruments.
		CO3. simulate the circuits using software tools.
		CO4. perform the experiments using virtual laboratory.
7	Functional English Lab	CO1. give short impromptu speeches with confidence and fluenc
		CO2. take part in conversations in different functional contexts using English following appropriate communication strategies.
		CO3. use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English.
		CO4. articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy.
		CO5. check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
		CO6. pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication.
		CO7. speak English with adequate attention to stress, rhythm, and
		CO8. speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.

		CO9. read out texts of different kinds fluently with appropriate pauses, stress, and intonation.
8	Applied Chemistry Lab	CO1. perform quantitative analysis by using chemical and instrur CO2. operate the pH meter, conductivity meter for analyzing the CO3. analyze the corrosion rate of a given metal in a given environment by gravimetric method. CO4. prepare printed circuit board by electroless plating. CO5. synthesize polymers and obtain cell potential by construction of an electrochemical cell.
9	Constitution Of India	CO1. understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties CO2. understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System. CO3. structure of the state government, Secretariat, Governor and Chief Minister and their functions. CO4. learn local administration viz. Panchayat, Block, Municipality and Corporation. CO5. learn about Election Commission and the process and about SC, ST, OBC and women.
10	Professional Communication	CO1. speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation) CO2. add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress and intonation. CO3. listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speaker accents CO4. produce written discourses of different kinds (e.g. texts expressing opinions and making a convincing case for one's standpoint, professional emails, and summaries of lengthy texts) with attention to elements of writing such as content, organization, language, style, and mechanics CO5. guard against grammatical errors Indians typically make in their speech and writing in English
		CO1. evaluate improper integrals using Laplace transforms. CO2. apply Laplace transforms to find the solutions of initial and boundary value problems.

11	Integral Transforms And Vector Calculus	CO3. find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems.
		CO4. apply the concepts of vector differentiation in their engineering fields.
		CO5. verify the relation between line, surface and volume integrals using integral theorems.
12	Linear Electrical Networks	CO1. apply various circuit laws to analyze the electrical circuits.
		CO2. analyze the steady state behavior of AC circuits.
		CO3. analyze the behavior of electrical resonance
		CO4. apply network theorems to analyze the electrical circuits
		CO5. evaluate different two port network parameters.
13	Solid State Physics	CO1. explain construction and working of laser.
		CO2. relate the principles of propagation of light in optical fibers for communication applications.
		CO3. differentiate classical , quantum free electron theories.
		CO4. identify conductivity mechanism in semiconductors.
		CO5. Interpret polarization in dielectrics and magnetic properties
14	Engineering Drawing	CO1. construct polygons and conic sections.
		CO2. draw projections of points, lines, planes and solids in differ
		CO3. draw orthographic and isometric views of different parts.
15	Professional Communication Lab	CO1. enhance the effectiveness of their communication through t
		CO2. take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency
		CO3. make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session;
		CO4. take part in group discussions and debates successfully;
		CO5. answer questions at an elementary level in job interviews (e.g. Can you tell us something about yourself? What kinds of things do you worry about? What are your key skills? What skills do you need to improve? What do you see as your strengths? What do you like doing in your spare time? How would you describe the way you work? Tell us about a time when you showed strong leadership skills. Tell us about a time when you had to make a difficult decision. How do you see yourself in five years' time?)
CO6. use team-building skills with impact in different situations.		

16	Solid State Physics Lab	CO1. identify the semiconductor from the obtained energy gap and Hall coefficient
		CO2. draw characteristic curves to estimate thermal coefficient of a thermistor.
		CO3. verify magnetic field along the axis of a circular coil.
		CO4. recognize the coercivity and retentivity from B-H curve
		CO5. determine dielectric constant of a dielectric material
		CO6. calculate light gathering power of optical fiber and bending losses
		CO7. estimate wavelength of unknown light source.
		CO8. examine working of various sensors
17	Environmental Studies	CO1. create awareness among the people in protection of environment.
		CO2. create awareness among the people in protection of environment.
		CO3. explain the values of biodiversity.
		CO4. identify the sources of environmental pollution, assess their effects and suggest suitable control measures
		CO5. adopt sustainable waste management practices.
18	Probability Theory And Stochastic Processes	CO1. determine and understand probability, statistics of random variables and their functions.
		CO2. determine statistics of random vectors and their functions
		CO3. calculate statistics of random sequences, random processes with temporal characteristics and spectral characteristics.
		CO4. relate power calculations and related parameters in time domain with frequency domain
		CO5. apply the concepts of probability, random variables / processes to analyze input and output relationships and statistics in linear systems.
19	Semiconductor Devices And Circuits	CO1. study the characteristics and models for diodes and use them for various applications
		CO2. characterize the current flow in BJTs and MOSFETs
		CO3. characterize the current flow in BJTs and MOSFETs
		CO4. analyze the behaviour of BJTs and MOSFETs under small-signal conditions.
20	Signals And Systems	CO1. classify the signals and perform various operations on signals.
		CO2. perform Fourier analysis on the signals
		CO3. verify magnetic field along the axis of a circular coil.
		CO4. perform correlation operations on signals.

		CO5. apply the various sampling techniques on continuous time signals.
		CO6. analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.
21	Electromagnetic Field Theory	CO1. apply the concepts of electric fields in different applications.
		CO2. understand the concepts of magnetic fields
		CO3. demonstrate the knowledge of time varying fields and Maxwell's equations.
		CO4. demonstrate the knowledge of time varying fields and Maxwell's equations.
		CO5. understand reflection and refraction of Electromagnetic Waves in different media
22	Digital Circuit Design	CO1. perform the various number system conversions
		CO2. design various logic circuits using Boolean laws.
		CO3. design combinational and sequential logic circuits.
		CO4. implement logic expressions using PLDs.
23	Numerical Methods And Complex Analysis	CO1. apply numerical techniques for solutions of algebraic and transcendental equations
		CO2. evaluate definite integrals by using different numerical techniques and solve ordinary differential equations numerically.
		CO3. test the analyticity of a complex function
		CO4. determination of the complex integration with the use of Cauchy's integral formulae.
		CO5. evaluation of real definite integral by using Residue theorem.
24	Semiconductor Devices and Circuits Lab	CO1. verify the I-V characteristics of junction diode, Zener diode, LED, photodiode, MOSFET, BJT, and obtain their parameters.
		CO2. use modern tools for simulation.
		CO3. develop applications of diode such as DC power supply, Zener voltage regulator, diode clipper, and clamper.
		CO4. design biasing circuits for BJT and MOSFET based amplifiers.
25	Linear Electrical Networks Lab	CO1. verify the applicability of network theorems to practical electrical circuits.
		CO2. specify and test RLC series and parallel resonant circuits.
		CO3. evaluate the time constant of simple RC and RL circuits.
		CO4. interpret /correlate physical observations and measurements involving electrical circuits to theoretical principles.

		CO5. make oral presentations and prepare written reports
26	Transmission Lines and Waveguides	CO1. analyze the carrier transport in junctions.
		CO2. apply the knowledge of network theory in analyzing the concepts of transmissions lines.
		CO3. analyze the transmission lines at different frequencies
		CO4. measure the transmission line parameters using Smith chart.
		CO5. demonstrate the fundamental principles of wave guides
		CO6. understand different modes of propagation in wave guides.
		CO7. select an appropriate wave guide to meet specified requirements.
27	Analog Circuits	CO1. analyze and characterize the MOS and BJT single stage amplifiers at low and high frequencies.
		CO2. analyze the operation of differential amplifier using MOS and BJT and current mirrors.
		CO3. analyze and characterize – feedback, power and tuned amplifiers.
		CO4. deduce the expressions for frequency of oscillations and conditions for oscillations of RC and LC oscillators
28	Analog and Digital Communications	CO1. disseminate the fundamentals of analog modulation schemes and different multiplexing techniques.
		CO2. understand the functioning of AM and FM transmitters and receivers.
		CO3. distinguish different pulse digital modulation systems.
		CO4. elucidate different digital modulation techniques.
29	Data Structures	CO1. design algorithms to create, search, insert, delete and traversal operations on linear and non-linear data structures
		CO2. implement stacks, queues and linked list.
		CO3. perform the operations on binary search trees
		CO4. write algorithms for searching and sorting techniques.
		CO5. develop algorithms for systematic traversal of a graph.
30	VLSI Design	CO1. describe the IC fabrication technology and various electrical properties of MOS, CMOS, BiCMOS circuits
		CO2. realize various logic circuits using nMOS, CMOS, and BiCMOS logic.
		CO3. apply scaling models to MOS circuit
		CO4. design subsystem components using different logic styles in CMOS
		CO5. design DRAM and SRAM circuits using CMOS logic.
		CO1. perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.
		CO2. use modern tools for simulation

31	Analog Circuits Lab	CO3. design, simulate, hardware implement, test, and obtain performance characteristics of - CS, CE, BJT differential, single-tuned, series-series feedback, shunt-shunt feedback, and class-B complementary symmetry power amplifiers, Wien-bridge and Colpitts oscillators.
		CO4. verify the operation of op amp in inverting and non-inverting configurations.
32	Digital Circuits Design Lab	CO1. apply Boolean laws and K-map to simplify the digital circuits.
		CO2. draw the digital circuits using gate level implementation.
		CO3. demonstrate the flow of Electronic Workbench.
		CO4. develop digital circuits using Electronic Workbench.
33	CMOS VLSI Design (Honor Degree)	CO1. understand the behavior of CMOS inverter and its energy dissipation.
		CO2. design CMOS inverter and calculate delay times using mathematics and basic engineering concepts.
		CO3. analyze combinational and sequential logic circuits; single-stage, cascode, and differential amplifiers; current mirrors, and switched-capacitor circuits.
		CO4. understand the operation of one-stage and two-stage op amps
34	Digital Signal Processing	CO1. classify various signals and systems, perform various operations on signals and process signals in the discrete domain
		CO2. compute the Fourier series coefficients and Z-transform of
		CO3. apply various transform techniques on discrete time signals
		CO4. design IIR filters for a given specifications
		CO5. categorize various techniques to design FIR filters and reali
35	Computer Organization and Microprocessors	CO1. demonstratethe basic structure and operation of a digital computer.
		CO2. summarizethe architecture and instruction set of 8086 micr
		CO3. develop the assembly language programs for 8086micropro
		CO4. classify the interrupts and directives.
		CO5. interface various peripherals with 8086 using 8255.
36	Antennas and Wave Propagation	CO1. apply the fundamental concepts of antenna to differentiate radiation mechanism of radiators.
		CO2. design basic antenna arrays.
		CO3. designnon-resonant radiators for given specifications.
		CO4. analyze the performance of different microwave antennas.
		CO5.demonstrate the knowledge of different wave propagation n
37	CAD For VLSI	CO1. distinguish various methodologies for the design of VLSI systems.
		CO2. design the VLSI circuits using physical design steps.
		CO3. demonstrate the knowledge of various placement and routin

		CO4. explore the FPGA physical design steps.
38	Linear Control Systems (Professional Elective - I)	CO1. develop mathematical models for physical systems.
		CO2. employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
		CO3. quantify time domain specifications to determine stability r
		CO4. apply state variable theory to determine the dynamic behavior of linear control systems.
		CO5. describe the components of digital control systems and/or evaluate mathematical models of linear discrete-time control systems using pulse transfer functions.
39	Bio-Medical Engineering (Professional Elective - I)	CO1. describe the physiology of the human body and infer the principles of transducers for biomedical applications.
		CO2. summarize the cardiovascular, respiratory, muscle and nervous system.
		CO3. demonstrate the recoding of the body vital signs and relating it to ICU and biotelemetry.
		CO4. demonstrate the working of modern diagnostic and therapeutic systems by using engineering principles.
40	Computer Networks And Network Security (Professional Elective - I)	CO1. identify an appropriate transmission media for establishing a physical network.
		CO2. analyze flow and error control mechanisms.
		CO3. establish an end to end connectivity using routing algorithms.
		CO4. illustrate the operation of transport and application layer protocols.
		CO5. suggest suitable cryptographic algorithms for network security services.
41	Analog and Digital Communications Lab	CO1. verify the sampling process with different sampling rates.
		CO2. compare the operation of various analog and digital modulation schemes.
		CO3. distinguish Frequency Shift Keying and Differential Phase Shift Keying techniques.
		CO4. test linear block encoders and decoders.
42	VLSI Design Lab	CO1. apply the knowledge of HDL programming to develop combinational and sequential circuits.
		CO2. demonstrate the process of simulation and synthesis using front end tools
		CO3. develop schematic for digital circuits using backend tools.
43	Programming With Python	CO1. explore various modern tools used for python.
		CO2. apply the basic built-in data structures in python to solve problems.

		CO3. develop programs using object-oriented concepts.
		CO4. make use of python constructs to solve games.
44	Advances In VLSI Design (Honors Degree)	CO1. demonstrate the operation of CCD and CMOS image sensors, BICMOS circuits, power MOSFETs, reversible and adiabatic logic circuits.
		CO2. distinguish working of various types of memories
		CO3. describe power reduction, testing, yield, packaging techniques
		CO4. verify clocking, critical timing, signal integrity, variability, and reliability of nanometer scale CMOS circuit designs.
45	Linear Integrated Circuits Applications	CO1. analyze the characteristics of op-amp and observe the frequency response of operational-amplifier.
		CO2. apply the feedback concepts for operational-amplifier appli
		CO3. design the applications of waveform generators, timers and
		CO4. differentiate A/D and D/A converters
46	Microcontrollers and Embedded Systems	CO1. acquire knowledge of the architecture and operation of Intel 8051 microcontroller.
		CO2. develop assembly language programs for 8051
		CO3. develop applications for real world problems using 8051 m
		CO4. differentiate an embedded System with the general computi
		CO5. explore the architectures of ARM processors.
47	Engineering Economics And Project Management	CO1. apply managerial economic concepts in business decision making.
		CO2. identify the influencing factors of demand for a product.
		CO3. categorize production with respect to time and cost.
		CO4. relate the market structures and pricing to a product.
		CO5. establish the suitable business organization with available r
		CO6. plan and evaluate a project and also apply network concept
48	ASIC Design (Professional Elective - II)	CO1. explore about the design flow, types and the programming technologies of an ASIC.
		CO2. demonstrate the goals, objectives, measurements and algorithms of partitioning, floor planning, placement and routing.
		CO3. extract the delay for designed circuits.
		CO4. design, synthesize and simulate the digital circuits using di
49	Electronic Instrumentation And Measurement Principles (Professional Elective - II)	CO1. recognize the units and standards in Measurements.
		CO2. identify the various parameters that are measurable in elect
		CO3. compare the operation of bridges.
		CO4. demonstrate different signal generators and analyzers
		CO5. differentiate various types of cathode ray oscilloscopes.
	DSP Processors And Architectures	CO1. demonstrate the concepts of sampling, DFT, filters and solve DSP computational errors.
		CO2. illustrate the architecture of DSP processors.

50	Architectures (Professional Elective - II)	CO3. summarize the on-chip peripherals and develop programs for TMS320C54XX DSP processor. CO4. interface I/O and memory devices with TMS320C54XX DSP processor. CO5. explore the architecture of ADSP 2100 and Blackfin processor.
51	Information Theory And Coding (Professional Elective - II)	CO1. compute efficiency of a communication system. CO2. compute Galois field arithmetic and Minimal Polynomials. CO3. investigate error detection and correction capabilities using CRC. CO4. design encoders and correct errors using decoders for RS and BCH codes. CO5. design encoders and correct errors using decoders for Convolutional codes.
52	Linear Integrated Circuits Applications Lab	CO1. design, implement, and test different op-amp applications. CO2. design, implement, and test multi-vibrators using 555 timer and IC723 voltage regulator. CO3. verify the operation of weighted resistor / R-2R digital to analog converter. CO4. analyze and interpret results by conducting the experiment.
53	Digital Signal Processing Lab	CO1. analyze and implement digital signal processing systems in time domain. CO2. compute linear and circular convolution of discrete-time signals. CO3. apply discrete Fourier transform (DFT) on discrete-time signals. CO4. design IIR filters using Butterworth and Chebyshev approximations. CO5. design FIR filters using windowing techniques.
54	Microprocessors And Microcontrollers Interfacing Lab	CO1. perform I/O interface with 8086 microprocessor and 8051 microcontroller. CO2. perform various programming operations with 8086 microprocessor and 8051 microcontroller
55	Advanced Microcontrollers (Honors Degree)	CO1. differentiate the internal architecture of Atmel and PIC microcontrollers. CO2. recommend suitable ARM core to develop embedded applications. CO3. summarize the features of LPC17xx microcontroller CO4. demonstrate the architecture of ARM Cortex-M7 processor CO5. classify various types of Cortex-M4/M7 DSP and SIMD Instructions. Course Content
56	Microwave And Optical Communications	CO1. apply the properties of scattering matrix to analyze the operation of microwave components. CO2. identify a suitable microwave source for a given application, based on the operational characteristics. CO3. measure power, attenuation, frequency and VSWR using microwave measurement techniques. CO4. demonstrate the characteristics of optical fiber.

		CO4. identify a suitable optical source and detector for a given application, based on the operational characteristics.
57	Digital Image Processing	CO1. demonstrate the fundamental concepts of digital image processing and apply various transforms on images. CO2. summarize the techniques for image enhancement. CO3. differentiate various image restoration techniques. CO4. interpret image segmentation and representation techniques CO5. categorize various compression techniques.
58	Low Power VLSI Circuits (Professional Elective - Iii)	CO1. demonstrate the fundamental concepts of digital image processing and apply various transforms on images. CO2. summarize the techniques for image enhancement. CO3. differentiate various image restoration techniques. CO4. interpret image segmentation and representation techniques CO5. categorize various compression techniques.
59	Cyber Physical Systems (Professional Elective - III)	CO1. summarize the traditional and emerging cyberphysical systems CO2. recommend possible solutions from the perspectives of systems CO3. identify the challenges in designing and development of cyber-physical systems CO4. apply the concepts of mathematics and computer science in real world computation interfaces.
60	Multi Rate Signal Processing (Professional Elective - III)	CO1. acquire the knowledge of multirate operations. CO2. implement uniform DFT filter banks. CO3. analyze two channel QMF banks. CO4. demonstrate M-channel perfect reconstruction filter banks. CO5. implement Cosine Modulated filter banks.
61	Cellular Mobile Communications (Professional Elective - III)	CO1. identify the limitations and challenges in cellular mobile radio systems CO2. apply suitable techniques to improve the overall performance of cellular systems CO3. design a cellular system model for a given region considering various constraints CO4. design an efficient frequency management and channel assignment scheme by selecting proper handoff mechanism. CO5. demonstrate the concepts of GSM and multiple access schemes
62	System On Chip Design (Professional Elective- IV)	CO1. explore different components of SOC. CO2. select processor cores for SOC. CO3. classify various memory cores for SOC. CO4. customize the instruction processor. CO5. illustrate the design of various SOCs.
63	Industrial Internet Of Things (Professional Elective - IV)	CO1. contrast various technologies of IIoT for different applications CO2. illustrate the architecture of IIoT. CO3. design Industrial Internet System. CO4. apply the concepts of Industry 4.0 for real time applications
		CO1. implement DSP algorithms using VLSI architectures.

64	VLSI Signal Processing (Professional Elective - IV)	CO2. realize the concepts of retiming and unfolding. CO3. design of FIR filters using pipelining and parallel processing. CO4. develop optimized IIR digital filters.
65	Satellite Communications (Professional Elective - IV)	CO1. demonstrate the knowledge of orbital parameters and satellite systems. CO2. compare various satellite subsystems. CO3. design satellite link for required specifications. CO4. explore different multiple accessing techniques for effective utilization of satellite transponders. CO5. navigate the receiving station by global positioning system.
66	Mixed Signal Ic Design (Professional Elective- V)	CO1. demonstrate the knowledge of orbital parameters and satellite systems. CO2. identify the challenges of mixed signal design. CO3. design sub-micron op-amp. CO4. design and analyze Nyquist rate A/D Converters. CO5. demonstrate the knowledge of switched capacitor circuits. CO6. identify the basic building blocks of digital integrated systems.
67	Wireless Sensor Networks (Professional Elective- V)	CO1. summarize the concepts of network architectures and applications of ad hoc and wireless sensor networks. CO2. analyze the protocol design issues of ad hoc and sensor networks. CO3. illustrate routing protocols for ad hoc and wireless sensor networks. CO4. demonstrate the sensor network platforms and tools.
68	Speech Processing (Professional Elective- V)	CO1. understand production of speech. CO2. analyze time domain models for speech signals. CO3. analyze linear predictive coding techniques. CO4. illustrate the homomorphic speech processing. CO5. analyze speech enhancement techniques.
69	Radar Engineering (Professional Elective- V)	CO1. estimate the performance of Radar using Radar Range Equation. CO2. apply the principle of FM-CW radar in FM-CW Altimeter. CO3. differentiate MTI and Pulse Doppler Radar. CO4. analyze different tracking radar systems. CO5. apply the radar concepts in Electronic Warfare.
70	RF and Optical Communications Lab	CO1. analyze the characteristics of microwave sources and optical components. CO2. measure the performance of RF and Microwave components. CO3. establish satellite and radar links.
71	Digital System Design Using Verilog	CO1. design and develop the digital circuits using different modeling techniques. CO2. simulate and synthesize various digital circuits. CO3. implement digital interfacing.
72	IoT Lab	CO1. interface I/O devices with ARM processor. CO2. implement various sensorial interfaces using scripting languages. CO3. develop simple IoT based smart systems.
73	Embedded System Based IoT (Honors Degree)	CO1. apply the concepts of embedded system for IoT application. CO2. categorize different hardware and software requirements for IoT. CO3. design embedded system applications using IoT.

	(HONORS Degree)	CO4. devise M2M applications using IoT.
		CO5. develop python programming for IoT Devices.
CSE		
S.No.	Course Name	Course Outcomes
1	Functional English	<p>CO1: Peak with a reasonable degree of fluency using communication strategies (i.e. using language appropriately to carry out functions such as greeting, requesting information, seeking confirmation, disagreeing) as well conventions of politeness and courtesy • speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing</p> <p>CO2: listen to short audio and video clips</p> <p>CO3: in standard Indian accent with understanding of the types listed in D (1) (a) below; and</p> <p>CO4: in native English accent (British and American), especially clips in which the speakers or voice actors speak slowly, and gain both understanding of messages and sensitivity to native-speaker accents</p> <p>CO5: read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meanings</p> <p>CO7: write coherent paragraphs with attention to elements of writing such as content, organization, language, style, and mechanics and the conventions of academic writing</p> <p>CO8: write survey reports with attention to conventions of report writing</p>
2	Linear Algebra and Calculus	<p>CO1: solve the system of linear equations in various engineering problems.</p> <p>CO2: evaluate the eigenvalues and eigenvectors.</p> <p>CO3: solve linear ordinary differential equations .</p> <p>CO4: apply the techniques of partial differentiation in optimization problems and solve first order partial differential equations.</p> <p>CO5: compute areas and volumes using double and triple integrals.</p>
3	Applied Physics	<p>CO1: explain construction and working of laser</p> <p>CO2: relate the principles of propagation of light in optical fibers for applications in communications</p> <p>CO3: solve Schrodinger's wave equation to find the wave function and associated probabilities for simple potentials</p> <p>CO4: identify conductivity mechanism in semiconductors</p> <p>CO5: correlate the electrical and magnetic properties of materials to the properties of atoms.</p>

4	Programming for Problem Solving	<p>CO1: outline problem solving steps and solve sample problems</p> <p>CO2: use control statements for writing the programs.</p> <p>CO3: apply the concepts of arrays and strings in problem solving.</p> <p>CO4: decompose a problem into functions to develop modular reusable code.</p> <p>CO5: utilize user- defined data types and text I/O operations for efficient handling of data.</p>
5	Universal Human Values 2: Understanding Harmony	<p>CO1: be aware of themselves and surroundings</p> <p>CO2: be responsible in life</p> <p>CO3: develop personality to be happy continuously and prosper</p> <p>CO4: handle the problems with sustainable solutions.</p> <p>CO5: possess human nature in mind</p> <p>CO6: apply what they have learnt to their own self in real life situations</p>
6	Functional English Lab	<p>CO1: give short impromptu speeches with confidence and fluency. • take part in conversations in different functional contexts using English following appropriate communication strategies. • use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English. • articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy.</p> <p>CO2: check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.</p> <p>CO3: pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication.</p> <p>CO4: speak English with adequate attention to stress, rhythm, and intonation.</p> <p>CO5: speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.</p> <p>CO6: read out texts of different kinds fluently with appropriate pauses, stress, and intonation.</p>

7	Applied Physics Lab	<p>CO1: calculate light gathering power of optical fiber and bending losses</p> <p>CO2: study the directionality and wavelength of laser</p> <p>CO3: identify the nature of semiconductor from the obtained energy gap and Hall coefficient.</p> <p>CO4: draw characteristic curves of thermistor and LED.</p> <p>CO5: study regulatory nature of zener diode</p> <p>CO6: estimate magnetic induction, Magnetic susceptibility and Dielectric constant.</p>
8	C Programming Lab	<p>CO1: apply problem solving steps to solve a problem.</p> <p>CO2: develop C programs using selection and iterative statements.</p> <p>CO3: decompose a problem into functions to develop modular reusable code.</p>
9	Constitution of India	<p>CO1: understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties</p> <p>CO2: understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System.</p> <p>CO3: structure of the state government, Secretariat, Governor and Chief Minister and their functions.</p> <p>CO4: learn local administration viz. Panchayat, Block, Municipality and Corporation.</p> <p>CO5: learn about Election Commission and the process and about SC, ST, OBC and women.</p>
10	Professional Communication	<p>CO1: speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation)</p> <p>CO2: add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress and intonation.</p> <p>CO3: listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native- speaker accents</p> <p>CO4: read fluently, comprehending texts of different kinds using multiple strategies and higher-order skills</p> <p>CO5: produce written discourses of different kinds (e.g. texts expressing opinions and making a convincing case for one's standpoint, professional emails, and summaries of lengthy texts) with attention to elements of writing such as content, organization, language, style, and mechanics</p> <p>CO6: guard against grammatical errors Indians typically make in their speech and writing in English</p>

11	Integral Transforms and Vector Calculus	<p>CO1: evaluate improper integrals using Laplace transforms.</p> <p>CO1: apply Laplace transforms to find the solutions of initial and boundary value problems.</p> <p>CO1: find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems.</p> <p>CO1: apply the concepts of vector differentiation in their engineering fields.</p> <p>CO1: verify the relation between line, surface and volume integrals using integral theorems.</p>
12	Basic Electronic Devices	<p>CO1: understand the behavior of different semiconductor devices.</p> <p>CO2: identify appropriate semiconductor devices for various applications.</p> <p>CO3: analyze the rectifier circuits with and without filters.</p> <p>CO4: describe the switching and amplification action of BJT and MOSFET.</p>
13	Python Programming	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • describe the basic elements of python programming for logic building. • use functions and modules to develop python programs. • differentiate mutable and immutable data types. • develop code to handle exceptions and files. • apply object-oriented concepts to develop programs.
14	Data Structures	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • implement and analyse searching and sorting techniques. • implement algorithms for linked lists. • apply algorithms of stacks and queues. • develop data structures to make use of trees and heaps. • develop algorithms for traversal of graphs and hashing for efficient storage of data.

15	Professional Communication Lab	<ul style="list-style-type: none"> • enhance the effectiveness of their communication through body language; • take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency • take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency • speak professionally in telephone conversations; • make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session; • take part in group discussions and debates successfully; • answer questions at an elementary level in job interviews (e.g. Can you tell us something about yourself? What kinds of things do you worry about? What are your key skills? What skills do you need to improve? What do you see as your strengths? What do you like doing in your spare time? How would you describe the way you work? Tell us about a time when you showed strong leadership skills. Tell us about a time when you had to
16	Python Programming Lab	<ul style="list-style-type: none"> • make use of control statements in decision making for various case studies. • handle exceptional cases at run-time. • use file handling operations for storing and retrieving of data. • apply object-oriented concepts to develop reusable code.
17	Data Structures Lab	<ul style="list-style-type: none"> • implement sorting and searching algorithms. • develop suitable code to simulate the operations on linked lists. • implement stacks and queues using arrays and linked lists. • write code using a stack for arithmetic expressions evaluation and conversion. • perform operations on binary search trees and graphs. • create a hash table and perform operations on it.
18	Environmental Studies	<p>CO1: create awareness among the people in protection of environment.</p> <p>CO1: analyze structure and functional attributes of an ecosystem.</p> <p>CO1: explain the values of biodiversity.</p> <p>CO1: identify the sources of environmental pollution, assess their effects and suggest suitable control measures.</p> <p>CO1: adopt sustainable waste management practices.</p>

19	Managerial Economics and Financial Analysis	<ul style="list-style-type: none"> • apply managerial economic concepts in business decision making. • categorize production with respect to time and cost. • relate market structures and pricing of a product. • establish suitable business organization with available resources. • apply accounting rules in determining the financial results and prepare financial statements.
20	Probability and Statistics	<ul style="list-style-type: none"> • find the mean, variance and different probabilities. • construct sampling distributions, confidence intervals and to find maximum error of estimates for population parameters. • validate given hypothesis in case of large sample problems. • examine the given hypothesis in case of exact samples. • measure the association between the variables and to fit different curves to the given data.
21	Digital Logic Design	<ul style="list-style-type: none"> • perform number system conversions, signed number arithmetic using complements. • simplify Boolean functions using Boolean laws, theorems and k- maps • implement combinational logic for adders and subtractors.
22	Object Oriented Programming through Java	<ul style="list-style-type: none"> • describe OOP concepts and features of Java. • apply class and inheritance concepts in developing the Java code. • create user interfaces and packages for a given problem. • develop code to handle exceptions and implement multi-threading to make applications more dynamic. • design GUI applications with event handling mechanism.
23	Database Management Systems	<ul style="list-style-type: none"> • analyze information storage problem and derive a model in the form of an entity relationship diagram. • develop simple and complex queries using Structured Query Language (SQL). • apply principles of normalization for designing a good relational database schema. • compare different techniques related to transaction management and concurrency control. • construct multi-level indices for fast retrieval of data and use recovery techniques to recover the database from a crash.
24	Probability and Statistics Using R Lab	<ul style="list-style-type: none"> • represent data in graphical form. • compute measures of central tendency. • compute measures of dispersion. • characterize different kinds of data distributions. • implement regression analysis.

25	Java Programming Lab	<ul style="list-style-type: none"> • apply the concept of object oriented approach in problem solving. • create packages for reusability. • examine exceptions and multi-tasking. • create GUI applications to handle events
26	Database Management Systems Lab	<ul style="list-style-type: none"> • create relational database with the given constraints. • formulate simple and complex queries using features of SQL. • create views on relational database based on the requirements of users. • develop PL/SQL programs for processing multiple SQL statements. • implement triggers on a relational database.
27	Discrete Mathematical Structures	<ul style="list-style-type: none"> • use mathematical logic for analyzing propositions and proving theorems. • describe the properties of relations, functions and lattice theories. • categorize different types of algebraic structures and describe their properties. • apply the concepts of graph theory in modeling and solving non-trivial problems in computer networks. • apply pigeon hole principle in computer applications and solve recurrence relations.
28	Computer Organization	<ul style="list-style-type: none"> • identify different types of instructions. • differentiate micro-programmed and hard-wired control units. • analyze the performance of hierarchical organization of memory. • summarize different data transfer techniques. • demonstrate arithmetic operations on fixed- and floating-point numbers and illustrate concepts of parallel processing.
29	Design and Analysis of Algorithms	<ul style="list-style-type: none"> • analyze the performance of algorithms based on time and space complexity. • apply divide and conquer technique to solve sorting and searching problems. • apply greedy method to find optimal solution to a class of problems. • solve optimization problems using dynamic programming. • construct state space tree to find all possible solutions to a class of problems using back tracking and branch and bound techniques.

30	Operating Systems	<ul style="list-style-type: none"> • describe the role, functions and structures of operating systems. • demonstrate the concept of process and analyze the performance of CPU scheduling algorithms. • compare different memory management schemes and apply page replacement algorithms in virtual memory. • apply deadlock handling techniques to prevent deadlocks and analyze the performance of different disk scheduling algorithms. • develop software/hardware-based solutions for critical section problems and outline files and directory structures.
31	Software Engineering *	<ul style="list-style-type: none"> • apply suitable process model for software development based on stake holder requirements. • estimate cost and schedule required to develop a software. • analyze customer requirements and prepare SRS document. • use software design principles in the design of a software. • test a software using different testing techniques.
32	Information Retrieval Systems	<ul style="list-style-type: none"> • identify the basic theories in information retrieval systems. • use inverted file as an index data structure to retrieve the documents from the database. • create signature files for fast retrieval of text data. • build PAT trees and PAT arrays for the given text document. • use stemming algorithms to improve the performance of IR systems.
33	Computer Graphics	<ul style="list-style-type: none"> • outline different graphical display devices and drawing algorithms. • illustrate different 2-D geometrical transformations on graphical objects • interpret different line and polygon clipping algorithms • infer different 3- D transformations and viewing functions on objects. • summarize different surface detection methods and computer animations
34	Operating Systems Lab	<ul style="list-style-type: none"> • simulate CPU and disk scheduling algorithms. • develop code for memory management techniques. • implement Banker's algorithm to avoid deadlocks. • develop shell scripts in order to perform shell programming.
35	Game Programming	<ul style="list-style-type: none"> • install and make use of Unity 3D Editor in developing gaming apps. • developing game objects using scripts. • develop a 2D gaming application on windows. • develop a 3D gaming application on windows.

36	Formal Languages and Automata Theory	<ul style="list-style-type: none"> • design finite automata for regular languages. • write regular expressions for regular languages or for DFA by applying Arden's theorem. • generate grammar for a given language. • design PDA for context free languages. • design Turing Machine for the phrase-structured languages.
37	Computer Networks	<ul style="list-style-type: none"> • compare protocol models (OSI, TCP/IP) and select suitable protocol for network design. • design a network by deciding relevant multiplexing and switching technique to improve performance of the network. • apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network. • apply routing and congestion control algorithms to deliver data packets across the networks. • use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet.
38	Full Stack Application Development	<ul style="list-style-type: none"> • design web pages using HTML5 and CSS3. • develop dynamic web pages and perform form validations using Javascript. • develop server side script to handle the given form data using JSP. • perform CRUD operations on MySQL database using PHP. • perform various operations on constructing React elements with data.
39	Artificial Intelligence	<ul style="list-style-type: none"> • analyze and formalize the problems as a state space, graph, or tree. • use search algorithms to discover solution to a given problem. • solve problems with uncertain information using probabilistic reasoning. • formalize sequential decision making using Markov decision process. • apply reinforcement learning to take suitable action to maximize reward in particular situation.
40	UML and Design Patterns	<ul style="list-style-type: none"> • apply the object oriented analysis and designs in software development and. • develop static conceptual models of the system. • create dynamic behavioral models of the system to meet user needs. • design object oriented architecture models. • select an appropriate design pattern to refine the model.

41	Advanced Data Structures	<ul style="list-style-type: none"> • apply sorting algorithms on a given data. • construct priority queue using a heap data structure. • create AVL and Red Black trees for the given data and perform insertion, deletion and search operations on them. • create multi-way search trees for the given data and perform insertion, deletion and search operations on them. • use digital search structures in searching process.
42	Software Project Management	<ul style="list-style-type: none"> • apply improvement strategies to see the inline growth in economic concerns of the project. • develop project plans that address real time management challenges. • design efficient work break down structures that meet real time deadlines of a project. • design effective software development plans to meet organizational needs. • use software metrics to measure the quality of software projects and to gain insights of management issues related to the project.
43	Network Programming	<ul style="list-style-type: none"> • analyze the requirements of a networked programming environment and identify the issues to be solved. • interpret the basic network technologies and protocols usage by common internet application. • develop client-server communication using TCP for communicating processes exist in the different systems. • apply theoretical principles and use appropriate functions for establishing client-server communication. • develop client-server communication using UDP protocols by writing socket programming.
44	Social Network Analysis	<ul style="list-style-type: none"> • demonstrate social network analysis and measures. • analyze random graph models and navigate social networks data • apply the network topology and Visualization tools. • analyze the experiment with small world models and clustering models. • compare the application driven virtual communities from social network Structure.
45	Computer Networks Lab	<ul style="list-style-type: none"> • implement data link layer framing and error detection methods. • analyze the topological and routing strategies for an IP based networking infrastructure.
46	Web Application Development Using Full Stack	<p>design web pages using HTML5, CSS3 and Javascript.</p> <ul style="list-style-type: none"> • use Javascript and PHP to access and validate form data. • develop a database application and perform various operations on database using JSP and PHP.

47	Compiler Design	<ul style="list-style-type: none"> • list compilation process steps of a language and represent tokens using regular expressions. • design a parser to verify the syntax of a programming language. • design syntax directed translation schemes for a given context free grammar. • construct symbol table to access identifier information and perform various operations on it. • apply code optimization techniques to enhance the efficiency of the intermediate code and generate code using generic code generation or DAG.
48	Data Mining **	<ul style="list-style-type: none"> • describe fundamentals, and functionalities of data mining system and data pre-processing techniques. • Illustrate the major concepts and operations of multi dimensional data models. • analyze the performance of association rule mining algorithms for finding frequent item sets from the large databases. • apply classification algorithms to solve classification problems. • use clustering methods to create clusters for the given data set.
49	Introduction to Machine Learning	<ul style="list-style-type: none"> • describe machine learning and different forms of learning. • use statistical learning techniques to solve a class of problems. • build support vector machine for the given data to create optimal boundary that best classifies the data. • design neural networks to simulate the way human brain analyzes and processes information. • solve classification problems using a decision tree.
50	Image Processing	<ul style="list-style-type: none"> • illustrate fundamental steps in digital image processing. • make use of appropriate digital image enhancement techniques in spatial domain for real world problems. • apply suitable image segmentation and Compression techniques for an application. • demonstrate Color image processing techniques. • summarize different reshaping operations on the image and their practical applications.

51	UNIX Network Programming	<ul style="list-style-type: none"> • analyze the requirements of a networked programming environment and identify the issues to be solved. • develop Client-Server communication using TCP&UDP protocols by writing socket programming. • interpret the basic network technologies & protocols usage by common internet application. • apply theoretical principles and use appropriate functions for establishing Client-Server communication. • classify different types of IPC mechanisms for communicating processes exist in the same system and in different systems.
52	Adhoc Wireless Networks	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • describe the fundamental characteristics and challenges and routing protocols of Ad hoc networks • apply the routing protocols and security services in large scale networks • design the wireless sensor applications apply the Data retrieval techniques in wireless networks • simulate the wireless network applications using network platforms and tools
53	C# .Net	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • configure the .NET environment for an application. • implement simple programs in C# using control structures. • apply the inheritance mechanism to solve simple problems in C#. • apply the exception handling mechanism to improve the robustness of an application. • create user interface components for a .NET application and connect web pages with a database.
54	DevOps	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • explain fundamentals and advance concepts of Agile and DevOps. • describe Usage of multiple tools for unit functions in a DevOps pipeline. • illustrate various types of version control systems, continuous integration tools. • elaborate on various tools to orchestrate, deployment, infrastructure management. • outline Devops and Cloud work together.

55	Object Oriented Analysis & Design	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • apply the object oriented analysis and designs in software development and familiar with the UML concepts. • develop static conceptual models of the system. • create dynamic behavioral models of the system to meet user needs. • design object oriented architecture models.
56	Machine Learning Lab	<ul style="list-style-type: none"> • design java/python programs for various learning algorithms. • apply appropriate data sets to the machine learning algorithms. • identify and apply machine Learning algorithms to solve real world problems.
57	MEAN Stack Technologies	<ul style="list-style-type: none"> • implement basic CRUD operations using MongoDB. • apply node.js constructs in application development • use Express.js for web application development and apply web services concepts using Restful API. • compose and transpile typescript codes. • design applications using front-end framework Angular.
58	Data Science	<ul style="list-style-type: none"> • apply statistical learning methods to data for inferences. • analyze data using machine learning approaches • illustrate graphical analysis and hypothesis testing methods • use data wrangling approaches for pre-processing the data • perform descriptive analytics over massive data.
59	Cryptography and Network Security	<ul style="list-style-type: none"> • describe security goals and various attacks occurs in a network. • compare and apply different encryption and decryption techniques. • compute cryptographic checksums and evaluate the performance of different message digest and authentication algorithms. • apply network and internet security protocols to secure E-mails, web content. • analyze system security using various firewalls and intrusion detection techniques.
60	Big Data Analytics	<ul style="list-style-type: none"> • illustrate the importance of big data and challenges of conventional systems. • outline the building blocks of hadoop and basic file system operations. • analyze data with hadoop Map Reduce framework. • process the data in hadoop environment using Pig and Hive to solve real world and industrial problems. • enumerate the open source frameworks used to efficiently store and process large data sets

61	Deep Learning	<ul style="list-style-type: none"> • outline a feed forward neural network to solve classification problems. • train the neural network using back propagation algorithm. • use deep neural networks to solve real life problems. • solve classification and pattern problems using Probabilistic Neural Networks. • apply neural networks in Object recognition, sparse coding, computer vision, and natural language processing.
62	Cloud Computing	<ul style="list-style-type: none"> • describe the stages in historical evolution of cloud computing. • use suitable cloud services to define cloud for the enterprise. • demonstrate hardware level and OS level virtualization to implement virtual machines • design machine images, web applications and databases for virtual machines. • apply data, network and host security for the cloud.
63	Natural Language Processing	<ul style="list-style-type: none"> • show sensitivity to linguistic phenomena and model them with formal grammars. • carry out proper experimental methodology for training and evaluating empirical NLP systems. • manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods. • design, implement, and analyze NLP algorithms. • design different language modeling Techniques.
64	DevOps Tools	<ul style="list-style-type: none"> • explain fundamentals and advance concepts of Agile and DevOps. • describe Usage of multiple tools for unit functions in a DevOps pipeline. • illustrate various types of version control systems, continuous integration tools. • elaborate on various tools to orchestrate, deployment, infrastructure management. • outline Devops, Cloud and application security work together.
65	Soft Computing Techniques	<ul style="list-style-type: none"> • describe soft computing and its applications. • design neural networks to simulate the way human brain analyzes and processes information. • use fuzzy systems in information processing for classification and decision making. • design genetic algorithms to find optimal or near optimal solutions to difficult problems. • illustrate different kinds of hybrid systems used in soft computing.

66	Internet of Things	<ul style="list-style-type: none"> • summarize the basic concepts of Internet of Things. • analyze the requirements and specifications to design any IoT application. • develop smart city and agricultural applications using Arduino IoT and Raspberry pi IoT kit. • use the tools such as AutoBahn, Xively Cloud communication API's to exchange data between cloud and IoT kit. • analyze the Home, Agricultural and Smart City Applications
67	Ethical Hacking	<ul style="list-style-type: none"> • describe the basic concepts in ethical hacking and legality. • use CEH Scanning methodology to gather network and host information. • implement the sniffers to give countermeasures to network vulnerabilities. • protect web servers and web applications from DoS attack and other software vulnerabilities. • use the sniffer tools, penetration and detection techniques in wireless network to protect from attacks
68	Blockchain Technologies	<ul style="list-style-type: none"> • demonstrate how the processes in payment and funding happens in block chain technology. • identify the risks involved in building block chain applications. • outline legal implications using smart contracts. • choose the present landscape of block chain implementations and understand crypto currency markets. • examine how to profit from trading crypto currencies.
69	Distributed Systems	<p>Upon successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • describe the important characteristics of distributed systems and the salient feature of architectural models. • apply inter-process communication in a distributed environment • implement the RMI and RPC for different case studies • analyze how operating system can support to distributed systems • develop a familiarity with distributed file systems and also synchronization algorithms distinguish between active replication and passive replication.
70	Agile Software Development Process	<ul style="list-style-type: none"> • illustrate Pair Programming for solving software problems • develop Reports for Software Collaboration. • develop less or zero bug software for sample scenario. • apply various slack reduction techniques in software development. • develop methodologies for estimating performance stories.

71	Introduction to Recommender Systems	<ul style="list-style-type: none"> • identify the importance of Recommender Systems. • model recommender system by using content-based filtering technique. • build recommender system by collaborative filtering technique. • design recommender system by hybrid approaches. • evaluate recommender systems.
72	Data Visualization Techniques	<ul style="list-style-type: none"> • describe the key techniques and theory behind data visualization. • classify various visualization systems and describe the methods used to spatial data to graphical depictions. • use effectively various visualization structures like tables, trees, graphs/ networks, text and document. • identify a wide variety of available visualization systems and its key features. • analyze visualization techniques for line, point and region.
73	Big Data Analytics Lab	<ul style="list-style-type: none"> • apply suitable LINUX commands to work in Hadoop environment. • use HDFS file structure and Map Reduce framework to solve complex problems. • analyze data using Pig and Hive.

IT

S.No.	Course Name	Course Outcomes
1	Functional English	CO1. speak with a reasonable degree of fluency using communication strategies (i.e. using language appropriately to carry out functions such as greeting, requesting information, seeking confirmation, disagreeing) as well conventions of politeness and courtesy
		CO2. speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing
		CO3. listen to short audio and video clips
		CO4. in standard Indian accent with understanding of the types listed in D (1) (a) below; and
		CO5. in native English accent (British and American), especially clips in which the speakers or voice actors speak slowly, and gain both understanding of messages and sensitivity to native-speaker accents
		CO6. read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meanings
		CO7. write coherent paragraphs with attention to elements of writing such as content, organization, language, style, and mechanics and the conventions of academic writing

		CO8.write survey reports with attention to conventions of report writing
		CO9.guard against mistakes Indians typically make in their speech and writing in English
2	Linear Algebra And Calculus	CO1.solve the system of linear equations in various engineering problems
		CO2.evaluate the eigenvalues and eigenvectors.
		CO3. solve linear ordinary differential equations .
		CO4. apply the techniques of partial differentiation in optimization problems and solve first order partial differential equations
		CO5.compute areas and volumes using double and triple integrals
3	Applied Chemistry	CO1.apply BET method to determine surface area of a nano material and discuss the preparation, properties and applications of nanomaterials. Explain the principles of green chemistry for sustainable development.
		CO2.explain the electrochemistry of batteries and sensors.
		CO3.explain the structure of bio-molecules and their application in molecular machines
		CO4.discuss the different types of semi-conductors, preparation and properties of polymer materials used in electronic components.
		CO5.interpret the spectral data to analyse the structure of simple molecules.
4	Elements Of Electronics Engineering	CO1.understand the behavior and characteristics of p-n junction diode.
		CO2.Identify appropriate special semiconductor devices for electronic applications
		CO3. describe the switching and amplification action of BJT & FET.
		CO4.recognize unipolar and bipolar logic families and their use in ICs.
5	Programming For Problem Solving	CO1.outline problem solving steps and solve sample problems
		CO2.use control statements for writing the programs.
		CO3.apply the concepts of arrays and strings in problem solving.
		CO4.decompose a problem into functions to develop modular reusable code.
		CO5.utilize user- defined data types and text I/O operations for efficient handling of data.
		CO1.give short impromptu speeches with confidence and fluency

6	Functional English Lab	CO2.take part in conversations in different functional contexts using English following appropriate communication strategies.
		CO3. use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English.
		CO4.articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy.
		CO5.check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
		CO6.pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication
		CO7.speak English with adequate attention to stress, rhythm, and intonation.
		CO8.speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.
		CO9.read out texts of different kinds fluently with appropriate pauses, stress, and intonation.
7	Applied Chemistry Lab	CO1.analyze the total hardness of water by volumetric method.
		CO2.operate the pH meter, conductivity meter and turbidity meter for analyzing the water quality
		CO3.synthesize phenol – formaldehyde resin (Bakelite), poly aniline and obtain cell potential by the construction of an electrochemical cell.
		CO4.analyze the corrosion rate of a given metal in a given environment by gravimetric method.
		CO5.operate spectrophotometer and determine the concentration of Ferric Iron in a given solution.
8	C Programming Lab	CO1.apply problem solving steps to solve a problem.
		CO2.develop C programs using selection and iterative statements.
		CO3.decompose a problem into functions to develop modular reusable code.
		CO4.apply structures and unions to solve a problem.
		CO5. implement file operations on a given file.
9	Environmental Studies	CO1.create awareness among the people in protection of environment.
		CO2.analyze structure and functional attributes of an ecosystem
		CO3.explain the values of biodiversity
		CO4.identify the sources of environmental pollution, assess their effects and suggest suitable control measures.

		CO5.adopt sustainable waste managementpractices.
10	Professional Communication	CO1.speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation)
		CO2.add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress and intonation.
		CO3.listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native speaker accents
		CO4. produce written discourses of different kinds (e.g. texts expressing opinions and making a convincing case for one’s standpoint, professional emails, and summaries of lengthy texts) with attention to elements of writing such as content, organization, language, style, and mechanics
		CO5.guard against grammatical errors Indians typically make in their speech and writing in English
11	Integral Transforms And Vector Calculus	CO1. evaluate improper integrals using Laplace transforms.
		CO2.apply Laplace transforms to find the solutions of initial and boundary value problems
		CO3.find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems.
		CO4.apply the concepts of vector differentiation in their engineering fields.
		CO5.verify the relation between line, surface and volume integrals using integral theorems.
12	Applied Physics	CO1.explain construction and working of laser
		CO2.relate the principles of propagation of light in optical fibers for applications in communications
		CO3.solve Schrodinger’s wave equation to find the wave function and associated probabilities for simple potentials
		CO4.identify conductivity mechanism in semiconductors
		CO5.correlate the electrical and magnetic properties of materials to the properties of atoms.
13	Data Structures	CO1. implement and analyse searching and sorting techniques.
		CO2.implement algorithms for linked lists.
		CO3.apply algorithms of stacks and queues.
		CO4.develop data structures to make use of trees and heaps.

		CO5.develop algorithms for traversal of graphs and hashing for efficient storage of data.
14	Universal Human Values 2: Understanding Harmony	CO1.be aware of themselves and surroundings
		CO2.be responsible in life
		CO3.develop personality to be happy continuously and prosper
		CO4.handle the problems with sustainable solutions.
		CO5.possess human nature in mind
		CO6.apply what they have learnt to their own self in real life situations
15	Professional Communication Lab	CO1.enhance the effectiveness of their communication through body language;
		CO2. take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency
		CO3.speak professionally in telephone conversations;
		CO4.make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session;
		CO5.take part in group discussions and debates successfully;
		CO6.answer questions at an elementary level in job interviews (e.g. Can you tell us something about yourself? What kinds of things do you worry about? What are your key skills? What skills do you need to improve? What do you see as your strengths? What do you like doing in your spare time? How would you describe the way you work? Tell us about a time when you showed strong leadership skills. Tell us about a time when you had to make a difficult decision. How do you see yourself in five years' time?);and
		CO7.use team-building skills with impact in different situations
16	Applied Physics Lab	CO1.calculate light gathering power of optical fiber and bending losses
		CO2.study the directionality and wavelength of laser
		CO3.identify the nature of semiconductor from the obtained energy gap and Hall coefficient.
		CO4.draw characteristic curves of thermistor and LED.
		CO5.study regulatory nature of zener diode
		CO6.estimate magnetic induction, Magnetic susceptibility and Dielectric constant.

17	Data Structures Lab	CO1.implement sorting and searching algorithms.
		CO2.develop suitable code to simulate the operations on linked lists.
		CO3.implement stacks and queues using arrays and linked lists.
		CO4.write code using a stack for arithmetic expressions evaluation and conversion.
		CO5.perform operations on binary search trees and graphs.
		CO6.create a hash table and perform operations on it.
18	Constitution Of India	CO1.understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties
		CO2.understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System.
		CO3.structure of the state government, Secretariat, Governor and Chief Minister and their functions
		CO4.learn local administration viz. Panchayat, Block, Municipality and Corporation.
		CO5.learn about Election Commission and the process and about SC, ST, OBC and women
19	Discrete Mathematical Structures	CO1.use mathematical logic for analyzing propositions and proving theorems
		CO2.describe the properties of relations, functions and lattice theories.
		CO3.categorize different types of algebraic structures and describe their properties.
		CO4.apply the concepts of graph theory in modeling and solving non-trivial problems in computer networks.
		CO5.apply pigeon hole principle in computer applications and solve recurrence relations.
20	Managerial Economics And Financial Analysis	CO1.apply managerial economic concepts in business decision making
		CO2.categorize production with respect to time and cost.
		CO3. relate market structures and pricing of a product
		CO4.establish suitable business organization with available resources.
		CO5.apply accounting rules in determining the financial results and prepare financial statements
21	Digital Logic Design	CO1.perform number system conversions, signed number arithmetic using complements
		CO2.simplify Boolean functions using Boolean laws, theorems and k- maps
		CO3. implement combinational logic for adders and subtractors.

		CO4.design combinational logic circuits such as decoders, encoders, multiplexers and demultiplexers.
		CO5.design registers and counters using flip flops
22	Object Oriented Programming Through Java	CO1.describe OOP concepts and features of Java.
		CO2.apply class and inheritance concepts in developing the Java code.
		CO3.create user interfaces and packages for a given problem.
		CO4.develop code to handle exceptions and implement multi-threading to make applications more dynamic.
		CO5.design GUI applications with event handling mechanism.
23	Formal Languages And Automata Theory	CO1.design finite automata for regular languages.
		CO2.write regular expressions for regular languages or for DFA by applying Arden's theorem.
		CO3.generate grammar for a given language.
		CO4.design PDA for context free languages.
		CO5.design Turing Machine for the phrase-structured languages.
24	JAVA Programming Lab	CO1.apply the concept of object oriented approach in problem solving.
		CO2.create packages for reusability.
		CO3.examine exceptions and multi-tasking.
		CO4.create GUI applications to handle event
25	R Programming Lab	CO1.solve basic mathematical expressions using R software tool.
		CO2.develop basic programs using control structures in R
		CO3.create and perform operations on data structures in R
		CO4.implement Graphs using R programming
26	R Programming Lab	CO1.use shell script to create files and handle text documents
		CO2.create child processes, background process and zombies
		CO3.write shell scripts to solve problems.
		CO4.implement some standard Linux utilities such as ls, cp etc. using system calls
27	Probability And Statistics	CO1.find the mean, variance and different probabilities.
		CO2.construct sampling distributions, confidence intervals and to find maximum error of estimates for population parameters.
		CO3.validate given hypothesis in case of large sample problems.
		CO4.examine the given hypothesis in case of exact samples.
		CO5.measure the association between the variables and to fit different curves to the given data.

28	Database Management Systems	CO1.analyze information storage problem and derive a model in the form of an entity relationship diagram.
		CO2.develop simple and complex queries using Structured Query Language (SQL).
		CO3.apply principles of normalization for designing a good relational database schema.
		CO4.compare different techniques related to transaction management and concurrency control.
		CO5.construct multi-level indices for fast retrieval of data and use recovery techniques to recover the database from a crash.
29	Computer Organization	CO1.identify different types of instructions.
		CO2.differentiate micro-programmed and hard-wired control units.
		CO3.analyze the performance of hierarchical organization of memory.
		CO4.summarize different data transfer techniques.
		CO5.demonstrate arithmetic operations on fixed- and floating-point numbers and illustrate concepts of parallel processing.
30	Python Programming	CO1.demonstrate Basics of Python Programming
		CO2.use functions and module to develop Python programs.
		CO3.differentiate mutable and immutable data types.
		CO4.develop code to handle exceptions and files.
		CO5.design applications with object orientation, GUI and database
31	Database Management Systems Lab	CO1.create relational database with the given constraints.
		CO2.formulate simple and complex queries using features of SQL.
		CO3.create views on relational database based on the requirements of users.
		CO4.develop PL/SQL programs for processing multiple SQL statements.
		CO5.implement triggers on a relational database.
32	Python Programming Lab	CO1.apply problem solving steps to solve a problem.
		CO2.develop a python program for a given problem.
		CO3.apply object-oriented concepts to develop programs.
		CO4.design applications with GUI, Database.
33	Mobile Application Development	CO1.apply basic and important design concepts and issues of development of mobile applications.
		CO2.summarize the capabilities and limitations of mobile devices.
		CO3.develop mobile applications using Android Studio.
		CO1.apply suitable process model for software development based on stake holder requirements

34	Principles Of Software Engineering	CO2.estimate cost and schedule required to develop a software.
		CO3.analyze customer requirements and prepare SRS document.
		CO4.apply software design principles in the design of a software.
		CO5.design test cases for testing a software product using different testing techniques.
35	Design And Analysis Of Algorithms	CO1.analyze the performance of algorithms based on time and space complexity
		CO2.apply divide and conquer technique to solve sorting and searching problems
		CO3.apply greedy method to find optimal solution to a class of problems.
		CO4.solve optimization problems using dynamic programming.
		CO5.construct state space tree to find all possible solutions to a class of problems using back tracking and branch and bound techniques.
36	Operating Systems	CO1.describe the role, functions and structures of operating systems.
		CO2.demonstrate the concept of process and analyze the performance of CPU scheduling algorithms.
		CO3.compare different memory management schemes and apply page replacement algorithms in virtual memory.
		CO4.apply deadlock handling techniques to prevent deadlocks and analyze the performance of different disk scheduling algorithms
		CO5.develop software/hardware based solutions for critical section problems and outline files and directory structures.
37	Full Stack Application Development	CO1.design web pages using HTML5 and CSS3.
		CO2.develop dynamic web pages and perform form validations using Javascript.
		CO3.develop server side script to handle the given form data using JSP.
		CO4.perform CRUD operations on MySql database using PHP.
		CO5.perform various operations on constructing React elements with data.
		CO1.demonstrate the benefits of Biometric security and working process of matching
		CO2.identify the Algorithms used for interpretation in finger scan technology

38	Biometrics	CO3.apply Facial scan biometric techniques for identification to ensure the security in the real world problems.
		CO4.apply the iris and voice scan biometric techniques for identification in real world applications.
		CO5.compare the functionality of various physiological and behavioral biometrics such as Hand Scan , Retina Scan , Keystroke scan and Signature scan .
39	Neural Networks And Fuzzy Systems	CO1.outline Neural Networks Techniques and its applications.
		CO2.classify Neural Networks learning techniques
		CO3.apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
		CO4.apply if-then rules on fuzzy sets and perform Fuzzyfications & Defuzzifications.
		CO5.apply genetic algorithms for a particular problem
40	Advanced Data Structures	CO1.apply sorting algorithms on a given data.
		CO2.construct Priority queues such as min heap and max heap for the given data.
		CO3.create AVL and Red Black trees for the given data and perform insertion, deletion and search operations on them.
		CO4.create Multi-way Search Trees for the given data and perform insertion, deletion and search operations on them.
		CO5.use digital search structures in searching process.
41	Computer Graphics	CO1.outline different graphical display devices and drawing algorithms.
		CO2.illustrate different 2-D geometrical transformations on graphical objects
		CO3.interpret different line and polygon clipping algorithms
		CO4.apply different 3- D transformations and viewing functions on objects
		CO5.summarize different surface detection methods and computer animations
42	Full Stack Application Development Lab	CO1.design web pages using HTML5, CSS3 and Java script
		CO2.use Java script and PHP to access and validate form data.
		CO3.develop a database application and perform various operations on database using JSP and PHP.
43	IoT Application Development	CO1.choose the sensors and actuators for an IoT application.
		CO2.select protocols for a specific IoT application.
		CO3.use the corresponding cloud services and APIs for selected IoT application
		CO4.experiment with embedded boards for creating IoT prototypes.

		CO5.design a solution for a given IoT application.
44	Artificial Intelligence	CO1.analyze and formalize the problems as a state space, graph, or tree.
		CO2.use search algorithms to discover solution to a given problem.
		CO3.solve problems with uncertain information using probabilistic reasoning.
		CO4.formalize sequential decision making using Markov decision process.
		CO5.apply reinforcement learning to take suitable action to maximize reward in particular situation.
45	Data Warehousing And Data Mining	CO1.describe fundamentals, and functionalities of data mining system and data preprocessing techniques.
		CO2.analyze the performance of association rule mining algorithms for finding frequent item sets from the large databases.
		CO3.outline the data classification procedure by selecting appropriate classification methods / algorithms.
		CO4.classify various clustering methods and algorithms on data sets to create appropriate clusters.
		CO5.apply appropriate web and text mining techniques for data analysis.
46	Computer Networks	CO1.compare protocol models (OSI, TCP/IP) and select suitable protocol for network design.
		CO2.design a network by deciding relevant multiplexing and switching technique to improve performance of the network.
		CO3.apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network and specify and identify deficiencies in MAC sublayer protocols.
		CO4.apply routing and congestion control algorithms to deliver data packets across the networks.
		CO5.use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet.
47	Principles Of Compiler Design	CO1.list compilation process steps of a language and represent tokens using regular expressions.
		CO2.design a parser to verify the syntax of a programming language.
		CO3.design syntax directed translation schemes for a given context free grammar
		CO4.construct symbol table to access identifier information and perform various operations on it.

		CO5.apply code optimization techniques to enhance the efficiency of the intermediate code and generate code using generic code generation or DAG
48	Cryptography And Network Security	CO1.describe security goals and various attacks occurs in a network.
		CO2.compare and apply different encryption and decryption techniques.
		CO3.compute cryptographic checksums and evaluate the performance of different message digest and authentication algorithms.
		CO4.apply network and internet security protocols to secure E-mails, web content.
		CO5.analyze system security using various firewalls and intrusion detection techniques.
49	Deep Learning	CO1.outline a feed forward neural network to solve classification problems.
		CO2.train the neural network using back propagation algorithm.
		CO3.use deep neural networks to solve real life problems.
		CO4.solve classification and pattern problems using Probabilistic Neural Networks
		CO5.apply neural networks in Object recognition, sparse coding, computer vision, and natural language processing.
50	Software Project Management	CO1.apply the improvement strategies to see the inline growth in economic concerns of the project.
		CO2.develop project plans that address real time management challenges.
		CO3.design efficient work break down structures that meet real time deadlines of a project.
		CO4.design effective software development plans to meet organizational needs.
		CO5.use software metrics to measure the quality of software projects and to gain insights of management issues related to the project.
51	Image Processing	CO1.illustrate fundamental steps in digital image processing.
		CO2.make use of appropriate digital image enhancement techniques in spatial domain for real world problems.
		CO3.apply suitable image segmentation and Compression techniques for an application.
		CO4.demonstrate Color image processing techniques.
		CO5.summarize different reshaping operations on the image and their practical applications.
52	Computer Networks Lab	CO1.implement data link layer framing and error detection methods.

52	Computer Networks Lab	CO2.analyze the topological and routing strategies for an IP based networking infrastructure.
53	Mean Stack Technologies	CO1.implement basic CRUD operations using MongoDB.
		CO2.apply node.js constructs in application development.
		CO3.use Express.js for web application development and apply web services concepts using ReactJS.
		CO4.compose and transpile typescript codes.
		CO5.design applications using front-end framework Angular.
54	Machine Learning	CO1.describe machine learning and different forms of learning.
		CO2.use statistical learning techniques to solve a class of problems.
		CO3.build support vector machine for the given data to create optimal boundary that best classifies the data.
		CO4.design neural networks to simulate the way human brain analyzes and processes information.
		CO5.solve classification problems using a decision tree.
55	Big Data Analytics	CO1.illustrate the importance of big data and challenges of conventional systems.
		CO2.outline the building blocks of hadoop and basic file system operations.
		CO3.analyze data with hadoop Map Reduce framework.
		CO4.process the data in hadoop environment using Pig and Hive to solve real world and industrial problems.
		CO5.enumerate the open source frameworks used to efficiently store and process large data sets.
56	Cloud Computing	CO1.describe the stages in historical evolution of cloud computing.
		CO2.use suitable cloud services to define cloud for the enterprise
		CO3.demonstrate hardware level and OS level virtualization to implement virtual Machines.
		CO4.design machine images, web applications and databases for virtual machines
		CO5.apply data, network and host security for the cloud.
57	Introduction To Recommender System	CO1.identify the importance of Recommender Systems.
		CO2.model Recommender System by using Content-based Filtering technique.
		CO3.build Recommender System by Collaborative Filtering technique.
		CO4.design Recommender System by Hybrid approaches.
		CO5.evaluate Recommender Systems
		CO1.explain fundamentals and advance concepts of Agile and DevOps.

58	Devops Tools	CO2.describe Usage of multiple tools for unit functions in a DevOps pipeline.
		CO3.illustrate various types of version control systems, continuous integration tools.
		CO4.elaborate on various tools to orchestrate, deployment, infrastructure management.
		CO5.outline Devops and Cloud work together.
59	Computer Vision	CO1.illustrate fundamentals in computer vision.
		CO2.make use of appropriate boundary detection techniques for an application.
		CO3.apply suitable techniques for texture feature extraction and pattern recognition for an application.
		CO4.utilize the motion analysis techniques.
		CO5.examine different recognition techniques on the image and their practical applications.
60	M-Commerce	CO1.outline the fundamentals in E-Commerce frame work and describe consumer oriented applications.
		CO2.classify the various types of electronic and mobile payment methods and identify the risks.
		CO3.distinguish problems in Electronic Data Interchange (EDI), VAN and Supply Chain Management.
		CO4.describe various Mobile-Commerce applications and Mobile Banking Services.
		CO5.Ensure the security goals in the mobile network, Bluetooth and WLANs.
61	Natural Language Processing	CO1.show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
		CO2.carry out proper experimental methodology for training and evaluating empirical NLP systems.
		CO3.manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
		CO4.design, implement, and analyze NLP algorithms.
		CO4.design different language modeling Techniques
62	Modern Scripting Languages	CO1.develop script to exchange data between server and browser using JSON.
		CO2.develop PERL scripts using arrays, hashes, control structures and subroutines.
		CO3.create Ruby scripts using data types, arrays, hashes, control structures and classes.
		CO4.develop script to retrieve data from a database using PHP and AJAX
		CO5.create TCL scripts for simple problems.

63	Data Visualization Techniques	CO1.describe the key techniques and theory behind data visualization
		CO2.classify various visualization systems and describe the methods used to spatial data to graphical depictions.
		CO3.use effectively the various visualization structures like tables, trees ,graphs/ networks, Text and Document.
		CO4.identify a wide variety of available visualization systems and its key features.
		CO5.analyze and Distinguish between visualization techniques for Line, Point and Region.
64	Blockchain Technologies	CO1.demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
		CO2.identify the risks involved in building Block chain applications.
		CO3.outline legal implications using smart contracts.
		CO4.choose the present landscape of Block chain implementations and Understand Crypto currency markets.
		CO5.examine how to profit from trading crypto currencies.
65	Reinforcement Learning	CO1.enumerate the elements of Reinforcement Learning.
		CO2.solve the n-armed Bandit problem.
		CO3.compare different Finite Markov Decision Process.
		CO4.discuss about Monte Carlo Methods in solving real world problems.
		CO5.list the Applications and Case Studies of Reinforcement Learning.
66	Software Testing Methodologies	CO1.describe the basic concepts of software testing
		CO2.design test cases to test a software using black box testing
		CO3.apply white-box testing techniques to uncover bugs present in the program.
		CO4.perform verification and validation activities to reduce the propagation of bugs.
		CO5.use regression testing and software quality management to improve the quality of a software product.
67	Virtual And Augmented Reality	CO1.identify basic elements of virtual Reality
		CO2.describe various input and output devices required for VR experience.
		CO3.classify human factors that affect VR experience.
		CO4.distinguish augmented reality from virtual reality.
		CO5.determine the object position and orientation in virtual space.
		CO1.apply suitable LINUX commands to work in Hadoop environment.

68	Big Data Analytics Lab	CO2.use HDFS file structure and Map Reduce framework to solve complex problems.
		CO3.analyze data using Pig and Hive.
69	Data Science Using Python Lab	CO1.import and export data.
		CO2.apply appropriate data collection and pre-processing methods.
		CO3.identify suitable data analysis Technique for given applications
		CO4.analyze data using data visualization techniques.

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CE

S.No.	Course Name	Course Outcomes
1	Functional English	CO1. Listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately
		CO2. Speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture
		CO3. reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes
		CO4. writing for academic purposes (e.g. assignments, examination answers) in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately
		CO5. To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English
2	Linear Algebra & Differential Equations	CO1. To understand the concepts of eigenvalues and eigenvectors
		CO2. To know the procedures to find the solutions of first and second order differential equations
		CO3. To understand different procedures to solve first order linear & non-linear partial differential equations
3	Engineering Chemistry	CO1. To impart the knowledge of corrosion, treatment methods of water and green synthesis of products.
		CO2. To enable the students to obtain the knowledge of refractories, nano materials and instrumental methods of analysis
4	Problem Solving Using C	CO1. To emphasize the use of flowcharts and pseudo code in problem solving
		CO2. To gain knowledge in C language
		CO3. To develop C Programs to solve problems.
		CO4. To familiarize with the discrete components of a computer, MS Office
5	Engineering Drawing	CO1. To highlight the significance of universal language of engineers
		CO2. To introduce the concepts of drawing 3-D objects in 2-D planes and vice versa with proper dimensioning and scaling.
6	Functional English Lab	CO1. the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English
		CO2. a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.
7	Engineering Chemistry Lab	CO1. To practice the chemical and instrumental methods of analysis for various parameters that are useful in determination of the quality of water
		CO2. To know the preparation of Bakelite.
8	Professional Communication	CO1. To gain the knowledge of Laplace and inverse Laplace transforms
		CO2. To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication.
9	Integral Transforms And Multiple Integrals	CO1. To gain the knowledge of Laplace and inverse Laplace transforms
		CO2. To understand the concept of Fourier Transforms
		CO3. To know vector integral theorems such as Green's, Gauss & Stoke's.
10	Environmental Studies	CO1. To impart the basic knowledge about the environment and ecology
		CO2. To develop an attitude of concern for biodiversity and its conservation
		CO3. To assess the environmental impacts of developmental activities.
		CO4. To create awareness on environmental pollution and waste management.
11	Engineering Physics	CO1. To solve oscillating systems problems
		CO2. To analyse crystal parameters to investigate crystal structures
		CO3. To apply principles of optics for engineering applications.

12	Engineering Mechanics	CO1.To impart the basic concepts of force systems, free body diagram and equilibrium conditions
		CO2. To familiarize on calculating the geometric properties like centroid, moment of inertia of various sectional areas and masses and introduce the concept of friction and virtual work.
		CO3. To develop the knowledge on basic principles of kinematics and kinetics with simple applications.
		CO4. To introduce applications on using work-energy principle and Impulsemomentum methods.
13	Professional Communication Lab	CO1. Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.
14	Computer Aided Drafting Lab	CO1. To understand the importance of CAD
		CO2. To enable the student learn the fundamentals of computer aided drafting
15	Engineering Physics Lab	CO1. To make the students gain practical knowledge to co-relate with the theoretical studies
		CO2.To impart skills in measurements
		CO3. To design and plan the experimental procedure and to record and process the results
16	Applied Mechanics Lab & Building Trade Practice	CO1. To impart knowledge on basic engineering applications.
		CO2.To impart hands-on training on basic engineering trades.
17	Mechanics Of Solids	CO1.To introduce the concepts of stress, strain and elastic constants and their relations for use in elastic design of prismatic bars.
		CO2.To familiarize with shear force, bending moment and torsion and to claculate shear stresses and bending stresses developed for different sections of beams and shafts.
		CO3. To impart the knowledge on the principal stresses & principal strains and various Energy methods
		CO4 To introduce the methods for obtaining axial forces in the members of pin jointed plane trusses.
18	Mechanics of Fluids	CO1. To familiarize with static and dynamic aspects of fluids
		CO2. To impart knowledge on laminar flow, turbulent flow and dimensional analysis
		CO3. To introduce the methods for obtaining axial forces in the members of pin jointed plane trusses.
19	Building Materials And Construction	CO1. To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
		CO2. To understand the knowledge of building components, finishings.
20	Surveying	CO1. To make understand the importance of surveying in civil engineering field
		CO2. To create awareness on various types of surveying and their instruments
		CO3. To create awareness on various types of surveying and their instruments
21	Elements of Mechanical And Electrical Engineering	CO1. To familiarize with the basic concepts of transmission systems , machine tools and internal combustion engines
		CO2.To introduce the basic concepts of electrical circuits
		CO3. To familiarize with the operation of DC machines and A.C Machines
22	Building Planning and Drawing	CO1. To introduce building fundamentals and familiarize with planning principles of residential and public buildings
		CO2. To familiarise with different sign conventions and draw different views of abuilding.
23	Mechanics of Solids Lab	CO1. To introduce various stress and strain measuring equipment
		CO2. To familiarize with various physical, mechanical and strength properties of various engineering materials.
24	Survey Field Work	CO1. To familiarize with surveying equipments/ instruments like chain,compass,levelling instruments, theodolite and total station
		CO2. To impart the knowledge on linear, angular measurement
25	Numerical and Statistical Methods	CO1.To understand the various numerical techniques
		CO2.To introduce the concepts of probability and statistics
		CO3. To know the importance of the correlation coefficient & lines of regression

		CO4. To know sampling theory and principles of hypothesis testing.
26	Structural Analysis	CO1.To familiarize with the procedures of obtaining slopes and deflections of determinate beams. CO2.To familiarize with the crippling loads in column and struts and slenderness ratio. CO3. To familiarize the concept of propped cantilevers and fixed beams. CO4. To describe the analysis of indeterminate beams by using Clayperon’s Theorem and Slope-Deflection Method.
27	Hydraulics and Hydraulic Machines	CO1. To familiarize with the design principles of channels. CO2.To impart knowledge on Uniform and Non-Uniform flow in open channels. CO3. To introduce the working principles of hydraulic machines.
28	Concrete Technology	CO1.To introduce types, properties of cements and admixtures CO2.To build the knowledge on different types of aggregates CO3. To impart setting and hardening characteristics of concretes. CO4. To familiarize with the method of Mix Design.
29	Engineering Geology and Geomatics	CO1.To relate the importance of Geology to selection of site, materials and design of Civil Engineering Projects. CO2. To familiarize with the frameworks of GIS and Location Technologies. CO3. To introduce air-borne and space based imaging technologies and their working principles.
30	Elements of Civil Engineering	CO1.To introduce basics of Civil Engineering concepts in the fields of surveying,building materials, water resources,Water Supply,Sanitary, Electrical Works in Building and Highway engineering.
31	Building Services	CO1. To impart knowledge on water supply, treatments and water distribution for all type of buildings CO2.To acquire principles and best practices for Solid waste management in residential units. CO3. To create awareness about the importance of electrical and mechanical services in buildings and fire safety
32	Electrical Materials	CO1. To introduce the concepts of dielectric and ferro magnetic materials CO2.To impart knowledge on semiconductor materials. CO3. To familiarize with the required materials used for electrical applications.
33	Control Systems Engineering	CO1.To introduce the basic concepts of control systems by developing mathematical models for physical systems CO2.To familiarize with the time domain behavior of linear control systems. CO3. To impart knowledge on analytical and graphical methods to quantify stability of linear control systems. CO4. To introduce concepts on the state variable theory.
34	Elements of Manufacturing Processes	CO1.To introduce the principles of manufacturing processes to convert materials into desired shapes and sizes.
35	Automotive Engineering	CO1. To introduce various components of an automobile and engine sub systems CO2.To familiarize with the various systems such as transmission system, steering system, suspension system, braking system, and safety systems. CO3. To impart knowledge on various safety systems of an automobile and emission norms.
36	Introduction to Microprocessors and Microcontrollers	CO1. To familiarize with architecture of 8086 microprocessor and 8051 microcontroller. CO2.To introduce the assembly language programming concepts of 8086 processor. CO3. To expose with various interfacing devices with 8086 using 8255.
37	Fundamentals of Communications	CO1. To introduce various analog and digital modulation and demodulation techniques CO2.To familiarize with various multiplexing schemes and Data communication protocols CO3. To impart the standards and mechanisms of television systems
38	Computer Graphics	CO1. To introduce computer graphics applications and functionalities of various graphic systems. CO2.To familiarize with 2D and 3D geometrical transformations CO3. To disseminate knowledge on the visible surface detection and animation
39	Object Oriented Programming through JAVA	CO1.To familiarize with the concepts of object oriented programming. CO2. To impart the knowledge of AWT components in creation of GUI.

40	Systems Software	CO1.To familiarize with the implementation details of assemblers, loaders, linkers,and macro processors.
41	Web Programming	CO1.To develop real time web applications CO2. To get acquainted with skills for creating websites and web applications by learning various technologies like HTML, CSS, JavaScript, XML, JSP and JDBC.
42	Mathematical Cryptography	CO1.To give a simple account of classicalnumber theory, prepare students towards the concepts of Network Security and to demonstrate applications of number theory (such as public-key cryptography). CO2.To students will have a working knowledge of the fundamental definitions and theorems of elementary number theory, be able to work with congruences. CO3. To solve congruence equations and systems of equations with one and more variables. CO4. To students will also have an exposure to cryptography.
43	Semiconductor Physics	CO1.To know the physics and applications of semi conductor CO2. To understand fundamental principles and applications of the electronic and optoelectronic.
44	Fluid Mechanics and Hydraulic Machines Lab	CO1. To impart the knowledge on flow measurement through closed conduit/tank/channel. CO2.To familiarize with various losses in closed conduits. CO3. To familiarize with performance curves for various hydraulic turbines and pumps
45	Concrete Technology Lab	CO1. To develop the skill of testing the building materials like cement & aggregates. CO2.To impart the knowledge on properties of fresh concrete. CO3. To familiarize with the strength properties of hardened Concrete CO4. To introduce the concepts of non-destructive testing.
46	Interior Design	CO1.To introduce with civilisations of Greece, Romes, traditions of islamic and asian. CO2. To impart knowledge on design process, organising space in a building and sustainable design.
47	Building Bye Laws and Scientific Planning	CO1. To familiarize with building bye laws and regulations. CO2. To impart the knowledge of orientation and planning principles for buildings
48	Data Structures	CO1. To impart knowledge of linear and non-linear data structures. CO2. To familiarize with different sorting and searching techniques.
49	Theory of Structures	CO1. To introduce the concept of analyzing the two hinged and three hinged parabolic arches. CO2.To impart knowledge on influence lines and moving loads CO3. To familiarize with lateral load analysis using approximation methods CO4. To impart knowledge on solving indeterminate structures by Moment distribution, Kani's and matrix methods.
50	Geotechnical Engineering	CO1. To familiarize with soil formation and classification of soils. CO2.To make understand vertical stress distribution in soils CO3. To introduce concepts of consolidation settlement and compaction control CO4. To impart knowledge on shear strength parameters.
51	Hydrology and Water Resources Engineering	CO1. To impart the knowledge of essential components of the hydrologic cycle CO2. To provide an overview and understanding of Unit Hydrograph theory and its analysis. CO3. To familiarize with different methods of flood frequency analysis and flood routing. CO4.To impart knowledge on groundwater movement and well hydraulics CO5.To familiarize with the relationships between soil, water and plant and their significance in planning an irrigation system
52	Water and Waste Water Engineering	CO1. To impart the knowledge of selecting sources of water with reference to quality and quantity in a locality, for domestic application and drinking. CO2.To introduce various treatment options available and their design principles for water treatment and wastewater treatment at the household and municipal level. CO3. To elucidate the various collection and disposal options available for water and wastewater, including the networks, layout, construction and maintenance.
53	Advanced Strength of Materials	CO1. To impact the knowledge on classification of cylinders based on their thickness and familiarize the stresses induced in thin and thick cylinders. CO2.To impart concepts on various theories of failures and unsymmetrical bending in beams.

		CO3. To familiarize with principles of analyzing cables, suspension bridges and plastic theory
54	GIS and GPS	CO1. To introduce spatial information technology fundamentals. CO2.To narrate the progress from analog to digital spatial decision support systems CO3. To elaborate the applications of GPS in surveying
55	Green Buildings	CO1.To introduce students to the concept of ‘Green’ Building. CO2.To familiarize students with the ‘voluntary environmental building rating systems’ (VERS) operating in India. CO3. To communicate the logic behind the rating categories in IGBC, GRIHA, LEED,EDGE, and WELL rating systems.
56	Construction Management	CO1.To introduce the importance of management in construction projects. CO2.To familiarize with quality, safety and material management in construction projects. CO3. To explore environmental issues in construction project.
57	Geoinformatics	CO1.To introduce the basic concepts and principles of remote sensing. CO2.To familiarize with structure and function of Geographic Information Systems. CO3. To illustrate the multidisciplinary nature of Geospatial applications
58	Environmental Sanitation	CO1.To communicate the importance of institutional sanitation in maintaining public health. CO2.To introduce the strategies for maintaining healthy living and working environment. CO3. To delineate the role of environmental engineer in industrial environments.
59	Modeling and Simulation of Engineering Systems	CO1. To familiarize with programming skills using basic MATLAB and its associated tool boxes. CO2. To impart knowledge on building SIMULINK and Graphical user interface.
60	Modeling and Simulation of Engineering Systems	CO1. To familiarize with programming skills using basic MATLAB and its associated tool boxes. CO2. To impart knowledge on building SIMULINK and Graphical user interface.
61	Power Systems Engineering	CO1. To introduce the working of power plants in power generation and layout of substations. CO2. To familiarize with the concepts of corona, insulators and sag in overhead lines.
62	Elements of Mechanical Transmission	CO1.To familiarize with the principles of mechanical power transmission elements
63	Material Handling Equipment	CO1.To provide knowledge on materials handling equipment.
64	Automotive Electronics	CO1. To familiarize with the electronic systems inside an automotive vehicle. CO2. To introduce the concepts of advanced safety systems
65	Introduction to MEMS	CO1.To introduce lithography principles, mechanical sensors and actuators. CO2. To make it known the thermal sensors and actuators, magnetic sensors and actuators. CO3. To present formally micro fluidic systems and chemical and bio medical micro systems.
66	Data Science	CO1. To familiarize with statistical methods to analyze data using classification, graphical and computational methods CO2. To introduce Data Wrangling approaches and descriptive analytics on large data sets.
67	Virtual and Augmented Reality	CO1. To introduce key elements of virtual Reality with the components in VR systems. CO2.To gain knowledge of various input and output devices required for interacting in virtual world and augmented reality.
68	Open Source Software	CO1. To impart the opportunities for open source software in the global market. CO2. To familiarize with different steps in implementing the open source.
69	Cyber Laws	CO1. To expose the need of cyber laws to prosecute cybercrimes in the society. CO2. To familiarize with Licensing Issues Authorities for Digital Signatures.
70	Quality, Reliability and Operations Research	CO1.To equip students with basic practical skills with sufficient theory. CO2. To understand the principles involved in the application area. CO3. To develop the power of systematic thinking and reasoning, practical approach and exposition in the students.
71	Geotechnical Engineering Lab	CO1. To introduce the tests for determining the dry density of soils. CO2.To familiarize with different test procedures for obtaining shear strengthof soils. CO3. To appraise the soil properties by compaction and consolidation process. CO4. To familiarize with the tests for finding out the permeability of soils.

72	Water and Waste Water Engineering Lab	CO1.To verify the suitability of water for drinking, based on Indian Standards CO2. To estimate the strength of sewage in terms of biological parameters CO3. To identify the vital conditions for survival of aquatic life.
73	Infrastructure Development	CO1.To evaluate infrastructure development. CO2. To know PPP Procurement Process in India. CO3. To manage the risks associated with various infrastructure projects. CO4. To identify the critical issues in infrastructure financing.
74	Basics of Power Plant Engineering	CO1.To introduce the working principles of various power plants.
75	Object Oriented Programming through JAVA	CO1. To familiarize with the concepts of object oriented programming CO2.To impart the knowledge of AWT components in creation of GUI.
76	Foundation Engineering	CO1.To introduce the stability of earth slopes. CO2. To familiarize with lateral earth pressure and stability of retaining walls. CO3. To familiarizewith load carrying capacity of shallow and deep foundations.
77	Highway Engineering	CO1.To familiarize with different concepts in the field of Highway Engineering. CO2.To acquire design principles of Highway geometrics and pavements CO3. To learn various highway construction and maintenance procedures.
78	Design of RC Structures	CO1.To familiarize with the different types of design philosophies and IS:456 - 2000 provisions CO2.To introduce the concepts of limit state of collapse and serviceability for analysis and design of structural elements along with detailing and drawings CO3. To impart the knowledge on the design of shear, development length, deflection and cracking.
79	Advanced Structural Analysis	CO1.To familiarize with numerical methods of Engineering analysis CO2. To impart the knowledge on ILDs of three hinged arches. CO3. To familiarize with basic principles of matrix methods of structural analysis CO4. To introduce the basics of theory of elasticity.
80	Environmental Pollution and Its Control	CO1.To introduce the concepts of Air Pollution and the control methods. CO2. To impart the knowledge of the Solid Waste generation problem CO3. To familiarize the best practices for management of solid wastes adopted at the service provider level. CO4. To elucidate noise pollution problems and emphasize the necessity to control them.
81	Ground Water Development and Management	CO1.To impart knowledge on ground water flow in confined and unconfined aquifers CO2. To familiarize with the principles involved in design and construction of wells. CO3. To provide awareness on improving the groundwater potential using various recharge techniques. CO4. To introduce the concept of saline water intrusion in coastal aquifers and its control measures.
82	Ground Improvement Techniques	CO1.To impart the need of ground improvement techniques in improving the strength parameters of soils. CO2.To familiarize with various dewatering methods CO3. To introducethe applications of reinforced earth, confinement systems and geo-synthetics
83	Hydrology	CO1. To impart the knowledge of essential components of the hydrologic cycle CO2. To provide an overview and understanding of Unit Hydrograph theory and its analysis. CO3. To familiarize with different methods of flood frequency analysis and flood routing. CO4.To impart knowledge on groundwater movement and well hydraulics CO5.To familiarize with the relationships between soil, water and plant and their significance in planning an irrigation system
84	Planning for Sustainable Development	CO1. To familiarize the concept of sustainable development CO2.To introduce various components of sustainable development
85	Electrical and Hybrid Vehicles	CO1. To introduce the concepts on working principles of electric drives used for different hybrid electric vehicles. CO2.To familiarize with the different energy storage systems and their management strategies.

86	Power Plant Instrumentation	CO1. To provide an overview of different methods of power generation with a particular stress on thermal power generation. CO2.To impart knowledge on the different types of controls loops.
87	Material Science	CO1.to understand the properties of engineering materials, so as to manipulate them for the desired engineering applications.
88	Renewable Energy Sources	CO1. To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.
89	Assistive Technologies	CO1. To introduce different assistive technology devices CO2.To familiarize with the concepts of enhance speech communication and independent living.
90	Bio-Medical Engineering	CO1.To introduce the basics of biological concepts and relate it to engineering. CO2. To familiarize with physiology of cardio-vascular system, respiratory system & the elements of Patient Care Monitoring. CO3. To impart the knowledge on the patient monitoring displays, diagnosis & techniques.
91	Node and Angular JS	CO1.To familiarize with defining own custom AngularJS directives that extend the HTML language CO2. To introduce the concepts of client-side services that can interact with the Node.js web server CO3. To understand the best practices for server -side JavaScript
92	Cyber Security	CO1.To understand security concepts, Ethics in Network Security. CO2. To familiarize with new algorithms (mathematical formulas) and statistical measures that assesses relationships among members of large data sets. CO3. To identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply those to design and evaluate counter measure tools. CO4. To gain knowledge on security threats, and the security services and mechanisms to counter them.
93	Scripting Languages	CO1. To familiarize with JQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.
94	Software Project Management	CO1. To introduce plan and manage projects at each stage of the software development life cycle (SDLC). CO2.To impart effective software projects that support organization's strategic goals.
95	Elements of Stochastic Processes	CO1.To study and understand the systems which evolve randomly over time, especially in long run. CO2. To survey the important tools of stochastic processes. CO3. To model and solve engineering problems arising in real life situations
96	Academic Communication	CO1.To acquaint the students with the process and elements of academic writing. CO2. To help them gain accuracy in the academic writing tasks they will be called upon to perform as part of their graduate and postgraduate studies. CO3.To empower them to carry out academic writing tasks such as project report writing with success.
97	Structural Engineering Lab	CO1.To develop the drafting skills of the structural elements by using software CO2. To introduce various properties of concrete and concepts of Non-destructive testing CO3.To familiarizewith effect of dynamic forces on a three storied building
98	Highway Engineering Lab	CO1. To develop the testing skills of the road aggregates CO2. To impart the knowledge on the properties of bitumen. CO3. To Study the Traffic characteristics.
99	Smart Buildings and Automation	CO1. To introduce the concept of building management systems. CO2. To emphasize the importance of automating the building operations for safety, health and economy. CO3. To demonstrate current trends in home automation.
100	Building Information Modeling	CO1. To introducethe importance of Building Information Modelling (BIM) in Architecture, Engineering and Construction (AEC) industry CO2. To familiarise the use of BIM with owners, facility managers, architects, engineers and contractors.
101	Database Management Systems	CO1. To familiarize the concepts of database systems and different issues involved in the database design.

101	Database Management Systems	CO2. To introduce how to write SQL for storage, retrieval and manipulation of data in a relational database.
102	Project Management and Finance	CO1. To define the importance of project management (PM) and causes of failure in construction projects. CO2. To identify PM network objectives and techniques and basics of network analysis.
103	Estimation, Costing and Valuation	CO1. To introduce the concept of estimate, types of estimate and estimating a work. CO2. To build ability of calculating road and canal work quantities. CO3. To impart knowledge on different specifications of civil works. CO4. To familiarize with rate analysis, contracts and valuation.
104	Design of Steel Structures	CO1. To familiarize with the types of structural steel sections, plastic analysis and IS code provisions. CO2. To introduce the principles for design of tension members, compression members and elements of truss using I.S. code. CO3. To impart the design aspects of laterally supported beams, unsupported beams and welded plate girder in accordance with I.S. code provisions.
105	Pre-stressed Concrete	CO1. To familiarize with the concept of prestressing and IS code provisions. CO2. To impart the knowledge on analysis and losses of prestress CO3. To introduce design procedures of pre-stressed concrete members under flexure and shear
106	Advanced Foundation Engineering	CO1. To familiarize with advanced knowledge of foundations in various practices CO2. To appreciate the foundation practices in difficult soil conditions under different loading conditions
107	Traffic Engineering	CO1. To introduce fundamental knowledge of traffic engineering. CO2. To acquire design principles of traffic engineering. CO3. To familiarize with various traffic issues including planning, safety, operation and control.
108	Industrial Wastewater Management	CO1. To impart the knowledge of industrial wastes and their pollution potential. CO2. To introduce manufacturing processes of different types of industries. CO3. To elucidate the high-level strategies adopted to deal with industrial effluents.
109	Advanced Design of RC Structures	CO1. To impart the design procedure for flat slabs and footings. CO2. To make understand the loading pattern and design procedure for silos and bunkers. CO3. To familiarize with I.R.C loads and their application on designing the R.C bridges. CO4. To introduce the design procedure of R.C water tanks.
110	Hydraulic Structures	CO1. To familiarize with the design principles of hydraulic structures on permeable foundations. CO2. To impart knowledge on various types of dams and selection of suitable type depending on site conditions CO3. To familiarize with the design principles of irrigation structures
111	Geosynthetics	CO1. To familiarize with geosynthetics. CO2. To impart knowledge on designing the geosynthetic material for various functions.
112	Disaster Preparedness and Planning	CO1. To provide an exposure to disasters, their significance and types. CO2. To familiarize with impacts of disaster key skills. CO3. To impart the knowledge on different approaches of Disaster risk reduction.
113	Disaster Management	CO1. To familiarize with disaster occurrence, strategies and remedial measures.
114	Repair and Retrofitting Techniques	CO1. To familiarize with durability aspects, quality of concrete causes of deterioration. CO2. To impart the knowledge on inspection and assessment of distressed structures, strengthen measures and demolition procedures. CO3. To familiarize with various concrete materials for repairs, and various precautions during retrofitting.
115	Modern Optimization Techniques	CO1. To familiarize with the concepts of evolutionary optimization CO2. To introduce the principles of soft computing optimization algorithms such as Genetic Algorithm, Particle Swarm Optimization, Differential Evolution and Ant Colony Optimization.
116	Electrical Power Utilization	CO1. To familiarize with the mechanics of train movement. CO2. To impart knowledge on various heating methods and laws of illumination CO3. To familiarize with the concepts of refrigeration and air-conditioning.

117	Green Engineering	CO1. To impart the knowledge needed to minimize impacts of products, processes on environment for sustainable development.
118	Non Destructive Evaluation	CO1.To familiarize with the concepts of various NDE techniques to identify the defect in a mechanical elements.
119	Cyber Physical Systems	CO1. To prototype the Smart objects and provides a holistic understanding of development Platforms, connected products of Internet of things (IoTs). CO2. To familiarize with real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.
120	Signals and Systems	CO1. To familiarize with the basic concepts of signals and systems. CO2. To introduce various transform techniques on signals. CO3. To develop an understanding of sampling and correlation techniques on signals.
121	Digital Forensics	CO1. To provide a comprehensive overview of digital forensic process. CO2. To familiarize with the different roles a computer in crime investigation.
122	Business Intelligence and Decision Support Systems	CO1. To identify the process of decision making and use of model for decision making. CO2. To use various visualization tools for delivery of knowledge.
123	Adhoc and Sensor Networks	CO1. To acquire fundamental concepts of ad hoc networks CO2. To learn design considerations of wireless sensor networks.
124	Information Retrieval Systems	CO1. To provide the foundation knowledge in information retrieval. CO2. To familiarize about different applications of information retrieval techniques in the Internet or Web environment.
125	Fuzzy Logic	CO1. To impart the knowledge of fuzzy set theory and its applications in Engineering.
126	Computer Applications in Civil Engineering Lab	CO1. To familiarise with programming languages to solve the civil engineering problems CO2. To introduce the concept of designing structures by using software. CO3. To impart the knowledge on Arc GIS software in solving civil engineering problems
127	Project Scheduling and Contracts	CO1. To impart the knowledge on contract documents and specifications CO2. To illustrate the Methodology of scheduling for activities and resources. CO3. To distinguish scheduling methods and contracts CO4. To address the need of tender, estimation and bidding process.
128	Optimization Techniques	CO1. To familiarize with various methods of optimization, decision making methods and design of civil engineering systems structural members.
129	Entrepreneurship	CO1. To understand entrepreneurial process and its significance in economic development of a nation. CO2. To provide awareness about entrepreneurship. CO3. To develop idea generation, creative and innovative skills. CO4. To design business plan.
130	Earthquake Resistant Design of Structures	CO1. To familiarize with basics of structural dynamics and earthquake engineering. CO2. To impart the knowledge of analyzing and designing earthquake resistant structure CO3. To introduce the seismic planning concepts and design principles of shear wall
131	Logistics Infrastructure Engineering	CO1. To familiarize with various components, their functions and design principles of geometry in a railway track. CO2. To introduce the design principles of airport geometrics and pavements. CO3. To impart the knowledge of planning, construction and maintenance of Docks and Harbours.
132	Finite Element Methods	CO1.To familiarize with the fundamentals of finite element method. CO2.To impart knowledge of solving one dimensional and two dimensional problems by FEM. CO3. To introduce the concepts of axi-symmetric and iso-parametric formulation.
133	Design and Drawing of Irrigation Structures	CO1.To impart the knowledge and principles of hydraulic structures. CO2. To impart the knowledge on design principles of irrigation structures. CO3. To enhance partial design concept.
134	Pre-Engineered Buildings	CO1. To impart the concepts of designing water tanks, bridges, transmission line towers and chimneys. CO2.To familiarize on plastic behavior, plastic moment and plastic mechanism of steel structures like simple beams and portal frames.
135	Urban Transportation Planning	CO1. To introduce the various procedures for travel demand estimation. CO2. To impart the knowledge on various data collection techniques for origin and destination data.

135	Urban Transportation Planning	CO3. To familiarize with various models and techniques for trip generation, trip distribution, mode choice and traffic assignment. CO4. To introduce alternative urban transport network plans.
136	Soil Dynamics and Machine Foundations	CO1. To impart knowledge on free and forced vibrations with and without damping for single degree freedom system. CO2. To familiarize field and laboratory methods of determination Dynamic Soil Properties. CO3. To introduce the design considerations of foundations for reciprocating machine, impact type and rotary type.
137	Environmental Impact Assessment	CO1. To familiarize with various methodologies of EIA for project assessment. CO2. To distinguish impact prediction, assessment based on significance and preparation of audit report.

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S.No	Course Name	Course Outcomes
1	Functional English	CO1: speak with a reasonable degree of fluency using communication strategies as well as conventions of politeness and courtesy CO2: listen to short audio and video clips in both standard Indian accent and native English accent and gain both understanding of messages and sensitivity to native- speaker CO3: read fluently comprehending texts of different kinds CO4: write coherent paragraphs and technical reports CO5: guard against mistakes Indians typically make in their speech and writing in English
2	Linear Algebra & Differential Equations	CO1: use the concepts of eigenvalues and eigenvectors in solving engineering problems CO2: apply 1st & 2nd order differential equations to solve various engineering problems. CO3: apply the techniques of partial differentiation to find maxima and minima of two/three variables CO4: solve first order linear & non-linear partial differential equations.
3	Engineer And Society	CO1: comprehend different moral perspectives and one's own Ethical standards CO2: understand the concept of safety and risk CO3: explain different initiatives to protect nature CO4: identify the role of Information Technology CO5: understand different types of infringement of Intellectual Property Rights CO6: analyze the importance of Entrepreneurship
4	Applied Chemistry	CO1: explain the working of lead acid battery, nickel – cadmium battery, lithium ion battery and fuel cells and to explain the applications of sensors and biosensors CO2: explain about new generation photo voltaic cells CO3: apply a suitable method of water treatment depending on the quality requirement CO4: explain the methods of synthesis of liquid crystals, nano materials properties and applications of CNTs and quantum dots CO5: explain properties and engineering applications of fibre reinforced plastics, conducting polymers and bio degradable polymers CO6: explain the principles and working of spectrophotometer and flame photometer for the determination of a given ion in a given solution
5	Problem Solving Using C	CO1: design flowcharts and pseudo code for solving problems CO2: understand C tokens and control statements CO3: gain knowledge on arrays, strings, pointers, functions, structures and files. CO4: use C language for solving problems CO5: self-learn advanced features of C
6	Engineering Drawing	CO1: apply principles of drawing in representing dimensions of an object. CO2: construct polygons and conical curves. CO3: draw projections of points, lines and planes CO4: draw projections of solids in different positions. CO5: convert orthographic views into isometric views and vice-versa.
		CO1: give short impromptu speeches with confidence and fluency and take part in conversations in different functional contexts using English following appropriate communication strategies

7	Functional English Lab	CO2: check the pronunciation of words in a dictionary using their knowledge of phonemic symbols CO3: speak English with adequate attention to stress, rhythm, and intonation CO4: speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English
8	Applied Chemistry Lab	CO1: test the quality parameters of water by volumetric and instrumental methods CO2: to operate the sensors for testing the water quality CO3: synthesize phenol – formaldehyde resin (Bakelite). CO4: operate spectrophotometer and determine the concentration of Ferric Iron in a given solution
9	Professional Communication	CO1: speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation) CO2: listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speaker accents CO3: read fluently, comprehending texts of different kinds using multiple strategies and higher-order skills CO4: produce written discourses of different kinds CO5: guard against grammatical errors Indians typically make in their speech and writing in English
10	Integral Transforms And Vector Calculus	CO1: apply Laplace transforms to find the solutions of ordinary differential equations CO2: express a function in Fourier series and in Fourier integral form CO3: apply the concepts of vector differentiation and integration to the surface and volume integrals
11	Elements Of Electrical Circuits	CO1: describe the history and classify elements of electrical engineering CO2: apply various circuit laws to analyze the electrical circuits. CO3: analyze the steady state behavior of DC and AC circuits. CO4: apply network theorems to analyze the electrical circuits
12	Solid State Physics	CO1: explain construction and working of laser CO2: relate the principles of propagation of light in optical fibers for applications in communications CO3: identify conductivity mechanism in semiconductors CO4: determine types of polarization and classius-mossoti relation CO5: Differentiate classical and quantum free electron theories CO6: derive orbital and spin contribution for magnetism
13	Environmental Studies	CO1: understand the role of a citizen in protection of environment CO2: analyze functional attributes of an ecosystem CO3: enumerate the values of biodiversity CO4: identify appropriate processes to control pollution CO5: identify waste management practices CO6: understand various stages of Environmental Impact Assessment (EIA)
14	Elements Of Mechanical Engineering	CO1: determine the resultant of the given force systems. CO2: analyze force systems using equations of equilibrium CO3: determine centroid of areas and calculate the moments of inertia of areas CO4: determine stresses and strains in bars subjected to loads CO5: determine hydrodynamic force developed by impact of jets on various plates CO6: analyze the working of hydraulic turbines CO7: analyze the working of hydraulic pumps
15	Professional Communication Lab	CO1: enhance the effectiveness of their communication through body language CO2: take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency CO3: take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency CO4: speak professionally in telephone conversations

15	Professional Communication Lab	CO5: make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session CO6: take part in group discussions and debates successfully CO7: answer questions at an elementary level in job interviews CO8: use team-building skills with impact in different situations
16	Solid State Physics Lab	CO1: identify energy gap of a semiconductor CO2: draw characteristic curves to estimate thermal coefficient of a thermistor CO3: observe self timer and tuning nature of passive components like RC,LCR CO4: verify magnetic field along the axis of a circular coil. CO5: determine frequency of AC and unknown tuning fork CO6: calculate light gathering power of optical fiber CO7: estimate wavelength of unknown source
17	Dc Machines And Transformers	CO1: determine the performance of D.C generator for various operating conditions. CO2: find the performance characteristics of various types of D.C motors. CO3: select suitable speed control and testing methods of D.C motor for various applications CO4: find the performance specifications of a single-phase transformer for various loading conditions. CO5: describe the operation of single phase and three phase transformers for various operating conditions
18	Electric Circuit Analysis	CO1: quantify the specifications pertaining to electrical resonance. CO2: analyze three - phase circuits with both balanced and unbalanced supplies and / or loads CO3: determine the transient behavior of R-L, R-C and R-L-C circuits for different excitations. CO4: characterize two- port networks with alternative descriptions.
19	Analog Electronics	CO1: Identify V-I characteristics of Diodes, BJT, MOSFET CO2: analyze the biasing circuits of BJT and MOSFETs CO3: develop small signal models for BJT and MOSFET. CO4: Differentiate various Feedback connection types. CO5: design oscillator circuits using BJTs
20	Power System – I	CO1: identify different components of a thermal power station. CO2: describe the operation of various components of a nuclear power station. CO3: distinguish between the operation of hydro and gas power plants. CO4: develop the layout of a substation CO5: analyze the significance of various factors for economic analysis of power generation CO6: select the suitable tariff method for various consumers
21	Numerical Methods With Computer Application	CO1: demonstrate various commands in MATLAB programming. CO2: analyze a mathematical problem and select a suitable numerical technique to implement it in MATLAB programming. CO3: construct an interpolating polynomial for the given data using MATAB. CO4: find derivatives and integrals by using numerical techniques using MATLAB CO5: utilize Method of least squares to fit a curve for the given data using MATLAB
22	Mechanical Engineering Lab	CO1: Determine the moment of force experimentally CO2: Determine the centroid of plane lamina CO3: Determine the modulus of elasticity experimentally CO4: Select appropriate pump/turbine for suitable application
23	Electric Circuits Lab	CO1: Verify the applicability of network theorems to practical electrical circuits. CO2: Specify and test RLC series and parallel resonant circuits. CO3: Evaluate the time constant of simple rc and rl circuits. CO4: Interpret /correlate physical observations and measurements involving electrical circuits to theoretical principles. CO5: Measure active and reactive power flows for a given electrical installation
24	Analog Electronics Lab	CO1: Identify various electronic components and basic electronic measuring instruments and other lab equipment. CO2: Verify the I-V characteristics of junction diode, zener diode, MOSFET, BJT.

24	Analog Electronics Lab	CO3: Test the Zener voltage as voltage regulator, BJT voltage-divider bias and using it as an amplifier. CO4: Verify the functionality of feedback amplifiers and oscillator circuits.
25	Digital Circuit Design	CO1: Design various logic circuits using Boolean laws. CO2: Design combinational and sequential logic circuits CO3: Gain the knowledge of PLDs. CO4: Develop digital circuits using HDL
26	Control Systems	CO1: Develop mathematical models for physical systems. CO2: Employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers CO3: Quantify time and frequency domain specifications to determine stability margins CO4: Apply state variable theory to determine the dynamic behavior of linear control systems
27	Engineering Economics And Project Management	CO1: Apply managerial economic concepts in business decision making CO2: Identify the influencing factors of demand for a product CO3: Categorize production with respect to time and cost CO4: Relate the market structures and pricing to a product. CO5: Establish the suitable business organization with available resources. CO6: Identify the importance of project management CO7: Apply network concepts in business decision making
28	Induction And Synchronous Machines	CO1: calculate various performance parameters of a three-phase induction motor. CO2: select/identify various starting and speed control methods of three-phase induction motor CO3: describe the constructional details and working principles of single phase induction motor and synchronous machines. CO4: determine the performance characteristics of synchronous machine. CO5: describe the parallel operation of alternator with infinite bus bars.
29	Electromagnetic Fields	CO1: determine electric field and potential for symmetrical charge configuration. CO2: distinguish between the conduction and convection currents and determinethe dielectric boundary conditions CO3: Compute magnetic fields for symmetric current distributions. CO4: quantify the magnetic forces and torque produced by currents in magnetic fields. CO5: apply maxwell's equations for time invariant fields and time variant fields.
30	Digital Circuit Design Lab	CO1: Learn the digital circuit concepts. CO2: Design the digital circuits CO3: Develop digital circuits using CAD tools
31	Electrical Machines–I Lab	CO1: Select the appropriate apparatus for determining the performance of DC machines and transformers based on the capacity experimentally. CO2: Determine the equivalent circuit parameters of transformers experimentally. CO3: Compute the performance characteristics of transformers and DC machines through suitable tests.
32	Signals And Systems	CO1: classify the signals and various operations on signals CO2: perform Fourier analysis on the signals CO3: analyze the various systems. CO4: perform correlation operational on signals. CO5: apply the various sampling techniques on continuous signals. CO6: analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.
33	Power Systems - II	CO1: estimate the inductance and capacitance for different conductor configurations. CO2: assess the performance of short & medium transmission lines. CO3: analyze the performance of long transmission lines and the effect of surge impedance loading. CO4: select a suitable insulator for a particular operating voltage, configuration and best method to improve string efficiency CO4: analyze the effect of various factors on corona. CO5: evaluate the sag and tension of transmission line for various configurations under the effect of wind and ice.
		CO1: describe operation of electrical measuring instruments CO2: select suitable instrument for measuring power and energy of electrical systems.

34	Electrical Measurements And Instrumentation	CO3: determine the parameters of electrical circuits using suitable measuring instruments. CO4: select a suitable transducer for measuring non-electrical physical quantities CO5: analyse the operation of various digital meters and specify suitable digital meters for measuring electrical parameters.
35	Switch Gear And Protection	CO1: identify suitable circuit breaker and relay for a particular application CO2: describe the operating principles of various types of relays. CO3: select an appropriate protection scheme for generator and transformer CO4: choose an appropriate protection scheme for transmission line and bus-bar. CO5: analyze various methods of neutral grounding.
36	Probability And Fuzzy Mathematics	CO1: use the concepts of probability in different real time problems. CO2: use probability distributions in appropriate scenario. CO3: distinguish between crisp set and fuzzy set. CO4: compose the operations on fuzzy sets to characterize the belongingness of elements in the sets CO5: construct fuzzy relations to draw inferences CO6: apply fuzzy logic to control automatic engineering systems.
37	Control Systems Lab	CO1: describe the characteristics of d.c. servo motors, a.c. servo motors, synchros and magnetic amplifier CO2: employ p, pi, pd and pid controllers. CO3: design lag, lead and lag-lead compensators. CO4: control the temperature using pid controller. CO5: determine the transfer function of d.c. motor and d.c. generator CO6: verify the boolean expressions using programmable logic controller.
38	Electrical Machines – II Lab	CO1: estimate the performance of induction motors and synchronous machines. CO2: describe the operational behaviour of the induction motor under various loading conditions. CO3: determine the parameters of synchronous machine. CO4: operate an alternator in parallel with infinite bus bar CO5: find operational characteristics of three phase transformer.
39	Power Electronics	CO1: select suitable semiconductor devices for various power converters. CO2: analyze the performance of controlled and uncontrolled single- phase and three-phase converters. CO3: employ suitable ac voltage controllers and cyclo-converters for a particular industrial applications. CO4: realize dc-dc converters without electrical isolation. CO5: develop control methods for inverters
40	Microprocessors, Microcontrollers And Its Applications	CO1: recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system. CO2: identify a detailed s/w & h/w structure of the microprocessor and microcontroller CO3: illustrate how the different peripherals (8255) are interfaced with Microprocessor CO4: interface various I/O devices to the 8051 microcontroller. CO5: know the ARM philosophy
41	Embedded System Design	CO1: Distinguish between the general computing system and the embedded system. CO2: Differentiate general purpose processors and single purpose processors. CO3: Model different state machines and concurrent process. CO4: Specify different design technologies of software and hardware design.
42	Principles of VLSI Design	CO1: characterize the MOS devices CO2: explore CMOS process technology CO3: draw layouts CO4: apply design techniques and testing and verification principles for VLSI circuits
43	Engineering Optimization	CO1: Apply the knowledge of Mathematics in analyzing an Engineering problem. CO2: Develop an optimization problem in standard form and assess the optimality of a solution. CO3: Analyze multi objective and multidisciplinary optimization problems. CO4: Construct algorithm for constrained and unconstrained nonlinear optimization problem of multiple variables. CO5 :Select an appropriate optimization technique for a system.

44	Microprocessor And Microcontroller Interfacing Lab	CO1: Acquire the knowledge of assembly language programming using 8086 microprocessor CO2: Perform various arithmetic and shift operations with 8086 based system. CO3: Interface various I/O modules with 8086 based system. CO4: Implement various real time applications using 8051.
45	Electrical Systems Simulation Lab	CO1: apply the programming skills to analyze the behavior of linear control system using MATLAB. CO2: analyze the behavior of the passive circuits through network theorems using SIMULINK. CO3: investigate the stability, controllability and observability of the given control system. CO4: design a pid controller through simulation. CO5: analyze the behavior of various electrical machines and power electronic converters CO6: determine the parameters of a transmission line.
46	Electrical Measurements And Instrumentation Lab	CO1: identify the measuring instruments used for measuring electrical quantities. CO2: select appropriate measuring instrument with range for measurement of various electrical quantities. CO3: select appropriate instrument for measurement of power, energy CO4: calibrate Ammeter, Volt meter CO5: select appropriate Transducer for the measurement of strain. CO6: measure the Inductance and Capacitance values
47	Electrical Distribution Systems	CO1: distinguish various load models in the distribution system CO2: describe the primary feeder ratings and voltage levels. CO3: design an optimum location of the substation CO4: analyze the distribution system and its associated coordination procedures CO5: select appropriate voltage control method in the distribution systems
48	High Voltage Engineering	CO1: analyze the behavior of dielectric material under Different circumstances.. CO2: demonstrate an understanding of high voltage engineering techniques. CO3: conduct analysis of industrial equipment. CO4: identify the most suitable equipment for performing specific testing on high voltage applications. CO5: perform basic AC, DC, impulse voltage and partial discharge tests on high voltage equipment and insulation systems in the laboratory environment.
49	Utilization Of Electrical Energy	CO1: describe various electric heating and welding methods CO2: design illumination systems for residential, commercial and industrial CO3: analyze various speed time curves of electric traction. CO4: determine the tractive effort, power and specific energy consumption of electric traction
50	Project	CO1: Use modern tools CO2: Work as individual and in a team CO3: Analyze critically CO4: Identify and solve problems
51	Flexible Ac Transmission Systems	CO1: Apply the knowledge of FACTS devices for enhancing power handling capacity in the transmission network CO2: Demonstrate the knowledge and understanding of the fundamental principles and control practices associated with FACT controllers. CO3: Describe different types of FACTS controllers CO4: Determine the operational related problems of transmission system and suggest the remedial measures. CO5: Select an appropriate FACTS controller to meet specified performance requirements
52	Power Semiconductor Drives	CO1: analyze the operation of converter controlled electrical drives with active and passive loads CO2: realize the voltage and current waveforms of converter fed drives CO3: adopt the application of chopper for four quadrant operation of DC drives CO4: apply the scalar control and slip power control schemes to asynchronous motor drives CO5: describe the inverter-fed control of synchronous motor and its closed loop control methodologies

53	Power System Operation And Control	CO1:evaluate optimal generation schedule with and without losses.
		CO2:compute loss coefficients and transmission losses.
		CO3:find the solution for short term hydrothermal scheduling problems
		CO4:determine the steady state changes in frequency in single area and two area load frequency control.
		CO5:suggest suitable voltage control method for different applications.
54	Power System Analysis	CO1:describe the per unit system of power system.
		CO2:apply the concepts of addition or removal of element in the power system for determining the impedance matrix.
		CO3:formulate and solve the power flow problem of power system
		CO4:develop and solve positive, negative and zero sequence networks for systems consisting of machines, transmission lines and transformers
		CO5:determine the fault voltages and currents for various faults.
		CO6:analyze the stability of power system under various disturbances
55	Power Electronics Lab	CO1:plot the characteristics of various power semiconductor switches.
		CO2:trigger and commutate the SCR using various methods
		CO3:analyse and test the operation of simple power electronic circuits.
		CO4:operate the given drive in all four quadrants.
		CO5:analyse the performance of PWM converter.
		CO6:perform closed loop control of DC motor
56	Power Systems Lab	CO1:determine the sub transient reactance of a Salient Pole Machine.
		CO2:verify the characteristics of the over voltage and over current relay
		CO3:analyze the importance of transmission line parameters
		CO4:describe the Ferranti effect and surge impedance loading.
		CO5:plot the characteristics of PV Module

ME

S.No.	Course Name	Course Outcomes
1	Functional English	CO1.Speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture
		CO2.listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately
		CO3.reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes; and
		CO4.writing for academic purposes (e.g. assignments, examination in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately
		CO5.To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English
2	Linear Algebra & Differential Equations	CO1.To understandthe concepts of eigenvalues and eigenvectors
		CO2.To know the procedures to find the solutions of first and second order differential equations
		CO3.To understand different procedures to solve first order linear & non-linear partial differential equations.
3	Physics for Engineers	CO1.To solve oscillating systems problems
		CO2.To understant crystal structures and defects
		CO3.To apply principles of optics for engineering applications.
4	Environmental Studies	CO1.To impart the basic knowledge about the environment and ecology
		CO2.To develop an attitude of concern for biodiversity and its conservation.
		CO3.To assess the environmental impacts of developmental activities.
		CO4.To create awareness on environmental pollution and waste management.
5	Problem Solving Using C	CO1.To emphasize the use of flowcharts and pseudo code in problem solving.
		CO2.To gain knowledge in C language
		CO3. To develop C Programs to solve problems.
		CO4.To familiarize with the discrete components of a computer, MS Office
6	Engineering Graphics	CO1.To highlight the significance of universal language of engineers

6	Engineering Graphics	CO2.To impart basic knowledge and skills required to prepare engineering drawings
7	Functional English Lab	CO1.the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English
		CO2.a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility
8	Engineering Physics Lab	CO1.To make the students gain practical knowledge to co-relate with the theoretical studies.
		CO2.To impart skills in measurements
		CO3.To design and plan the experimental procedure and to record and process the results
9	Professional Communication	CO1.To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length and complexity
		CO2.To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication
10	Integral Transforms and Multiple Integrals	CO1.To gain the knowledge of Laplace and inverse Laplace transforms
		CO2.To understand the concept of Fourier Transforms
		CO3.To know vector integral theorems such as Green's, Gauss & Stoke's
11	Engineer & Society	CO1.To understand the Ethics and Human Values
		CO2.To familiarize with the rights and responsibilities of an engineer
		CO3.To elucidate the rules and regulations of patent and trade laws
		CO4.To equip the students to have a basic awareness on environmental and socioeconomic factors
12	Industrial Chemistry	CO1.To impart knowledge of corrosion prevention methods and water treatment technologies
		CO2.To enable the students to obtain the knowledge on various types of electro chemical energy systems, polymers, fuels, lubricants and their applications in engineering.
13	Engineering Mechanics	CO1.To impart the basic concepts of force systems, free body diagram and equilibrium conditions
		CO2.To familiarize on calculating the geometric properties like centroid, moment of inertia of various sectional areas and masses and introduce the concept of friction and virtual work.
		CO3.To develop the knowledge on basic principles of kinematics and kinetics with simple applications
		CO4.To introduce applications on using work-energy principle and Impulsemomentum methods.
14	Computer Aided Engineering Drawing	CO1.To impart knowledge and skills required to draw projections of solids in different contexts
		CO2.To impart the skills required for drafting using drafting package
15	Engineering Workshop	CO1.To impart hands-on training on basic engineering trades
16	Professional Communication Lab	CO1.Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.
17	Industrial Chemistry Lab & Engineering Mechanics Lab	CO1.To impart skills for testing lubricating oils and finding calorific value of a fuel
		CO2.To impart skills for testing the pH of water sample and to calculate the rate of corrosion of a metal.
		CO3.To impart knowledge on basic engineering applications
18	Elements of Electrical and Electronics Engineering	CO1.To introduce the basic concepts of electrical circuits.
		CO2.To familiarize with the constructional details, working principles of DC and AC machines
		CO3.To familiarize with the operation of diode and transistors
19	Engineering Thermodynamics	CO1.To familiarize with basic concepts of system, properties and cycles.
		CO2.To introduce the laws of thermodynamics and their applications to various thermodynamic processes and cycles.
20	Kinematics of Machines	CO1.To introduce the concepts to study the relative motion between the links of mechanisms.
		CO2.To familiarize with the kinematic analysis of machines.

21	Solid Mechanics	CO1.To impart the knowledge on internal behaviour of mechanical elements under the action of applied loads
22	Engineering Metallurgy	CO1.To familiarize with the fundamentals of crystallography, metallurgy, heat treatment and metal properties.
23	Electrical and Electronics Engineering Lab	CO1.Information to supplement the Electrical & Electronics Engineering course CO2.To conduct tests on various electrical & electronic circuits and to familiarize experimental procedures of those Circuits.
24	Solid Mechanics and Metallurgy	CO1.To impart hands on training to examine the mechanical properties of materials
25	Computer Aided Modeling Lab	CO1.To impart hands on training for part modeling and assembly using Modeling Package. CO1.To impart hands on training for part modeling and assembly using Modeling Package.
26	Manufacturing Processes	CO1.To introduce the principles of manufacturing processes to convert materials into desired shapes and sizes.
27	Applied Thermodynamics	CO1.To introduce the principles of operation of heat engines and compressors along with the performance characteristics CO2.To familiarize with various thermodynamic cycles of Refrigeration and psychrometric processes
28	Dynamics of Machines	CO1.To familiarize with the dynamic force analysis of machines and their effect.
29	Fluid Mechanics	CO1.To familiarize the fluid properties, basic laws and principles used to describe equilibrium and motions of fluids. CO2.To introduce the principles of conservation of mass, momentum and energy and their application in study of fluid flow.
30	Elements of Civil Engineering	CO1.To introduce the principles of conservation of mass, momentum and energy and their application in study of fluid flow. CO2.To introduce basics of Civil Engineering concepts in the fields of surveying,building materials, water resources,Water Supply, Sanitary ,Electrical Works in Building and Highway engineering.
31	Building Services	CO1.To impart knowledge on water supply, treatments and water distribution for all type of buildings CO2.To acquire principles and best practices for Solid waste management in residential units. CO3.To create awareness about the importance of electrical and mechanical services in buildings and fire safety
32	Electrical Materials	CO1.To introduce the concepts of dielectric and ferro magnetic materials. CO2.To impart knowledge on semiconductor materials CO3.To familiarize with the required materials used for electrical applications.
33	Control Systems Engineering	CO1.To introduce the basic concepts of control systems by developing mathematical models for physical systems. CO2.To familiarize with the time domain behavior of linear control systems. CO3.To impart knowledge on analytical and graphical methods to quantify stability of linear control systems.
34	Elements of Manufacturing Processes	CO1.To introduce the principles of manufacturing processes to convert materials into desired shapes and sizes
35	Automotive Engineering	CO1.To introduce various components of an automobile and engine sub systems. CO2.To familiarize with the various systems such as transmission system, steering system, suspension system, braking system, and safety systems. CO3.To impart knowledge on various safety systems of an automobile and emission norms.
36	Introduction to Microprocessors and Microcontrollers	CO1.To familiarize with architecture of 8086 microprocessor and 8051 microcontroller. CO2.To introduce the assembly language programming concepts of 8086 processor. CO3.To expose with various interfacing devices with 8086 using 8255.
37	Fundamentals of Communications	CO1.To introduce various analog and digital modulation and demodulation techniques CO2.To familiarize with various multiplexing schemes and Data communication protocols CO3.To impart the standards and mechanisms of television systems
38	Computer Graphics	CO1.To introduce computer graphics applications and functionalities of various graphic systems. CO2.To familiarize with 2D and 3D geometrical transformations CO3. To disseminate knowledge on the visible surface detection and animation.
39	Object Oriented Programming	CO1. To familiarize with the concepts of object oriented programming.

39	through JAVA	CO2. To impart the knowledge of AWT components in creation of GUI.
40	Systems Software	CO1. To familiarize with the implementation details of assemblers, loaders, linkers, and macro processors.
41	Web Programming	CO1. To develop real time web applications CO2. To get acquainted with skills for creating websites and web applications by learning various technologies like HTML, CSS, JavaScript, XML, JSP and JDBC
42	Mathematical Cryptography	CO1. To give a simple account of classical number theory, prepare students towards the concepts of Network Security and to demonstrate applications of number theory (such as public-key cryptography). CO2. To students will have a working knowledge of the fundamental definitions and theorems of elementary number theory, be able to work with congruences. CO3. To solve congruence equations and systems of equations with one and more variables. CO4. To students will also have an exposure to cryptography.
43	Semiconductor Physics	CO1. To know the physics and applications of semi conductor. CO2. To understand fundamental principles and applications of the electronic and optoelectronic.
44	Thermal Engineering Lab	CO1. To study experimentally the performance of IC engines, compressors, refrigeration and air conditioning systems.
46	Control Systems	CO1. To introduce the basic concepts of control systems by developing mathematical models for physical systems. CO2. To familiarize with the time domain behavior of linear control systems. CO3. To impart knowledge on analytical and graphical methods to quantify stability of linear control systems. CO4. To introduce concepts on the state variable theory.
47	Nano Technology	CO1. To familiarize with principles of quantum mechanics on which nano materials behave CO2. To elucidate applications of nanotechnology
48	Digital Logic Design	CO1. To familiarize with the concepts of designing digital circuits.
50	Numerical and Statistical Methods	CO1. To understand the various numerical techniques. CO2. To introduce the concepts of probability and statistics. CO3. To know the importance of the correlation coefficient & lines of regression CO4. To know sampling theory and principles of hypothesis testing.
51	Metal Cutting and Machine Tools	CO1. To expose the students to the mechanics of metal cutting, so as to equip them with adequate knowledge about elements of metal cutting process. CO2. To emphasize upon the prominent theories, concepts and constructional features of machine tools related to turning, shaping, planning, drilling, milling and grinding
52	Turbo Machinery	CO1. To introduce the principles of hydraulic turbines and pumps, steam turbines and compressors along with their performance characteristics.
53	Non-Conventional Sources of Energy	CO1. To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.
54	Mechanical Vibrations	CO1. To familiarize with the concepts of mathematical model and solution methods for vibrations of the mechanical systems.
55	Mechanics of Composite	CO1. To familiarize with the composite materials and their mechanical behaviour
56	Data Structures	CO1. To impart knowledge of linear and non-linear data structures. CO2. To familiarize with different sorting and searching techniques.
57	Geoinformatics	CO1. To introduce the basic concepts and principles of remote sensing. CO2. To familiarize with structure and function of Geographic Information Systems. CO3. To illustrate the multidisciplinary nature of Geospatial applications.
58	Environmental Sanitation	CO1. To communicate the importance of institutional sanitation in maintaining public health. CO2. To introduce the strategies for maintaining healthy living and working environment. CO3. To delineate the role of environmental engineer in industrial environments.
59	Modeling and Simulation of Engineering Systems	CO1. To familiarize with programming skills using basic MATLAB and its associated tool boxes. CO2. To impart knowledge on building SIMULINK and Graphical user interface.
60	Power Systems Engineering	CO1. To introduce the working of power plants in power generation and layout of substations. CO2. To familiarize with the concepts of corona, insulators and sag in overhead lines

61	Elements of Mechanical	CO1. To familiarize with the principles of mechanical power transmission elements
62	Material Handling Equipment	CO1. To provide knowledge on materials handling equipment
63	Automotive Electronics	CO1. To familiarize with the electronic systems inside an automotive vehicle. CO2. To introduce the concepts of advanced safety systems
64	Introduction to MEMS	CO1. To introduce lithography principles, mechanical sensors and actuators. CO2. To familiarize with the concepts of corona, insulators and sag in overhead lines CO3. To present formally micro fluidic systems and chemical and bio medical micro systems.
65	Data Science	CO1. To familiarize with statistical methods to analyze data using classification, graphical and computational methods CO2. To introduce Data Wrangling approaches and descriptive analytics on large data sets.
66	Virtual and Augmented Reality	CO1. To introduce key elements of virtual Reality with the components in VR systems. CO2. To gain knowledge of various input and output devices required for interacting in virtual world and augmented reality
67	Open Source Software	CO1. To impart the opportunities for open source software in the global market. CO2. To familiarize with different steps in implementing the open source.
68	Cyber Laws	CO1. To expose the need of cyber laws to prosecute cybercrimes in the society CO2. To familiarize with Licensing Issues Authorities for Digital Signatures.
69	Quality, Reliability and Operations Research	CO1. To equip students with basic practical skills with sufficient theory. CO2. To understand the principles involved in the application area. CO3. To develop the power of systematic thinking and reasoning, practical approach and exposition in the students.
70	Fluid Mechanics and Turbo Machinery Lab	CO1. Determine experimentally the co-efficient of discharge of various flow measuring devices and study the performance of various turbo machines.
71	Machine Tools Lab	CO1. To impart hands on training in the operation of basic machine tools.
72	Computer Aided Machine Drawing Lab	CO1. To impart hands on training for drafting ,modeling and assembly of machine parts using modeling package
73	Computer Graphics	CO1. To introduce computer graphics applications and functionalities of various graphic systems. CO2. To familiarize with 2D and 3D geometrical transformations. CO3. To disseminate knowledge on the visible surface detection and animation
74	Fuzzy Logic Systems	CO1. To impart knowledge on fundamentals of fuzzy sets and defuzzification CO2. To familiarize with the Fuzzy Logic systems.
75	Micro Processors and Interfacing	CO1. To familiarize with the architecture of 8086 microprocessor CO2. To introduce the assembly language programming concepts of 8086 processor. CO3. To impart knowledge on I/O interfacing.
77	Engineering Economics and Accountancy	CO1. To familiarize with the concepts of managerial economics and accountancy principles.
78	Metrology and Instrumentation	CO1.To impart the principles of measurement of dimensional and geometric parameters of mechanical elements. CO2.To introduce working of various temperature, pressure, flow and strain measuring instruments.
79	Design of Machine Members	CO1. To impart the knowledge of the basic engineering design against static and fluctuating loads by considering strength and rigidity.
80	Heat Transfer	CO1. To introduce various modes of heat transfer and their significance in the design of various heat transfer equipment.
81	Principles of Finite Element Method	CO1. To familiarize with the basic concepts of finite element method and its applications to structural and heat transfer problems.
82	Robotics	CO1. To familiarize with anatomy, kinematics, sensors and dynamics of a programmable machine, robot.
83	Automobile Engineering	CO1. To impart knowledge on IC engines, engine systems and combustion phenomenon. CO2. To familiarize with the various automotive systems such as transmission system, steering system, suspension system, braking system, safety systems and hybrid vehicles.
84	Database Management Systems	CO1. To familiarize the concepts of database systems and different issues involved in the database design. CO2. To introduce how to write SQL for storage, retrieval and manipulation of data in a relational database.

85	Hydrology	CO1. To impart the knowledge of essential components of the hydrologic cycle
		CO2.To familiarize with different methods of flood frequency analysis and flood routing
		CO3. To impart knowledge on groundwater movement and well hydraulics
		CO4.To provide an overview and understanding of Unit Hydrograph theory and its analysis.
		CO5. To familiarize with the relationships between soil, water and plant and their significance in planning an irrigation system
86	Planning for Sustainable Development	CO1. To familiarize the concept of sustainable development
		CO2. To introduce various components of sustainable development
87	Electrical and Hybrid Vehicles	CO1. To introduce the concepts on working principles of electric drives used for different hybrid electric vehicles.
		CO2. To familiarize with the different energy storage systems and their management strategies.
88	Power Plant Instrumentation	CO1. To provide an overview of different methods of power generation with a particular stress on thermal power generation
		CO2. To impart knowledge on the different types of control loops.
89	Material Science	CO1. to understand the properties of engineering materials, so as to manipulate them for the desired engineering applications.
90	Renewable Energy Sources	CO1. To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.
91	Assistive Technologies	CO1. To introduce different assistive technology devices
		CO2. To familiarize with the concepts of enhance speech communication and independent living.
92	Bio-Medical Engineering	CO1. To introduce the basics of biological concepts and relate it to engineering
		CO2. To familiarize with physiology of cardio-vascular system, respiratory system & the elements of Patient Care Monitoring.
		CO3. To impart the knowledge on the patient monitoring displays, diagnosis & techniques.
93	Node and Angular JS	CO1. To familiarize with defining own custom AngularJS directives that extend the HTML language
		CO2. To introduce the concepts of client-side services that can interact with the Node.js web server
		CO3. To understand the best practices for server -side JavaScript
94	Cyber Security	CO1. To understand security concepts, Ethics in Network Security.
		CO2. To familiarize with new algorithms (mathematical formulas) and statistical measures that assesses relationships among members of large data sets.
		CO3. To identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply those to design and evaluate counter measure tools.
		CO4. To gain knowledge on security threats, and the security services and mechanisms to counter them.
95	Scripting Languages	CO1. To familiarize with JQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.
96	Software Project Management	CO1. To introduce plan and manage projects at each stage of the software development life cycle (SDLC).
		CO2. To impart effective software projects that support organization's strategic goals.
97	Elements of Stochastic Processes	CO1. o study and understand the systems which evolve randomly over time, especially in long run.
		CO2. To survey the important tools of stochastic processes.
		CO3. To model and solve engineering problems arising in real life situations.
98	Academic Communication	CO1. To acquaint the students with the process and elements of academic writing.
		CO2. To help them gain accuracy in the academic writing tasks they will be called upon to perform as part of their graduate and postgraduate studies.
		CO3. To empower them to carry out academic writing tasks such as project report writing with success.
99	Heat Transfer Lab	CO1. To determine experimentally the conductive and radiating properties of materials and heat transfer coefficients in single and two phase flows.
100	Metrology and Instrumentation	CO1. To impart hands on training in measuring methods and metrology instruments.

101	Computer Aided Engineering Analysis Lab	CO1. To impart hands on training for analysis of structural , vibration and fluid flow problems using analysis package.
102	Object Oriented Programming Through JAVA	CO1. To familiarize with the concepts of object oriented programming. CO2. To impart the knowledge of AWT components in creation of GUI.
103	Mechatronics	CO1. To impart knowledge on design of complex engineering systems using sensors, actuators, controllers. CO2. To familiarize with the intelligent systems used in Mechatronics.
104	Embedded System Design	CO1. To introduce the concepts of embedded system design and to show how such systems are developed using a concrete platform built around.
106	Industrial Engineering and Management	CO1. To familiarize the significance of industrial engineering and its tools to enhance productivity of the systems. CO2. To introduce the principles and techniques for effective project management and personal management.
107	CAD / CAM	CO1. To present the role of computers in design and manufacture
108	Optimization Techniques	CO1. To familiarize with the concepts of evolutionary optimization CO2. To introduce the principles of soft computing optimization algorithmes such as Genetic Algorithm, Particle Swarm Optimization, Differential Evolution and Ant Colony Optimization.
109	Refrigeration and Air Conditioning	CO1. To introduce the basic cycles of various refrigerating systems, their performance evaluation along with details of system components and refrigerant properties. CO2. To impart knowledge of psychrometric properties, processes which are used in air-conditioning systems for comfort and industrial applications.
110	Unconventional Machining	CO1. To impart the principles of non-traditional machining methods.
111	Tribology	CO1. To familiarize with the selection of lubricating system for different machine components
112	Total Quality Management	CO1. To familiarize with the concepts of Total Quality Management.
113	Computational Fluid Dynamics	CO1. To equip students with the knowledge that is essential for application of computational fluid dynamics to solve engineering flow problems. CO2. To provide the essential numerical background for solving the partial differential equations governing the fluid flow.
114	Condition Monitoring	CO1. To familiarize with the importance of types of maintenance with their limitations and the methods of condition monitoring in different industrial sectors.
115	Design of Transmission Elements	CO1. To familiarize with the design of various machine elements for effective power transmission.
116	Disaster Management	CO1. To familiarize with disaster occurrence, strategies and remedial measures.
117	Repair and Retrofitting Techniques	CO1. To familiarize with durability aspects, quality of concrete causes of deterioration. CO2. To impart the knowledge on inspection and assessment of distresse structures, strengthen measures and demolition procedures. CO3. To familiarize with various concrete materials for repairs, and various precautions during retrofitting.
118	Modern Optimization Techniques	CO1. To familiarize with the concepts of evolutionary optimization CO2. To introduce the principles of soft computing optimization algorithmes such as Genetic Algorithm, Particle Swarm Optimization, Differential Evolution and Ant Colony Optimization.
119	Electrical Power Utilization	CO1. To familiarize with the mechanics of train movement. CO2. To impart knowledge on various heating methods and laws of illumination. CO3. To familiarize with the concepts of refrigeration and air-conditioning.
120	Green Engineering	CO1. To impart the knowledge needed to minimize impacts of products, processes on environment for sustainable development.
121	Non Destructive Evaluation	CO1. To familiarize with the concepts of various NDE techniques to identify the defect in a mechanical elements.
122	Cyber Physical Systems	CO1. To prototype the Smart objects and provides a holistic understanding of development Platforms, connected products of Internet of things (IoTs). CO2. To famialize with real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.
123	Signals and Systems	CO1. To familiarize with the basic concepts of signals and systems. CO2. To introduce various transform techniques on signals. CO3. To develop an understanding of sampling and correlation techniques on signals.

124	Digital Forensics	CO1. To provide a comprehensive overview of digital forensic process. CO2. To familiarize with the different roles a computer in crime investigation.
125	Business Intelligence and Decision Support Systems	CO1. To identify the process of decision making and use of model for decision making CO2. To use various visualization tools for delivery of knowledge.
126	Adhoc and Sensor Networks	CO1. To acquire fundamental concepts of ad hoc networks. CO2. To learn design considerations of wireless sensor networks.
127	Information Retrieval Systems	CO1. To provide the foundation knowledge in information retrieval. CO2. To familiarize about different applications of information retrieval techniques in the Internet or Web environment
128	Fuzzy Logic	CO1. To impart the knowledge of fuzzy set theory and its applications in Engineering.
129	Simulation Lab	CO1. To provide hands on experience in MATLAB and to write simple codes to implement the numerical methods. CO2. To demonstrate the simulation of manufacturing processes using simulation package. CO3. To demonstrate the working principle and operation of CNC lathe, CNC Mill, Robot and 3D printer.
130	Big Data Analytics	CO1. To introduce the architectural concepts of Hadoop and introducing map reduce paradigm. CO2. To disseminate knowledge on how to summarize, query, and analyze data with Hive. CO3. To familiarize with business decisions and create competitive advantage with Big Data analytics.
131	Computer Organization and Architecture	CO1. To familiarize with organizational aspects of memory, processor and I/O.
132	Cryogenics	CO1. To study various fluid properties, applications, gas liquefaction systems, air separation techniques, Insulating materials, vacuum pumps used in cryogenics.
134	Design for Manufacturing and Assembly	CO1. To familiarize with the design considerations for manufacturing and assembly.
136	Power Plant Engineering	CO1. To introduce the working of various power plants. CO2. To familiarize with estimation of unit power cost and factors affecting it.
137	Theory of Elasticity	CO1. To familiarize with the basic concepts of theory of elasticity.
138	Rapid Prototyping	CO1. To familiarize with rapid prototype tools and techniques for design and Manufacturing.
139	Gas Dynamics and Jet Propulsion	CO1. To analyze and solve basic problems of Subsonic and Supersonic flows of compressible fluids with Friction and Heat transfer. CO2. To estimate the thrust and specific impulse of a propeller engine from fluid and thermodynamic principles.
140	Automation in Manufacturing	CO1. To introduce various strategies of automation in manufacturing.
141	Non Destructive Techniques	CO1. To familiarize with the concepts of various NDE techniques to identify the defect in a mechanical elements.
ECE		
S.No	Course Name	Course Outcomes
1	Functional English	CO1 . Speak with a reasonable degree of fluency using communication strategies as well as conventions of politeness and courtesy. CO2. Listen to short audio and video clips in both standard Indian accent and native English accent and gain both understanding of messages and sensitivity to native- speaker accents. CO3. Read fluently comprehending texts of different kinds. CO4. Write coherent paragraphs and technical reports. CO5. Guard against mistakes Indians typically make in their speech and writing in English
2	Linear Algebra& Differential Equations	CO1. Use the concepts of Eigen values and eigenvectors in solving engineering problems. CO2. Apply 1st & 2nd order differential equations to solve various engineering problems. CO3. Apply the techniques of partial differentiation to find maxima and minima of two/three variables. CO4. Solve first order linear & non-linear partial differential equations.

3	Engineer & Society	CO1. Comprehend different moral perspectives and one's own Ethical standards. CO2. Understand the concept of safety and risk. CO3. Explain different initiatives to protect nature. CO4. Identify the role of Information Technology. CO5. Understand different types of infringement of Intellectual Property Rights. CO6. Analyze the importance of Entrepreneurship.
4	Solid State Physics	CO1. Explain construction and working of laser. CO2. Relate the principles of propagation of light in optical fibers for applications in communications. CO3. Identify conductivity mechanism in semiconductors . CO4. Determine types of polarization and classius-mossoti relation . CO5. Differentiate classical and quantum free electron theories Derive orbital and spin contribution for magnetism
5	Problem Solving through Computer Programming	CO1. Outline problem solving steps, c-tokens and data types. CO2. Design algorithm and flowchart for solving problem. CO3. Use control statements for writing the programs. CO4. Apply the concepts of arrays and strings in problem solving. CO5. Use pointers and functions to develop C programs. CO6. Distinguish structures and unions and develop programs using structures. CO7. Demonstrate the operations on files.
6	Functional English Lab	CO1. Give short impromptu speeches with confidence and fluency and take part in conversations in different functional contexts using English following appropriate communication strategies. CO2. Check the pronunciation of words in a dictionary using their knowledge of phonemic symbols. CO3. Speak English with adequate attention to stress, rhythm, and intonation; and CO4. Speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.
7	Solid State Physics Lab	CO1. Identify energy gap of a semiconductor . CO2. Draw characteristic curves to estimate thermal coefficient of a thermistor . CO3. Observe self timer and tuning nature of passive components like RC,LCR CO4. Verify magnetic field along the axis of a circular coil. CO5. Determine frequency of AC and unknown tuning fork CO6. Calculate light gathering power of optical fiber CO7. Estimate wavelength of unknown source
8	Computer Programming Lab	CO1. Identify discrete components of computers. CO2. Prepare applications using MS Office. CO3. Apply problem solving steps to solve a problem. CO4. Develop a C program for a given problem.
9	Professional Communication	CO1. Speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation) CO2. Listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speaker accents CO3. Read fluently, comprehending texts of different kinds using multiple strategies and higher-order skills CO4. Produce written discourses of different kinds; CO5. Guard against grammatical errors Indians typically make in their speech and writing in English
10	Integral Transforms and Vector Calculus	CO1. Apply Laplace transforms to find the solutions of ordinary differential equations. CO2. Express a function in Fourier series and in Fourier integral form. CO3. Apply the concepts of vector differentiation and integration to the surface and volume integrals. Solve difference equations by z-transforms.

11	Applied chemistry	<p>CO1. Explain the working of lead acid battery, nickel – cadmium battery, lithium ion battery and fuel cells and to explain the applications of sensors and biosensors.</p> <p>CO2. Explain about new generation photo voltaic cells.</p> <p>CO3. Apply a suitable method of water treatment depending on the quality requirement.</p> <p>CO4. Explain the methods of synthesis of liquid crystals, nano materials properties and applications of CNTs and quantum dots.</p> <p>CO5. Explain properties and engineering applications of fibre reinforced plastics, conducting polymers and bio degradable polymers.</p> <p>CO6. Explain the principles and working of spectrophotometer and flame photometer for the determination of a given ion in a given solution.</p>
12	Environmental Studies	<p>CO1. Understand the role of a citizen in protection of environment.</p> <p>CO2. Analyze functional attributes of an ecosystem.</p> <p>CO3. Enumerate the values of biodiversity.</p> <p>CO4. Identify appropriate processes to control pollution</p> <p>CO5. Identify waste management practices</p> <p>CO6. Understand various stages of Environmental Impact Assessment (EIA)</p>
13	Linear Electrical Networks	<p>CO1. Apply various circuit laws to analyze the electrical circuits.</p> <p>CO2. Analyze the steady state behavior of DC and AC circuits.</p> <p>CO3. Apply network theorems to analyze the electrical circuits.</p> <p>CO4. Analyze the behavior of electrical resonance • evaluate different two port network parameters.</p>
14	Numerical Methods& complex Analysis	<p>CO1. Apply numerical techniques for solutions of Algebraic, transcendental and ordinary differential equations.</p> <p>CO2. Compute interpolating polynomial for the given data.</p> <p>CO3. Find derivatives and integrals by using numerical techniques.</p> <p>CO4. Test the differentiability(analyticity) of a complex function</p> <p>CO5. Find the complex integration with the use of Cauchy’s integral formula.</p> <p>CO6. Apply the concepts of conformal and bilinear transformations of standard functions.</p>
15	Engineering Drawing	<p>CO1. Apply principles of drawing in representing dimensions of an object.</p> <p>CO2. Construct polygons and conical curves.</p> <p>CO3. Draw projections of points, lines and planes.</p> <p>CO4. Draw projections of solids in different positions.</p> <p>CO5. Convert orthographic views into isometric views and vice-versa.</p>
16	Professional Communication Lab	<p>CO1. Enhance the effectiveness of their communication through body language</p> <p>CO2. Take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency</p> <p>CO3. Take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency</p> <p>CO4. Speak professionally in telephone conversations;</p> <p>CO5. Make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session;</p> <p>CO6. Take part in group discussions and debates successfully;</p> <p>CO7. Answer questions at an elementary level in job interviews; and</p> <p>CO8. Use team-building skills with impact in different situations.</p>
17	Applied Chemistry Lab	<p>CO1. Test the quality parameters of water by volumetric and instrumental methods. • to operate the sensors for testing the water quality.</p> <p>CO2. Synthesize phenol – formaldehyde resin (Bakelite)</p> <p>CO3. Operate spectrophotometer and determine the concentration of Ferric Iron in a given solution. Familiar with word processing spread sheet and presentation applications.</p> <p>CO4. Get awareness on internet and World Wide Web.</p> <p>CO5. Understand protection of personal computer from different threats.</p>

18	Probability Theory and Stochastic Processes	<p>CO1. Determine and understand probability, statistics of random variables and their functions.</p> <p>CO2. Decide statistics of random vectors and their functions.</p> <p>CO3. Calculate statistics of random sequences, random processes, and their input and output relationships and statistics in linear systems.</p> <p>CO4. Apply the concepts of probability, random variables</p> <p>CO5. Processes to analyze statistical problems in Electronics and communication Engineering field.</p> <p>CO6. Apply the concepts of filtering and prediction of a random process</p>
19	Electronic Devices	<p>CO1. Analyze the carrier transport in junctions.</p> <p>CO2. Analyze the behavior of electronic devices.</p> <p>CO3. Study the models for diodes and use them for various applications.</p> <p>CO4. Design power supply using junction diode and Zener voltage regulator.</p> <p>CO5. Characterize the current flow in BJTs and MOSFETs.</p> <p>CO6. Bias the BJTs and MOSFETs for amplifier applications.</p> <p>CO7. Analyze the behavior of BJTs and MOSFETs under small-signal conditions.</p>
20	Signals & Systems	<p>CO1. Classify the signals and various operations on signals.</p> <p>CO2. Perform Fourier analysis on the signals</p> <p>CO3. Analyze the various systems.</p> <p>CO4. Perform correlation operational on signals.</p> <p>CO5. Apply the various sampling techniques on continuous time signals.</p> <p>CO6. Analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.</p>
21	Engineering Economics and Project Management	<p>CO1. Apply economic concepts in business decision making.</p> <p>CO2. Identify the influencing factors of Demand for a given product.</p> <p>CO3. Establish the suitable business organization with available resources.</p> <p>CO4. Analyze BEP for a project and adopt appropriate pricing strategies.</p> <p>CO5. Understand the importance of project management.</p> <p>CO6. Apply network concepts in business decision making.</p>
22	Electromagnetic Field Theory	<p>CO1. Apply the concepts of electric fields and magnetic fields in different applications.</p> <p>CO2. Analyze the electric and magnetic fields for different charge distributions.</p> <p>CO3. Derive the wave equations in perfect dielectric and conducting media.</p> <p>CO4. Calculate the energy stored in electric and magnetic fields.</p> <p>CO5. Understand reflection and refraction of electromagnetic waves in different media.</p> <p>CO6. Determine the power flow in electromagnetic waves.</p>
23	Elements of Electrical Engineering	<p>CO1. Describe the performance of DC, three phase, single-phase AC machines and measuring instruments.</p> <p>CO2. Determine the EMF equation of DC and AC machines</p> <p>CO3. Realize magnetization and load characteristics of DC machines.</p> <p>CO4. Determine the characteristics of three phase and single phase induction motor.</p> <p>CO5. Find the losses and efficiency of AC and DC machines..</p>
24	Electronic Devices Lab	<p>CO1. Identify various electronic components and basic electronic measuring instruments and other lab equipment.</p> <p>CO2. Perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.</p> <p>CO3. Use modern tools for simulation.</p> <p>CO4. Verify the I-V characteristics of junction diode, Zener diode, LED, photodiode, MOSFET, BJT, and obtain their parameters.</p> <p>CO5. Design, simulate, hardware implement, and test - DC power supply, Zener voltage regulator, diode clipper, clamper, and BJT and MOSFET voltage divider bias circuits.</p> <p>CO6. Verify the switching action of transistor.</p> <p>CO7. Make oral presentations and prepare written reports.</p>

25	Networks & Electrical Technology Lab	CO1. Verify the applicability of network theorems to practical electrical circuits. CO2. Specify and test RLC series and parallel resonant circuits. CO3. Interpret /correlate physical observations and measurements involving electrical circuits to theoretical principles CO4. Predict the efficiency of DC Shunt motor by conducting No-Load Test and able to draw performance curves by conducting brake test.
26	Transmission Lines and Waveguides	CO1. Apply the knowledge of network theory in analyzing the concepts of transmissions lines. CO2. Analyze the transmission lines at different frequencies. CO3. Measure the transmission line parameters using smith chart. CO4. Demonstrate the knowledge of wave guides and fundamental principles. CO5. Understand different modes of propagation in wave guides. CO6. Select an appropriate wave guide to meet specified requirements.
27	Analog Circuits	CO1. Draw, analyses, and characterize the MOS and BJT single-stage amplifiers at low and high frequencies. CO2. Design CS and CE amplifiers at low frequencies. CO3. Draw, analyze, and characterize - cascode, darlington, differential, feedback, power amplifiers and oscillators. CO4. Draw and analyze the behaviour of tuned amplifiers and op amp under inverting and non-inverting configurations..
28	Analog Communications	CO1. Disseminate the fundamentals of analog modulation schemes. CO2. Differentiate DSB-SC and SSB modulation schemes. CO3. Understand the functioning of AM and FM transmitters and receivers. CO4. Determine power relations for various modulation schemes and evaluate the impact of noise in AM and FM modulation schemes. Compare and contrast TDM and FDM techniques.
29	Digital Circuit Design	CO1. Design various logic circuits using Boolean laws. CO2. Design combinational and sequential logic circuits. CO3. Gain the knowledge of PLDs. CO4. Develop digital circuits using HDL
30	Fundamentals of data Structures	CO1. Demonstrate the working process of sorting (bubble, insertion, selection and heap) and searching (linear and binary) methods using a programming language. CO2. Design algorithms to create, search, insert, delete and traversal operations on linear and non-linear data structures. CO3. Evaluate the arithmetic expressions using stacks. CO4. Compare array and linked list representation of data structures.
31	Analog Circuits Lab	CO1. Design, simulation, and conduct of experiments to obtain the frequency response/ performance characteristics of single-stage, cascode, differential, tuned, feedback, and power amplifiers, RC and LC oscillators,. CO2. Testing of op-amp in inverting and non-inverting configurations.
32	Digital Circuit Design Lab	CO1. learn the digital circuit concepts. CO2. Design the digital circuits. CO3. Develop digital circuits using CAD tools.
33	Linear Integrated Circuits Applications	CO1. Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques. CO2. Elucidate and design linear and non-linear applications using op-amps. CO3. Design and analyze comparators, waveform generators and multivibrators using functional ICs. CO4. Design active filters and regulated power supplies for various applications. CO5. Apply the concepts of VCO and PLL in the design of demodulator circuits. CO6. Choose appropriate A/D and D/A converters for signal processing applications.
34	Digital Communications	CO1. Understand basic concepts of digital communication systems. CO2. Distinguish PCM and DM systems. CO3. Elucidate different digital modulation techniques. CO4. Determine the probability error for different digital modulation techniques. CO5. Identify error detection & correction capabilities of linear block codes.

35	Antennas and Wave Propagation	<p>CO1. Understand the fundamental concepts of Antennas.</p> <p>CO2. Differentiate antennas based on their radiation mechanism.</p> <p>CO3. Design basic antenna arrays using multiplication of patterns.</p> <p>CO4. Analyze the performance of non resonant radiators, VHF and UHF antennas.</p> <p>CO5. Compare the performance of several antennas working at high frequencies.</p> <p>CO6. Distinguish wave propagations based on frequency of operation.</p>
36	Principles of VLSI Design	<p>CO1. Characterize the MOS devices</p> <p>CO2. Draw layouts</p> <p>CO3. Apply design techniques for VLSI circuits</p> <p>CO4. Apply testing and verification principles for VLSI circuits</p>
37	Professional Elective – I: CAD for VLSI	<p>CO1. Understand various methodologies for the design of VLSI systems.</p> <p>CO2. Optimize combinational circuits.</p> <p>CO3. Develop algorithms for the layout optimization.</p> <p>CO4. Size floor plan and solve routing problems.</p> <p>CO5. Analyze different simulation and synthesis techniques.</p>
38	Computer Organization	<p>CO1. Learn the basic structure and operations performed by the components of a digital computer.</p> <p>CO2. Know the concepts of micro-programming, micro code sequencing and pipelining techniques.</p> <p>CO3. Differentiate the hierarchical memory system including cache, virtual memories and instruction level parallelism.</p>
39	Computer and Communication Networks	<p>CO1. Identify the topology and architecture of a computer network.</p> <p>CO2. Differentiate the OSI and TCP reference models.</p> <p>CO3. Apply protocols to different layers of a network hierarchy.</p> <p>CO4. Understand different datalink protocols.</p> <p>CO5. Identify the routing algorithm for given user application.</p> <p>CO6. Understand the applications of computer networks.</p>
40	Biomedical Engineering	<p>CO1. Know the concept of bio-medical engineering, evolution, age, development, advancements and applications.</p> <p>CO2. Get awareness on novel theory related to human body and various components.</p> <p>CO3. Analyze the operation of measuring the cardio-vascular system by knowing its inner organization, sensor and transducer theory & plethysmographical concepts.</p> <p>CO4. Learn the principles of respiration and respiratory therapy equipment. Understand the fundamental principles & techniques of diagnosis and biotelemetry, monitors, recorders.</p>
41	Linear Integrated Circuits Applications Lab	<p>CO1. Perform experiment, take observations, present the results in proper form, analyze and interpret results, draw conclusions by correlating with theory.</p> <p>CO2. Measure the parameters of IC 741 op-amp.</p> <p>CO3. Design, hardware implement, and test op-amp adder, integrator, Schmitt trigger, square and triangular wave generators, low-pass, high-pass, and bandpass active filters.</p> <p>CO4. Design, hardware implement, and test monostable and astable multivibrator circuits using 555 timer.</p> <p>CO5. Design, hardware implement, and test regulated power supply using 3-terminal / 723 IC regulators.</p> <p>CO6. Verify the lock range and capture range of PLL IC 565, operation of weighted resistor / R-2R digital to analog converters, and analog to digital converters.</p> <p>CO7. Make oral presentations and prepare written reports.</p>
42	Analog and Digital Communications Lab	<p>CO1. Verify the sampling process with different sampling rates.</p> <p>CO2. Compare the operation of various analog and digital modulation schemes.</p> <p>CO3. Distinguish Frequency Shift Keying and Differential Phase Shift Keying techniques.</p> <p>CO4. Test linear block encoders and decoders</p>

43	Digital Signal Processing	<p>CO1. Analyze and process signals in the discrete domain.</p> <p>CO2. Determine the Fourier series coefficients and z-transform of discrete time signals.</p> <p>CO3. Apply the various transform techniques on discrete time signals.</p> <p>CO4. Design digital filters (IIR and FIR) for a given specifications.</p> <p>CO5. Apply various windowing techniques in the design of FIR filter.</p> <p>CO6. Realize digital filters (IIR and FIR).</p>
44	Control Systems	<p>CO1. Develop mathematical models for physical systems.</p> <p>CO2. Employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.</p> <p>CO3. Quantify time and frequency domain specifications to determine stability margins.</p> <p>CO4. Apply state variable theory to determine the dynamic behavior of linear control systems.</p>
45	Microprocessors, Microcontrollers and Applications**	<p>CO1. Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.</p> <p>CO2. Identify a detailed s/w & h/w structure of the microprocessor and microcontroller</p> <p>CO3. Illustrate how the different peripherals (8255) are interfaced with Microprocessor</p> <p>CO4. Interface various I/O devices to the 8051 microcontroller.</p> <p>CO5. Know the ARM philosophy</p>
46	Microwave and Optical Communications	<p>CO1. Design the microwave bench setup with different wave guide components</p> <p>CO2. Distinguish microwave sources based on constructional, operational and performance aspects</p> <p>CO3. Demonstrate the use of microwave bench for calculating power, attenuation, frequency and VSWR.</p> <p>CO4. Understand the basic concepts of fiber optics. design a fiber optic communication network with suitable light sources for a given application.</p> <p>CO5. Design a fiber optic communication network with suitable optical detectors for a given application.</p>
47	Professional Elective – II: Analog IC Design	<p>CO1. Apply the knowledge of Mathematics and semiconductor theory in analyzing and designing of analog integrated circuits</p> <p>CO2. Demonstrate the knowledge and understanding of various current mirrors and switched capacitor circuits</p> <p>CO3. Describe and determine the effect of feedback on the stability of amplifier circuits. Select an appropriate A/D and D/A converter to meet specified performance requirements.</p>
48	Nano Electronics	<p>CO1. Explain various aspects of nano electronics.</p> <p>CO2. Explore the fabrication techniques used for nanodevices.</p> <p>CO3. Identify the importance of scaling.</p> <p>CO4. List of various applications of tunneling.</p> <p>CO5. Demonstrate the concepts of coulomb blockade and electron transport mechanisms.</p>
49	Smart Antennas	<p>CO1. Apply different windowing techniques to obtain weights for desired antenna pattern.</p> <p>CO2. Make use of random variables for pre-processing of the signals.</p> <p>CO3. Differentiate the performance of general antenna and smart antenna for spatial processing of the signal.</p> <p>CO4. Conceptualize adaptive beamforming.</p> <p>CO5. Understand the concept of angle of arrival algorithms for beamforming.</p> <p>CO6. Test the received signal performance with different algorithms and can choose the suitable algorithm for the given application.</p>

50	Coding Theory	<p>CO1. Develop mathematical models for practical communication channels and analyze information carrying capacity.</p> <p>CO2. Understand source coding mechanism.</p> <p>CO3. Analyze linear block codes and investigate the relationship between minimum distance and error correction/detection capabilities</p> <p>CO4. Analyze encoder and efficient decoder algorithms for convolutional codes.</p> <p>CO5. Design and implement channel encoder and decoder in hardware/ software to meet the required error performance in present day communication applications.</p>
51	Microprocessor and Microcontroller Interfacing Lab	<p>CO1. Acquire the knowledge of assembly language programming using 8086 microprocessor.</p> <p>CO2. Perform various arithmetic and shift operations with 8086 based system.</p> <p>CO3. Interface various I/O modules with 8086 based system.</p> <p>CO4. Implement various real time applications using 8051.</p>
52	Digital Signal Processing Lab	<p>CO1. Analyze and implement digital signal processing systems in time domain.</p> <p>CO2. Compute linear and circular convolution and the discrete Fourier transform (DFT) of discrete-time signals.</p> <p>CO3. Perform the frequency response of frequency-selective digital filters using Butterworth, chebyshev approximations and windows.</p> <p>CO4. Implement DSP operations on TMS320C6711 DSP processor.</p>
53	VLSI Lab	<p>CO1. Design analog and digital circuits.</p> <p>CO2. Use EDA tools to perform simulation, draw schematic and layout, analysis, testing, and interpret results.</p> <p>CO3. Write VHDL/Verilog code.</p> <p>CO4. Make oral presentations and prepare written reports.</p>
54	CMOS Digital IC Design	<p>CO1. Characterize the behavior of CMOS inverter</p> <p>CO2. Design various combinational and sequential circuits using CMOS logic</p> <p>CO3. Identify different components contributing to delay offered by interconnects</p> <p>CO4. Design complex digital circuits Design memory based array structures.</p>
55	Embedded System Design	<p>CO1. Distinguish between the general computing system and the embedded system.</p> <p>CO2. Differentiate general purpose processors and single purpose processors.</p> <p>CO3. Model different state machines and concurrent process.</p> <p>CO4. Specify different design technologies of software and hardware design.</p>
56	Electronic Measurements and Instrumentation	<p>CO1. Classify the instruments based on static and dynamic characteristics.</p> <p>CO2. Analyze the frequency component of a generated wave and its distortion</p> <p>CO3. Learn the concepts of active and passive transducers.</p>
57	Professional Elective - III : Mixed Signal IC Design	<p>CO1. Analyze the switched capacitor circuits.</p> <p>CO2. Explore the fundamentals and different architectures of ADCs and DACs, mixed signal layout issues.</p> <p>CO3. Use PLLs for various applications.</p> <p>CO4. Characterize various digital IC building blocks.</p>
58	Cellular and Mobile Communications	<p>CO1. Understand the characteristics of radio environment.</p> <p>CO2. Apply the concepts of frequency reuse and cell splitting to increase the capacity of cellular system.</p> <p>CO3. Analyse different interferences in a cell to improve the performance of the system.</p> <p>CO4. Create a cellular system model for a given region considering terrain configuration.</p> <p>CO5. Design an efficient frequency management and channel assignment scheme by selecting proper handoff mechanism.</p> <p>CO6. Conceptualize GSM and multiple access schemes.</p>
59	Digital TV Engineering	<p>CO1. Understand color Television standards and their specifications.</p> <p>CO2. Conceptualize the operation of color Television system.</p> <p>CO3. Find the applications of Digital TV.</p>
60	DSP Processors and Architectures	<p>CO1. Apply the concepts of Sampling, DFT and Filters.</p> <p>CO2. Calculate DSP computational Errors.</p> <p>CO3. Identify the Architectural features of DSP processors.</p> <p>CO4. Interface I/O and memory devices with DSP Processors.</p>

61	Professional Elective – IV: System on Chip Design	CO1. Understand architecture designs and their design issues, Core Libraries and EDA Tools required for SoC Design. CO2. Explore design methodology for Logic Cores, Soft and Hard Cores, Memory and Analog Cores. CO3. Perform SoC Design validation, prototyping and verification. CO4. Design SoCs for various applications.
62	Wireless Sensor Networks	CO1. Explain the concepts, network architectures and applications of ad hoc and wireless sensor Networks CO2. Analyse the protocol design issues of ad hoc and sensor networks. CO3. Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues. CO4. Evaluate the QoS related performance measurements of ad hoc and sensor networks
63	Satellite Communication	CO1. Demonstrate the knowledge of orbital parameters and satellite launching techniques. CO2. Compare the role of various satellite subsystems. CO3. Design satellite link for required specifications. CO4. Understand the coordination of earth stations for efficient utilization of the satellite by means of multiple accessing techniques. CO5. Develop a virtual satellite earth station. CO6. Navigate the receiving station by global positioning system.
64	Digital Image Processing	CO1. Analyze the need for image transforms, types and their properties. CO2. Process the images for the enhancement of certain properties or for optimized use of the resources. CO3. Explore causes for image degradation and to develop various restoration techniques. CO4. Evaluate the image compression techniques
65	Microwave and Optical Communications Lab	CO1. experiment with microwave sources like reflex klystron, Gunn diode and optical sources like LED's & Lasers. CO2. conduct measurements using a standard microwave test bench, analog and digital optical links for microwave and optical signal characteristics. CO3. develop test bench for characterizing a given microwave component.
66	Professional Elective – V: Low Power VLSI Circuits	CO1. Identify the requirements for low power CO2. Distinguish static and dynamic power dissipations CO3. Apply voltage scaling approaches to reduce dynamic power CO4. Apply various methods to minimize switched capacitance CO5. Identify suitable leakage power minimization technique CO6. Describe low power design methodologies such as adiabatic circuits.
67	Real Time Operating Systems	CO1. Apply the concepts of real time operating system. CO2. Develop software for embedded systems using the system design techniques. CO3. Identify how to port RTOS on a microcontroller based development board. CO4. Model real-time applications using Unix/Linux and RTLinux programming.
68	Speech Processing	CO1. Understand how speech is produced. CO2. Perform speech analysis and homomorphic processing of speech signals. CO3. Code the speech signals using linear predictive analysis. CO4. Enhance the speech signals and recognize speech as well as speaker.
69	Adaptive Signal Processing	CO1. Understand the concept of adaptive filters. CO2. Apply Wiener and Kalman filters for signal processing applications. CO3. Apply LMS and RLS algorithms for adaptive filter applications. CO4. Understand the concepts of linear and non-linear adaptive signal processing techniques
70	Professional Elective – VI: ASIC Design	CO1. Understand the different types of ASICs and its Design Flow. CO2. Analyze the Characteristics and Performance of Programmable ASICs, Logic cells, I/O Cells and Interconnects. CO3. Measure goals and objectives related to Floor planning, Placement and Routing.
71	Embedded C	CO1. Distinguish C and Embedded C. CO2. Select the processor, memory and operating system for an application. CO3. Design and develop an application using Embedded C.

72	RADAR Engineering	CO1. Compute different parameters from radar data. CO2. Conceptualize the radar operation. CO3. Distinguish moving target and pulse Doppler radars. CO4. Understand the operation of different radar receivers. CO5. Track different objects by using radar in different noise conditions. CO6. Realize radar systems for electronic warfare.
73	Multi Rate Signal Processing	CO1. Acquire the knowledge of multirate signal processing. CO2. Design perfect reconstruction and near perfect reconstruction filter bank system and to learn to assess the computational efficiency of multirate systems. CO3. Analyze the quantization effects in filter banks. CO4. Recognize the use of filter banks in applications such as speech processing and communication
74	Project	CO1. Do the project keeping in view environmental safety, healthy design and develop socio & economical aspects. CO2. Interface peripherals to micro processors/micro controllers. CO3. Develop code for simulating the circuits and algorithms. CO4. Use modern tools for analyzing the circuits and algorithms. CO5. Test the developed circuits. CO6. Write reports & give oral presentations.

CSE

S.No.	Course Name	Course Outcomes
1	Functional English	CO1. listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately.
		CO2. Speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture.
		CO3. reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes.
		CO4. writing for academic purposes (e.g. assignments, examination answers)+C1410 in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately; and
		CO5. To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.
		CO5. To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.
2	Linear Algebra & Integral transforms	CO1. To understand the concepts of eigenvalues and eigenvectors
		CO2. To gain the knowledge of Laplace and inverse Laplace transforms
		CO3. To understand the concepts of Fourier Transforms
3	Chemistry	CO1. To impart the knowledge in chemistry and applications of nano materials, liquid crystals and polymers used in engineering.
		CO2. To impart knowledge in chemistry of semiconductors, batteries and to impart the knowledge of green chemistry in green synthesis of products
4	Environmental Studies	CO1. To impart the basic knowledge about the environment and ecology.
		CO2. To develop an attitude of concern for biodiversity and its conservation.
		CO3. To assess the environmental impacts of developmental activities.
		CO4. To create awareness on environmental pollution and waste management.
5	Basic Electrical Engineering	CO1. To introduce the basics electrical circuits and network theorems.
		CO2. To develop an understanding of DC machines and AC machines .
6	Problem Solving through Computer Programming	CO1. To emphasize the use of flowcharts and pseudo code in problem solving.
		CO2. To gain knowledge in C language.
		CO3. To apply C language in problem solving
7	Functional English Lab	CO1. The communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English.

7	Functional English Lab	CO2. a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.
8	Computer Programming Lab	CO1. To familiarize with the discrete components of a computer, MS Office. CO2. To develop C Programs to solve problems
9	Professional Communication	CO1. To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length and complexity. CO2. To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication.
10	Numerical Methods and Differential Equations	CO1. To understand the various numerical techniques CO2. To aware of different techniques to solve first and second order differential equations.
11	Applied Physics	CO1. To learn conditions for propagation of laser light in guided medium. CO2. To understand principles of solid state materials for use in the engineering applications.
12	Engineer & Society	CO1. To understand the Ethics and Human Values CO2. To equip the students to have a basic awareness on environmental and socioeconomic factors. CO3. To familiarize with the rights and responsibilities of an engineer. CO4. To elucidate the rules and regulations of patents and trade laws.
13	Elements of Electronics Engineering	CO1. To familiarize the construction, characteristics and applications of various semiconductor devices. CO2. To introduce various electronic circuits and their operation.
14	Python Programming	CO1. To introduce Scripting Language. CO2. To explore various problems solving approaches of computer science. CO3. To develop a basic understanding of Python programming.
15	Professional Communication Lab	CO1. Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.
16	Applied Physics Lab	CO1. To draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components CO2. To understand the behaviour and characteristics of various active and passive components.
17	Managerial Economics and Financial Analysis	CO1. To familiarize with the importance of Managerial Economics and know its significant role in achieving business objectives. CO2. To interpret and analyze the financial performance of a business unit.
18	Discrete Mathematical Structures	CO1. To familiarize the structure of statements (and arguments) involving predicates and quantifiers. CO2. To introduce the applications of graph theory to various practical problems. CO3. To impart recurrence relations for solving a recursive problem.
19	Data Structures	CO1. To impart knowledge of linear and non-linear data structures. CO2. To familiarize with different sorting and searching techniques.
20	Digital Logic Design	CO1. To familiarize with the concepts of designing digital circuits.
21	Object Oriented Programming through Java	CO1. To familiarize with the concepts of object oriented programming. CO2. To impart the knowledge of AWT components in creation of GUI.
22	Data Structures Lab	CO1. To implement different searching and sorting algorithms. CO2. To implement linear and non-linear data structures.
23	Object Oriented Programming Lab	CO1. To demonstrate object oriented programming concepts. CO2. To introduce the creation of GUI using AWT components.
24	UNIX Programming Lab	CO1. To familiarize with various UNIX utilities. CO2. To impart knowledge on developing shell scripts.
25	Probability and Statistics	CO1. To impart the concepts of probability and statistics. CO2. To disseminate the knowledge on sampling theory and principles of hypothesis testing CO3. To introduce the correlation coefficient and lines of regression.
26	Operating Systems	CO1. To impart the concepts of process, memory and file management techniques. CO2. To familiarize with the deadlock handling techniques.

27	Formal Languages and Automata Theory	CO1. To introduce the classification of machines by their power to recognize languages and to solve problems in computing. CO2. To familiarize how to employ deterministic and non-deterministic machines.
28	Computer Organization and Architecture	CO1. To familiarize with organizational aspects of memory, processor and I/O.
29	Database Management Systems	CO1. To familiarize with the concepts of database systems and different issues involved in the database design. CO2. To introduce SQL for storage, retrieval and manipulation of data in a relational database.
30	Elements of Civil Engineering	CO1. To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.
31	Building Services	CO1. To impart knowledge on water supply, treatments and water distribution for all type of buildings. CO2. To acquire principles and best practices for Solid waste management in residential units. CO3. To create awareness about the importance of electrical and mechanical services in buildings and fire safety
32	Electrical Materials	CO1. To introduce the concepts of dielectric and ferro magnetic materials. CO2. To impart knowledge on semiconductor materials. CO3. To familiarize with the required materials used for electrical applications.
33	Control Systems Engineering	CO1. To introduce the basic concepts of control systems by developing mathematical models for physical systems. CO2. To familiarize with the time domain behavior of linear control systems. CO3. To impart knowledge on analytical and graphical methods to quantify stability of linear control systems. CO4. To introduce concepts on the state variable theory.
34	Elements of Manufacturing Processes	CO1. To introduce the principles of manufacturing processes to convert materials into desired shapes and sizes.
35	Automotive Engineering	CO1. To introduce various components of an automobile and engine sub systems. CO2. To familiarize with the various systems such as transmission system, steering system, suspension system, braking system, and safety systems. CO3. To impart knowledge on various safety systems of an automobile and emission norms.
36	Introduction to Microprocessors and Microcontrollers	CO1. To familiarize with architecture of 8086 microprocessor and 8051 microcontroller. CO2. To introduce the assembly language programming concepts of 8086 processor CO3. To expose with various interfacing devices with 8086 using 8255.
37	Fundamentals of Communications	CO1. To introduce various analog and digital modulation and demodulation techniques. protocols. CO3. To impart the standards and mechanisms of television systems.
38	Computer Graphics	CO1. To introduce computer graphics applications and functionalities of various graphic systems. CO2. To familiarize with 2D and 3D geometrical transformations. CO3. To disseminate knowledge on the visible surface detection and animation.
39	Object Oriented Programming through Java	CO1. To familiarize with the concepts of object oriented programming. CO2. To impart the knowledge of AWT components in creation of GUI.
40	Systems Software	CO1. To familiarize with the implementation details of assemblers, loaders, linkers, and macro processors.
41	Web Programming	CO1. To develop real time web applications. CO2. To get acquainted with skills for creating websites and web applications by learning various technologies like HTML, CSS, JavaScript, XML, JSP and JDBC.
42	Mathematical Cryptography	CO1. To give a simple account of classical number theory, prepare students towards the concepts of Network Security and to demonstrate applications of number theory (such as public-key cryptography). CO2. To students will have a working knowledge of the fundamental definitions and theorems of elementary number theory, be able to work with congruences. CO3. To solve congruence equations and systems of equations with one and more variables.

		CO4. To students will also have an exposure to cryptography.
43	Semiconductor Physics	CO1. To know the physics and applications of semi conductor. CO2. To understand fundamental principles and applications of the electronic and optoelectronic.
44	Operating Systems Lab	CO1. To develop the concepts of process and memory management techniques. CO2. To know the problems of deadlock and study the various handling mechanisms.
45	Database Management Systems Lab	CO1. To familiarize with creation of database and formulate SQL solutions to manipulate the database. CO2. To disseminate knowledge on integrity constraints, triggers and PL/SQL programs in a database environment.
46	Environmental Impact Assessment	CO1. To familiarize with various methodologies of EIA for project assessment. CO2. To distinguish impact prediction, assessment based on significance and preparation of audit report.
47	Signals and Systems	CO1. To familiarize with the basic concepts of signals and systems. CO2. To introduce various transform techniques on signals. CO3. To develop an understanding of sampling and correlation techniques on signals.
48	Fuzzy Logic	CO1. To impart the knowledge of fuzzy set theory and its applications in Engineering
50	Software Engineering	CO1. To illustrate basic taxonomy and terminology of the software engineering. CO2. To plan and monitor the control aspects of project.
51	Compiler Design	CO1. To familiarize with lexical analyzer and different parsers. CO2. To introduce various storage allocation strategies, code generation and code optimization techniques.
52	Computer Networks	CO1. To introduce the fundamental concepts of computer networking. CO2. To familiarize with networking concepts to work on various Protocols of ISOOSI and TCP/IP.
53	Web Technologies	CO1. To familiarize with various technologies like HTML, CSS, JavaScript, XML, JSP and PHP to develop real-time web applications.
54	C#.NET	CO1. To impart the concepts of control structures, classes, objects in .NET CO2. To demonstrate the concept of exception handling and threads. CO3. To impart the working style of forms in web applications CO4. To edify the connection to a database using web application.
55	Advanced Data Structures	CO1. To introduce dictionaries, priority queue and balanced trees. CO2. To disseminate knowledge on Pattern Matching Algorithms and Tries.
56	Software Testing Methodologies	CO1. To familiarize with the fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods CO2. To disseminate knowledge on software testing techniques.
57	Principles of Programming Languages	CO1. To understand and describe syntax and semantics of programming languages. CO2. To understand data, data types, and basic statements. CO3. To understand call-return architecture and ways of implementing them. CO4. To understand object-orientation, concurrency, and event handling in programming languages. CO5. To develop programs in non-procedural programming paradigms.
58	Geoinformatics	CO1. To introduce the basic concepts and principles of remote sensing. CO2. To familiarize with structure and function of Geographic Information Systems. CO3. To illustrate the multidisciplinary nature of Geospatial applications.
59	Environmental Sanitation	health. CO2. To introduce the strategies for maintaining healthy living and working environment. CO3. To delineate the role of environmental engineer in industrial environments.
60	Modeling and Simulation of Engineering Systems	CO1. To familiarize with programming skills using basic MATLAB and its associated tool boxes CO2. To impart knowledge on building SIMULINK and Graphical user interface
61	Power Systems Engineering	CO1. To introduce the working of power plants in power generation and layout of substations CO2. To familiarize with the concepts of corona, insulators and sag in overhead lines.
62	Elements of Mechanical	CO1. To familiarize with the principles of mechanical power transmission elements.
63	Material Handling Equipment	CO1. To provide knowledge on materials handling equipment.
64	Automotive Electronics	CO1. To familiarize with the electronic systems inside an automotive vehicle. CO2. To introduce the concepts of advanced safety systems.

65	Introduction to MEMS	CO1. To introduce lithography principles, mechanical sensors and actuators.
		CO2. To make it known the thermal sensors and actuators, magnetic sensors and actuators.
		CO3. To present formally micro fluidic systems and chemical and bio medical micro systems.
66	Data Science	CO1. To familiarize with statistical methods to analyze data using classification, graphical and computational methods.
		CO2. To introduce Data Wrangling approaches and descriptive analytics on large data sets.
67	Virtual and Augmented Reality	CO1. To introduce key elements of virtual Reality with the components in VR systems.
		CO2. To gain knowledge of various input and output devices required for interacting in virtual world and augmented reality.
68	Open Source Software	CO1. To impart the opportunities for open source software in the global market.
		CO2. To familiarize with different steps in implementing the open source
69	Cyber Laws	CO1. To expose the need of cyber laws to prosecute cybercrimes in the society.
		CO2. To familiarize with Licensing Issues Authorities for Digital Signatures.
70	Quality, Reliability and Operations Research	CO1. To equip students with basic practical skills with sufficient theory.
		CO2. To understand the principles involved in the application area.
		CO3. To develop the power of systematic thinking and reasoning, practical approach and exposition in the students.
71	Computer Networks and Compiler Design Lab	CO1. To demonstrate the functionalities of various layers of OSI model.
		CO2. To demonstrate lexical analysis and syntax analysis phases of a compiler.
72	Web Technologies Lab	CO1. To introduce concepts of designing dynamic web pages using HTML, CSS and Javascript.
		CO2. To familiarize with JSP programming and master database access using JSP and JDBC.
		CO3. To impart PHP programming and master database access using PHP and MySQL.
73	Human Computer Interaction	CO1. To introduce guidelines, principles, and theories influencing human computer interaction
		CO2. To familiarize with range of approaches, techniques, tools and methods available to them when designing useful and usable technology
74	Digital Signal Processing	CO1. To familiarize with the basic concepts of discrete time signals and systems.
		CO2. To introduce the concepts of Z-transform and frequency domain representation of discrete time signals.
		CO3. To familiarize with the designing of digital filters and their realization.
75	Control Systems	CO1. To introduce the basic concepts of control systems by developing mathematical models for physical systems.
		CO2. To equip the students to analyze the time domain behavior of linear control systems.
		CO3. To impart analytical and graphical methods to quantify stability of linear control systems.
		CO4. To introduce the state variable theory as a pre-requisite to advance control systems.
77	Design and Analysis of Algorithms	CO1. To disseminate knowledge on analyzing the running time of algorithms using asymptotic notations.
		CO2. To introduce algorithmic design paradigms such as Divide and Conquer, Greedy Method, Dynamic Programming, Back Tracking, Branch and Bound with illustrations.
78	Data Warehousing and Data Mining	CO1. To introduce the concepts of Data warehousing and Data mining.
		CO2. To familiarize with the concepts of association rule mining, classification, clustering techniques and algorithms.
79	UML and Design Patterns	CO1. To get familiar with the Object Oriented Analysis and Design in software development, develop UML structural and behavioral models of an application.
		CO2. To describe and choose an appropriate Design Pattern to refine the model.
80	Artificial Intelligence	CO1. To familiarize the concepts of AI for representation of knowledge and problem solving.
81	Scripting Languages	CO1. To familiarize with jQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.
82	Microprocessors and Interfacing	CO1. To familiarize with the architecture of 8086 microprocessor
		CO2. To introduce the assembly language programming concepts of 8086 processor.
		CO3. To impart knowledge on I/O interfacing.

83	Software Project Management	CO1. To introduce plan and manage projects at each stage of the software development life cycle (SDLC) CO2. To impart effective software projects that support organization's strategic goals.
84	Hydrology	CO1. To impart the knowledge of essential components of the hydrologic cycle. CO2. To provide an overview and understanding of Unit Hydrograph theory and its analysis. CO3. To familiarize with different methods of flood frequency analysis and flood routing. CO4. To impart knowledge on groundwater movement and well hydraulics. CO5. To familiarize with the relationships between soil, water and plant and their significance in planning an irrigation system.
85	Planning for Sustainable Development	CO1. To familiarize the concept of sustainable development CO2. To introduce various components of sustainable development
86	Electrical and Hybrid Vehicles	CO1. To introduce the concepts on working principles of electric drives used for different hybrid electric vehicles. CO2. To familiarize with the different energy storage systems and their management strategies.
87	Power Plant Instrumentation	CO1. To provide an overview of different methods of power generation with a particular stress on thermal power generation. CO2. To impart knowledge on the different types of control loops.
88	Material Science	CO1. to understand the properties of engineering materials, so as to manipulate them for the desired engineering applications.
89	Renewable Energy Sources	CO1. To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.
90	Assistive Technologies	CO1. To introduce different assistive technology devices CO2. To familiarize with the concepts of enhance speech communication and independent living
91	Bio-Medical Engineering	CO1. To introduce the basics of biological concepts and relate it to engineering. CO2. To familiarize with physiology of cardio-vascular system, respiratory system & the elements of Patient Care Monitoring. CO3. To impart the knowledge on the patient monitoring displays, diagnosis & techniques.
92	Node and Angular JS	CO1. To familiarize with defining own custom AngularJS directives that extend the HTML language CO2. To introduce the concepts of client-side services that can interact with the Node.js web server. CO3. To understand the best practices for server -side JavaScript.
93	Cyber Security	CO1. To understand security concepts, Ethics in Network Security CO2. To familiarize with new algorithms (mathematical formulas) and statistical measures that assesses relationships among members of large data sets. CO3. To identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply those to design and evaluate counter measure tools. CO4. To gain knowledge on security threats, and the security services and mechanisms to counter them.
94	Scripting Languages	CO1. To familiarize with jQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.
95	Software Project Management	CO1. To introduce plan and manage projects at each stage of the software development life cycle (SDLC). CO2. To impart effective software projects that support organization's strategic goals
96	Elements of Stochastic Processes	CO1. To study and understand the systems which evolve randomly over time, especially in long run. CO2. To survey the important tools of stochastic processes. CO3. To model and solve engineering problems arising in real life situations.
96	Academic Communication	CO1. To study and understand the systems which evolve randomly over time, especially in long run. CO2. To survey the important tools of stochastic processes. CO3 To empower them to carry out academic writing tasks such as project report writing with success.

97	Data Mining Lab	CO1. To exercise the data mining techniques such as classification, clustering, pattern mining etc with different datasets and dynamic parameters using WEKA tool.
98	Graph Theory	CO1. To apply the concepts of graph theory in real world problem solving CO2. To apply a combination of theoretical knowledge and independent mathematical thinking to investigate questions in graph theory
99	Embedded System Design	CO1. To introduce the concepts of embedded system design and to show how such systems are developed using a concrete platform built around.
100	Digital Control Systems	CO1. To introduce the concepts on digital control systems and their associated components.
		CO2. To impart knowledge on z-transformations for the analysis of digital control systems.
		CO1. To understand security concepts, Ethics in Network Security
		CO1. To understand security concepts, Ethics in Network Security
		CO3.To impart knowledge on design of state feedback controller using pole placement method.
102	Cryptography and Network Security	CO4.To familiarize with the concepts on state model representation of discrete-time systems and its stability testing methods.
		CO1.To familiarize with security concepts. CO2.To gain hands-on experience on cryptographic algorithms
103	Big Data Analytics	CO1. To introduce the architectural concepts of Hadoop and introducing map reduce paradigm.
		CO2. To disseminate knowledge on how to summarize, query, and analyze data with Hive..
		CO3.To familiarize with business decisions and create competitive advantage with Big Data analytics.
104	Machine Learning	CO1.To introduce the field of machine learning, in particular focusing on the core concepts of supervised learning.
		CO2. To familiarize with different types of learning algorithms.
105	Internet of Things	CO1. To introduce the fundamentals of Internet of Things
		CO2.To familiarize with the building of small low cost embedded system using Arduino / Raspberry Pi or equivalent boards
106	NoSQL Databases	CO1. To familiarize with various NoSQL Databases to handle structured, semistructured and unstructured data
107	Software Requirements Engineering and Estimation	CO1. To impart knowledge on good practices for requirements engineering, Requirements elicitation, elicitation techniques,
		CO2To familiarize knowledge on analysis models, Software quality attributes, software estimation, size estimation, Effort, Schedule and Cost Estimation.
108	Mobile Computing	CO1. To familiarize with the concepts of mobile computing paradigm, GSM, and various layers of mobile networks.
		CO2. To introduce the database issues, data delivery models, ad hoc networks platforms and protocols used in mobile environment.
109	Image Processing	CO1. To disseminate knowledge on various image processing techniques
110	Information Retrieval Systems	CO1. To introduce foundation knowledge in information retrieval.
		CO2. To familiarize about different applications of information retrieval techniques in the Internet or Web environment.
111	Optimization Techniques	CO1. To introduce how to formulate allocation problems as LPP, transportation problem and assign problems and locate solution.
		CO2. To familiarize with the concepts of queuing theory
		CO3. To impart knowledge on game theory concepts and to apply basic mathematical concepts to game Problems.
112	Disaster Management	CO1. To familiarize with disaster occurrence, strategies and remedial measures
113	Repair and Retrofitting Techniques	CO1. To familiarize with durability aspects, quality of concrete causes of deterioration.
		CO2. To impart the knowledge on inspection and assessment of distressed structures, strengthen measures and demolition procedures.
		CO3. To familiarize with various concrete materials for repairs, and various precautions during retrofitting.
		CO1. To familiarize with the concepts of evolutionary optimization

114	Modern Optimization Techniques	CO2.To introduce the principles of soft computing optimization algorithms such as Genetic Algorithm, Particle Swarm Optimization, Differential Evolution and Ant Colony Optimization.
115	Electrical Power Utilization	CO1. To familiarize with the mechanics of train movement. CO2.To impart knowledge on various heating methods and laws of illumination CO3. To familiarize with the concepts of refrigeration and air-conditioning.
116	Green Engineering	CO1. To impart the knowledge needed to minimize impacts of products, processes on environment for sustainable development.
117	Non Destructive Evaluation	CO1. To familiarize with the concepts of various NDE techniques to identify the defect in a mechanical elements.
118	Cyber Physical Systems	CO1. To prototype the Smart objects and provides a holistic understanding of development Platforms, connected products of Internet of things (IoTs). CO2.To familiarize with real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.
119	Signals and Systems	CO1. To familiarize with the basic concepts of signals and systems. CO2.To introduce various transform techniques on signals. CO3. To develop an understanding of sampling and correlation techniques on signals.
120	Digital Forensics	CO1. To provide a comprehensive overview of digital forensic process. CO2.To familiarize with the different roles a computer in crime investigation.
121	Business Intelligence and Decision Support Systems	CO1. To identify the process of decision making and use of model for decision making. CO2.To use various visualization tools for delivery of knowledge.
122	Adhoc and Sensor Networks	CO1. To acquire fundamental concepts of ad hoc networks. CO2.To learn design considerations of wireless sensor networks.
123	Information Retrieval Systems	CO1. To introduce foundation knowledge in information retrieval. CO2.To familiarize about different applications of information retrieval techniques in the Internet or Web environment.
124	Fuzzy Logic	CO1. To impart the knowledge of fuzzy set theory and its applications in Engineering
125	Big Data Analytics Lab	CO1. To demonstrate the basic concepts of Map Reduce, Hadoop and itsecosystem CO2.To introduce design and demonstration of Hadoop ecosystem components.
126	Cryptography and Network Security Lab	CO1. To familiarize with security concepts. CO2.To gain hands-on experience on cryptographic algorithms
127	Network Programming	CO1. To introduce the basics of network Technologies. CO2.To impart in-depth knowledge in socket creation and client-server communication in TCP and UDP. CO3. To familiarize the importance of remote login and inter-process communication.
128	Systems Software	CO1. To familiarize with the implementation details of assemblers, loaders, linkers, and macro processors.
129	Robotics	CO1. To familiarize with anatomy, kinematics, sensors and dynamics of a programmable machine, robot.
131	Web Mining	CO1. To impart machine learning techniques to mine the web and other information networks like social networks and social media. CO2.To introduce search, retrieval, classification and recommendation methods.
132	Cloud Computing	CO1. To provide the architectural concepts of Cloud computing CO2.To familiarize with cloud service models and cloud based applications.
133	Agile Software Development Process	CO1. To introduce the important concepts of Agile software development Process CO2.To emphasize the role of stand-up meetings in software collaboration. CO3. To impart the knowledge on values and principles in understanding agility
134	Blockchain Technologies	CO1. To introduce the fundamental concepts of Block Chain.
135	Distributed Systems	CO1. To familiarize with the concepts of distributed computing systems.
136	Social Networks	CO1. To familiarize with technological concepts of social networks. CO2.To provide a comprehensive overview of social network systems
137	Web Services	CO1. To introduce knowledge about various web services available and their architectures CO2.To impart WSDL tools, SOAP and UDDI architecture models in designing web service applications.
138	Deep Learning	CO1.To provide exposure to these advances and facilitate in depth discussions on deep learning.
IT		
S.No	Course Name	Course Outcomes

1	Functional English	CO1. speak with a reasonable degree of fluency using communication strategies as well as conventions of politeness and courtesy;
		CO 2.listen to short audio and video clips in both standard Indian accent and native English accent and gain both understanding of messages and sensitivity to native- speaker
		CO3. read fluently comprehending texts of different kinds;
		CO 4. write coherent paragraphs and technical reports; and
		CO5. guard against mistakes Indians typically make in their speech and writing in English
2	Linear Algebra & Integral Transforms	CO1: use the concepts of eigenvalues and eigenvectors in Engineering problems
		CO2:apply Laplace transforms to find the solutions of ordinary differential equations.
		CO3: find Fourier transforms and inverse transforms for a given function.
3	Applied Physics	CO1. explain construction and working of laser
		CO2. relate the principles of propagation of light in optical fibers for applications in communications.
		CO3. apply the wave nature of electrons to understand the basic concepts of quantum computing.
		CO4. identify conductivity mechanism in semiconductors
		CO5. derive orbital and spin contribution for magnetism
		CO6. determine types of polarization and classius-mossoti relation
4	Environmental Studies	CO1: understand the role of a citizen in protection of environment.
		CO2: analyze functional attributes of an ecosystem.
		CO3: enumerate the values of biodiversity.
		CO4: identify appropriate processes to control pollution.
		CO5: identify waste management practices
		CO6: understand various stages of Environmental Impact Assessment (EIA)
5	Problem Solving Through Computer Programming	CO1: outline problem solving steps, c-tokens and data types.
		CO2: design algorithm and flowchart for solving problem.
		CO3: use control statements for writing the programs.
		CO4: apply the concepts of arrays and strings in problem solving.
		CO5: use pointers and functions to develop C programs.
		CO6: distinguish structures and unions and develop programs using structures.
		CO7: demonstrate the operations on files.
6	Functional English Lab	CO1: give short impromptu speeches with confidence and fluency and take part in conversations in different functional contexts using English following appropriate communication strategies;
		CO2: check the pronunciation of words in a dictionary using their knowledge of phonemic symbols;
		CO3: speak English with adequate attention to stress, rhythm, and intonation
		CO4: speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English
7	PROFESSIONAL COMMUNICATION LAB - I	CO1: give short impromptu speeches with confidence and fluency and take part in conversations in different functional contexts using English following appropriate communication strategies.
		CO2: check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
		CO3: speak English with adequate attention to stress, rhythm, and intonation; and
		CO4: speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.
8	Applied Physics Lab	CO1: identify energy gap of a semiconductor.
		CO2: draw characteristic curves to estimate thermal coefficient of a thermistor
		CO3: observe self timer and tuning nature of passive components like RC,LCR
		CO4: verify magnetic field along the axis of a circular coil.
		CO5: determine frequency of AC and unknown tuning fork.
		CO6: calculate light gathering power of optical fiber
		CO7: estimate wavelength of unknown source
9	Computer Programming Lab	CO1: Identify discrete components of computers.
		CO2: Prepare applications using MS Office.
		CO3: Apply problem solving steps to solve a problem.
		CO4: Obtain the frequency response characteristics of CE, CC and FET CS amplifiers.

		CO5: Develop a C program for a given problem.
10	Professional Communication	CO1: speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation) CO2: listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speaker accents CO3: read fluently, comprehending texts of different kinds using multiple strategies and higher- order skills CO4: produce written discourses of different kinds; CO5: guard against grammatical errors Indians typically make in their speech and writing in English
11	Numerical Methods and Differential Equations	CO1: apply numerical techniques for solutions of Algebraic, transcendental and ordinary differential equations. CO2: find interpolating polynomial for the given data. CO3: apply the learnt techniques to solve first and second order differential equations in various engineering problems.. CO4: find the maximum and/or minimum points on a given surface.
12	Chemistry	CO 1: explain the synthesis, properties and applications of nano materials. CO 2: analyze the principles in working of LCD, sensors and bio sensors. CO 3: explain the preparation, properties and applications of polymers. CO 4: explain the characteristics of super conducting materials and non-elemental semiconductors. CO 5: analyze the working principles of batteries, fuel cells and solar cells. CO 6: explain the principles of green chemistry and suitable methods for synthesis of green products
13	Engineer and Society	CO1: comprehend different moral perspectives and one's own Ethical standards. CO2: understand the concept of safety and risk. CO3: explain different initiatives to protect nature. CO4: identify the role of Information Technology. CO5: understand different types of infringement of Intellectual Property Rights.. CO6: analyze the importance of Entrepreneurship.
14	Elements of Electronics Engineering	CO1: distinguish the behavior of PN junction diode under forward bias and reverse bias conditions. CO2: select appropriate semiconductor devices for different electronic circuits. CO3 analyze the rectifier circuits with and without filters. CO4: characterize the performance of BJT, FET, and MOSFETS
15	Python Programming	CO1: Demonstrate the basic elements of Python CO2: Implement programs using Python Control Structures. CO3: Design functions in Python to solve the problems. CO4: Apply strings, lists and tuples in developing Python programs CO5: Implement programs with the help of Dictionaries to solve the problems. CO6: Develop python programs by using files.
16	Professional Communication Lab	CO1: enhance the effectiveness of their communication through body language;. CO2:take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency. CO3: take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining and apologizing) with fluency CO4 speak professionally in telephone conversations CO5: make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language and good handling of question and answer session. CO6 : take part in group discussions and debates successfully. CO7: Answer questions at an elementary level in job interviews CO8:use team-building skills with impact in different situations.
	Elements of Electronics	CO1: Study and test different electronic components and understand the working of various electronic lab equipment

17	ELEMENTS OF ELECTRONICS Engineering Lab	CO2: Obtain the I-V characteristics of PN junction diode, Zener diode, BJT, FET.. CO3: Obtain the performance characteristics of Half wave and Full wave rectifiers without and with filters, Zener voltage regulator.
18	Discrete Mathematical Structures	CO1. apply the concept of Mathematical logic in software development process. CO 2.use the concept of Pigeonhole principle to derive the $\Omega(n \log n)$ lower bound. CO3. apply the concepts of graph theory in robotics, computer vision and computer graphics. CO 4. use the concepts of graph theory to provide solutions for routing applications in computer networks. CO5. apply the recurrence relation for analyzing recursive algorithms.
19	Data Structures	CO1: demonstrate the working process of sorting (bubble, insertion, selection and heap) and searching (linear and binary) methods using a programming language. CO2:design algorithms to create, search, insert, delete and traversal operations on linear and non- linear data structures. CO3: evaluate the arithmetic expressions using stacks. CO4: choose appropriate collision resolution techniques to resolve collisions. CO5: compare array and linked list representation of data structures.
20	Digital Logic Design	CO1. translate number given in one number system to another number system. CO2. apply complements to perform addition and subtraction of signed numbers. CO3. reduce Boolean function using Boolean laws, theorems and K-Maps. CO4. design combinational logic circuits such as adders, subtractors, decoders, encoders, Multiplexers and De-Multiplexers. CO5. prepare characteristic equation and excitation tables of SR, JK, T and D flip-flops. CO6. design counters and registers using flip-flops.
21	Object Oriented Programming Through Java	CO1: apply Object Oriented approach to design software. CO2: create user defined interfaces and packages for a given problem. CO3: develop code to handle exceptions. CO4: implement multi tasking with multi threading. CO5: develop Applets for web applications. CO6: design and develop GUI programs using AWT components.
22	UNIX And SHELL Programming	CO1: demonstrate the Architecture of Unix, features and its functions. CO2: classify the UNIX file system and work with file handling, process, disk, networking utilities. CO3: illustrate file management and directory handling system calls.. CO4: discriminate types of processes and able to create new process using system calls. CO5: choose appropriate signals to interrupt the system using system calls.. CO6: develop shell scripts for given applications
23	Data Structures Lab	CO1: demonstrate linear and binary search techniques to find an element in a given list of numbers. CO2: select an appropriate sorting technique to sort the given list of numbers. CO3: develop suitable code to simulate the operations on linked lists. CO4: determine the suitable ways to implement Stacks and Queues. CO5: choose appropriate data structure for evaluation of arithmetic expressions. CO6: demonstrate the operations on Binary Search Trees and Graphs. CO7: determine the use of hashing in implementing dictionaries.
24	Object Oriented Programming Lab	CO1: use inheritance to extend the functionality of classes. CO2: prepare code that exhibits polymorphism. CO3: examine multi tasking with multi threading. CO4: create packages for reusability. CO5: create an effective GUI using AWT components.. CO6: implement event handling.
25	Probability And Statistics	CO1. use the concepts of probability in different real time problems. CO 2.apply probability distribution in appropriate scenario. CO3. find confidence intervals for estimating population parameters. CO 4. apply a range of statistical tests appropriately. CO5. measure correlation between variables and obtain lines of regression.
	Microprocessors And	CO1: Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.

26	Microprocessors And Microcontrollers	CO2: identify a detailed S/W & H/W structure of the Microprocessor & Microcontroller. CO3: Interface I/O devices to 8086 using Intel 8255. CO4: distinguish between Microprocessors and Microcontrollers.
27	Formal Languages And Automata Theory	CO1. compare the automata based on their recognizing power. CO 2. design finite automata for regular languages. . CO3. reduce DFA by applying minimization algorithm. CO 4. write regular expressions for regular languages or for DFA by applying Arden's theorem. CO5. generate grammar for CFL. . CO6. use algorithm to simplify grammar. CO 7. design PDA for context free languages. . CO8. design Turing Machine for the phrase-structured languages.
28	Computer Organization And Architecture	CO1: identify different types of instructions. CO2: differentiate micro-programmed and hard-wired control units. CO3: analyze the performance of the hierarchical organization of memory. CO4: demonstrate various operations on fixed and floating point numbers. CO5: summarize different data transfer techniques. CO6: demonstrate the use of parallel processing.
29	Database Management Systems	CO1. recognize the importance of database system over file processing system. CO 2. analyze an information storage problem and derive an information model in the form of an entity relationship diagram.. CO3. write simple and complex queries using Structured Query Language (SQL) for storage, retrieval and manipulation of data in a relational database. CO 4. employ principles of normalization for designing a good relational database schema. CO5. describe the issues and techniques relating to concurrency and database recovery in a
30	Systems Software Elective-1) (Open	CO1: outline the relationship between system software and machine architecture. CO2: analyze working of assembler for a simplified Instructional computer. CO3: describe the important features of linkage Editors and Dynamic Linking. CO4: identify the mostly used macro processors algorithms and data structures. CO5: compare the functions of Absolute Loader, Bootstrap Loaders.
31	Database Management Systems Lab	CO1: create relational database with constraints.. CO2: formulate simple and complex queries using features of Structured Query Language (SQL) for storage, retrieval and manipulation of data in a relational database. CO3: create views on relational database based on the requirements of users. CO4: implement PL/SQL programs for processing multiple SQL statements. CO5: implement triggers on a relational database
32	Software Engineering	CO1. explain the basic concepts of Software Engineering. CO 2. select the suitable process model based on the client requirements. CO3. calculate software proficiency in terms of cost and schedule. CO 4. list the specifications of end-user according to business needs CO5. choose the appropriate architectural style for a given Scenario. CO 6. infer the system model for a sample case study. CO7. deduce test cases by following different testing methodologies.
33	Compiler Design	CO1: list out compilation process steps of a language. CO2: use regular languages to identify the tokens of a programming language. CO3: design a parser to verify the syntax of a programming language. CO4: compare top down parser with bottom up parser CO5: create symbol table to access identifier information CO6: apply code optimization techniques to enhance the efficiency of the intermediate code. CO7: write a program for the execution of DAG to generate the code.
34	Operating Systems	CO1. describe the role, functions and structures of operating systems. CO 2. evaluate the performance of CPU scheduling algorithms by calculating average waiting time and turnaround time. CO3. compare and contrast memory management schemes for efficient utilization of memory. CO 4. apply deadlock prevention, avoidance and recovery techniques to keep the system in safe state.

		CO5. determine seek time of disk scheduling algorithms.
		CO6. develop software or hardware based solutions for critical section problems.
		CO 7. analyze files and directory structures and implementations.
35	Web Technologies	CO1: identify various HTML tags and their purpose
		CO2:develop dynamic web pages using HTML, CSS and Javascript
		CO3: use XML to store and transport data
		CO4: design web applications using JSP and PHP.
		CO5: connect to heterogeneous databases using JSP as well as PHP
36	Artificial Intelligence (Professional elective-1)	CO1. identify the problems that are amenable and can be solved by using AI techniques..
		CO 2.analyse the problem solving and game playing techniques.
		CO3. specify the classical Artificial Intelligence algorithms, which are used to solve the heuristic search and game playing problems.
		CO 4. apply the basic principles and algorithms of Artificial Intelligence to recognize, model and solve the state space search, knowledge representation and reasoning problems.
		CO5. formulate the Reasoning model and state the conclusion for the uncertainty problems using actions and their effects over the time.
		CO6. describe expert systems and their applications.
37	Advanced Data Structures (Professional elective-1)	CO1: illustrate representations of sets and operations on sets and dictionaries.
		CO2: construct Priority queues such as min heap and max heap for the given data.
		CO3: create AVL, Red Black, Splay, B and B+ Trees for the given data and perform insertion, deletion and search operations on them.
		CO4: search for a pattern in the given text using Pattern Matching Techniques.
		CO5: demonstrate insertion and search operations on tries and also list its applications.
38	Open Source Software (Open elective-II)	CO1. state the need and applications of open source software.
		CO2: compare and Contrast between Open source and commercial software
		CO3: demonstrate LINUX operating systems concepts.
		CO4: create database in MYSQL and perform operations on it.
		CO5: design and develop a web application using PHP.
39	Cyber Laws (Open Elective-II)	CO1. outline the pros and cons of Internet.
		CO 2. operate on confidential data in a pre-cautious manner.
		CO3. discuss Criminal Justice in India and its Implications.
		CO 4. interpret the Cyber Consumers under the consumer Protection Act.
		CO 5. devise the legal framework for Confidential Information.
		CO 6. determine the e-commerce issues for copyright protection and defend personal data from being hacked.
40	Operating Systems And Compiler Design Lab	CO1. implement CPU and disk scheduling algorithms.
		CO2: develop code for memory management techniques.
		CO3: design code to implement Bankers algorithm to avoid dead locks.
		CO4: implement lexical analyzer and syntax analyzer.
41	Web Technologies Lab	CO1. design dynamic web pages using HTML, CSS and JavaScript.
		CO2: access and Validate form data using JavaScript and PHP.
		CO3: connect to database using JSP and JDBC and perform various operations.
		CO4: connect to MySQL using PHP and perform various operations.
42	Design And Analysis Of Algorithms	CO1. analyze the performance of algorithms by calculating time and space complexity.
		CO 2.design algorithms for binary search, quick sort and merge sort by applying divide and conquer technique.
		CO3. apply Greedy technique to find solution for knapsack, job sequencing, single source shortest path and minimum cost spanning trees.
		CO 4. design algorithm to find optimal solution to matrix chain multiplication, 0/1 knapsack, all pairs shortest paths and travelling salesperson problems using dynamic programming
		CO5. construct state space tree to find all possible solutions to various problems using back tracking and branch and bound techniques.
		CO1: outline different types of databases used in data mining.
		CO2:apply pre-processing methods on raw data to make it ready for mining.
		CO3: illustrate the major concepts and operations of multi dimensional data models.

43	Data Warehousing And Data Mining	<p>CO4: analyze the performance of association rules mining algorithms for finding frequent item sets from the large databases.</p> <p>CO5: simplify the data classification procedure by selecting appropriate classification methods / algorithms.</p> <p>CO6: classify various clustering methods and algorithms on data sets to create appropriate clusters.</p>
44	Object Oriented Analysis And Design	<p>CO1. recognize the need for object oriented modeling for system development.</p> <p>CO 2.apply structural and behavioral modeling techniques in designing library management system.</p> <p>CO3. implement Advanced structural and Behavioral Modeling for different real world issues like Passport automation systems.</p> <p>CO 4. construct software and hardware architecture models for designing library management system and Passport automation systems.</p> <p>CO5. design an object oriented software system, using structural and behavioral models based on the requirements of the user.</p>
45	Computer Networks	<p>CO1: compare protocol models (OSI, TCP/IP) and select suitable protocol for network design.</p> <p>CO2: design a network by deciding relevant multiplexing and switching technique to improve performance of the network.</p> <p>CO3: apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network.</p> <p>CO4: specify and identify deficiencies in MAC sublayer protocols.</p> <p>CO5: apply routing and congestion control algorithms to deliver data packets across the networks.</p> <p>CO6: use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet.</p>
46	Soft Computing Techniques (Professional Elective-II)	<p>CO1. outline soft computing techniques and its applications. .</p> <p>CO 2. classify the architecture of Artificial neural networks and learning techniques.</p> <p>CO3. interpret the working of Back propagation networks, back propagation algorithm and associative memory.</p> <p>CO 4. differentiate fuzzy sets and crisp sets operations.</p> <p>CO5. apply if-then rules on fuzzy sets and perform Fuzzifications & Defuzzifications.</p> <p>CO6. generalize the working principle, representations of genetic algorithm and its applications.</p>
47	Real Time Systems (Professional Elective-II)	<p>CO1: make use of hard and soft real time systems.</p> <p>CO2: evaluate Clock driven scheduling, weighted round-robin, priority driven approaches in real time systems.</p> <p>CO3: compare rate monotonic and deadline monotonic algorithms.</p> <p>CO4: analyze multi task scheduling algorithms for periodic, aperiodic and sporadic tasks. .</p> <p>CO5: demonstrate temporal distance and DCM.</p> <p>CO6: outline real time communications architecture.</p>
48	Image Processing (Professional Elective-II)	<p>CO1. use appropriate image enhancement technique to improve the quality of an image.</p> <p>CO 2. apply suitable image segmentation technique for an application.</p> <p>CO3. analyze various image compression techniques.</p> <p>CO 4. apply morphological operations to modify the structure of an image.</p>
49	Agile Software Development Process (Professional Elective-II)	<p>CO1: outline Pair Programming for solving software problems</p> <p>CO2: write Reports of Software Collaboration.</p> <p>CO3: prepare less or zero bug software for sample scenario.</p> <p>CO4: reduce the amount of slack in the software.</p> <p>CO5: develop methodologies for estimating performance stories.</p> <p>CO6: justify the waste elimination process in Software in mastering Agility.</p>
50	Scripting Languages (Open elective-III)	<p>CO1: use jQuery with DOM to manipulate HTML elements, attributes and CSS.</p> <p>CO2: store and exchange data between server and browser using JSON.</p> <p>CO3: develop PERL scripts using arrays, hashes, control structures and subroutines.</p> <p>CO4. write Ruby scripts using data types, arrays, hashes, control structures and classes.</p> <p>CO5: retrieve data from a database using PHP and AJAX.</p>
		CO1: analyze the different software projects.

51	Software Project Management (Open Elective-II)	CO2: prepare project plans that address real time management challenges. CO3: relate important risks facing a new project. CO4. design effective software development model to meet organizational needs. CO5: recognize appropriate methodology to develop a project schedule. CO6: apply appropriate techniques to assess ongoing project performance.
52	Software Project Management (Open Elective-III)	CO1: demonstrate data link layer framing methods. CO2: calculate best route by using distance vector routing algorithm. CO3: develop client/server communications using socket API. CO4: illustrate error detection method by using CRC. CO5: evaluate the performance of classification, association and clustering algorithms on different Data sets.
53	Managerial Economics And Financial Analysis	CO1. evaluate the economic concepts and apply them in various changing situations in industry. CO 2.predict the demand for a product of a company and analyze various factors influencing demand elasticity. CO3. apply various aspects of production and cost analysis in business decision making. CO 4. gain knowledge on various forms of business organizations and their establishment. CO5. propose various pricing strategies for different products or services. CO 6. apply the accounting rules in determining the financial results and prepare financial statements. CO7. evaluate various investment opportunities in business.
54	Big Data Analytics	CO1: summarize the importance of Big Data and its problems (storage and analysis). CO2: outline the building blocks of hadoop and anatomy of file read and write. CO3: analyze data with hadoop MapReduce. CO4: generalize how MapReduce works when running a job. CO5: choose best programming tools for solving real world and industrial problems.
55	Machine Learning And Pattern Recognition (Professional Elective-III)	CO1. describe basic concepts of machine learning. CO 2.apply Find-S and Candidate-elimination algorithms to solve problems of moderate complexity. CO3. calculate posterior probabilities using Bayes theorem. CO 4. differentiate lazy and eager learning algorithms along with their strengths and weaknesses. CO5. recognize patterns using HMM and SVM.
56	Distributed Operating Systems (Professional Elective-III)	CO1: describe important characteristics, architectural features of distributed systems. CO2: identify various ways of Inter process Communications and synchronization using different algorithms. CO3: estimate the performance of various deadlock algorithms to achieve synchronization between the participating nodes of distributed system. CO4: analyze processes and processors and their scheduling policies to avoid deadlock and synchronization problems. CO5: classify different file system of distributed environment in storing and retrieving data efficiently using various file usage methods. CO6: distinguish multiprocessor, page based, shared-variable distributed shared memory.
57	Human Computer Interaction (Professional Elective-III)	CO1: explain human and computer components functions regarding interaction with computer. CO2: illustrate the interaction between human and computer components. CO3: apply the screen design guidelines in creating User Interface. CO4: develop effective GUI using appropriate controls for windows based applications. CO5: choose appropriate widgets, components and tools for effective design of User Interface
58	Software Testing Methodologies (Professional Elective-III)	CO1: formulate problem by following software testing life cycle. CO2: design test cases for testing software project using black box testing techniques. CO3: apply path testing on a given program and uncover bugs present in the program. CO4: compare verification and validation in the context of software testing. CO5: describe regression testing and software quality assurance. CO6: demonstrate the use software testing tools for testing projects.
		CO1: understand the concepts of Business Intelligence, technologies and organizations for developing solutions to organizations.

59	Business Intelligence (Professional Elective-IV)	CO2: acquire knowledge about different types of capabilities for the presentation of information. CO3: demonstrate the design of Data warehouses and enterprise architecture for data mining applications. CO4: apply data mining models to business analytics problems to identify the impact of BI on corporate business performance. CO5: employ data mining tools and techniques for customization and standardization in decision support systems. CO6: describe the characteristics and steps of good business intelligence solutions for decision making system
60	Mobile Computing (Professional Elective-IV)	CO1: explain mobile computing paradigm, GSM, and layers of mobile networks. CO2: outline the mobile IP and Dynamic Host Configuration Protocol in network layer. CO3: describe the different TCP's and transmission mechanisms in transport layer. CO4: illustrate Data Dissemination and Synchronization models for applications. CO5: synthesize MANET applications and routing algorithms with security mechanisms. CO6: summarize the layers and functionalities in wireless application protocol and Bluetooth. .
61	Multimedia Tools (Professional Elective-IV)	CO1: outline Multimedia and list its applications. CO2: categorize the usage of color palettes in multimedia. CO3: generalize the principles of Animation and expand various video formats. CO4: demonstrate the four primary stages in a multimedia projects. CO5: collect various Multimedia Authoring tools. CO6: discuss various multimedia tools for Internet and WWW.
62	Cryptography And Network Security (Professional Elective-Iv)	CO1: describe security attacks and services over networks.. CO2:differentiate symmetric and asymmetric encryption techniques. CO3: apply integrity checking and authentication techniques. CO4: compare E-mail security and IP level security. CO5: use firewalls and intrusion detection techniques for system security. CO6: outline web security threats and counter measures.
63	Adhoc And Sensor Networks (Open Elective-Iv)	CO1: evaluate architecture and protocols in adhoc and wireless sensor networks. CO2: identify applications of adhoc and WSN's. CO3: illustrate wireless sensor networks design aspects. CO4: synthesize routing protocols for adhoc wireless networks. CO5: outline Transport layer and security protocols for Ad hoc wireless networks. CO6: summarize layer wise functionalities of wireless sensor networks. CO7: describe MAC protocols in adhoc and WSN's.
64	Information Retrieval Systems (Open Elective-Iv)	CO1: identify basic theories in information retrieval systems. CO2: identify the analysis tools as they apply to information retrieval systems. CO3: understand the problems solved in current IR systems. CO4: describes the advantages of current IR systems. CO5: understand the difficulty of representing and retrieving documents. CO6: understand the latest technologies for linking, describing and searching the web.
65	Big Data Analytics Lab	CO1: choose suitable LINUX commands to work in Hadoop environment. CO2: use HDFS file structure and MapReduce framework to solve complex problems. CO3: analyze data using Pig and Hive.
66	Steganography And Biometrics (Professional Elective-V)	CO1. outline the basic terminology of steganography. CO 2. interpret different scenarios related to steganalysis. CO3. distinguish between Biometric verification and identification. CO 4. apply Finger Scan and Facial Scan Technologies to provide person identification in logical access environment. CO5. compare and contrast physiological biometrics with behavioral biometrics in terms of their accuracy.
67	Parallel Computing (Professional Elective-V)	CO1: outline the fundamentals of Parallel computing. CO2: demonstrate Flynn's taxonomy. CO3: classify Different Structures of Parallel Computers. CO4: identify the methodologies for the development of parallel processing applications using CUDA.

		CO5: determine the important features of Graphical Processing Unit in application development.
		CO6: design and develop programs using CUDA Development Tool kit.
68	Virtual And Augmented Reality (Professional Elective-V)	CO1. identify basic elements of virtual Reality CO 2.describe various input and output devices required for VR experience CO3. classify human factors that affect VR experience. CO 4. distinguish augmented reality from virtual reality CO5. determine the object position and orientation in virtual space.
69	E-Commerce (Professional Elective-V)	CO1: outline the fundamentals in E-Commerce with respect to consumer and organization oriented applications CO2:compare Mercantile process models in context to consumer and merchant perspectives CO3: illustrate smart cards, credit/debit cards, Digital token based systems CO4: analyze the EDI problems and performance of VAN in inter-organizational commerce CO5: classify the procedures of work flow automation and SCM to improve intraorganizational commerce CO6: distinguish digital documents from document library for development of Ecommerce through online marketing process
70	Internet Of Things (Professional Elective-VI)	CO1: outline the basic concepts of Internet of Things. CO2:analyze the requirements and specifications to design home automation applications. CO3: develop smart city applications using ArduinoIoT kit. CO4: design agricultural applications using Raspberry pi IoT kit. CO5: use the tools such as AutoBahn, Xively Cloud communication API's to exchange data between cloud and IoT kit. CO6: analyze Home Automation, Agriculture, Smart City applications.
71	Cloud Computing (Professional Elective-VI)	CO1: differentiate the stages in historical evolution of cloud computing. CO2: use suitable cloud services to define cloud for the enterprise. CO3: demonstrate hardware level and OS level virtualization to implement virtual machines.. CO4: design machine images, web applications and databases for virtual machines. CO5: apply data, network and host security for the cloud.
72	Block chain Technologies (Professional Elective-VI)	CO1: outline fundamentals of Block chain. CO2: analyze the working of Block Chain. CO3: describe propelling business with block chains. CO4: illustrate Hyperledger and Linux Foundation Project, use cases. CO5: summarize challenges of Block chain
73	Design Patterns (Professional Elective-VI)	CO1: demonstrate how Design Patterns Solve Design Problems. CO2: design a Document Editor using Design Patterns. CO3: use Creational Patterns for object creation mechanism. CO4: demonstrate how Structural Design Patterns use to ease the design by identifying a simple way to realize relationships between entities. CO5: implement behavioral design patterns in carrying out communication between objects.