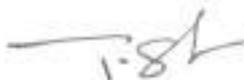


COURSE STRUCTURE AND SYLLABUS

For UG –R23 B. TECH
COURSE STRUCTURE

MECHANICAL ENGINEERING

I Year – I SEMESTER			
S. No	Course Code	Courses	Course outcomes
1	BS&H	Engineering Physics	<ul style="list-style-type: none"> Analyze the intensity variation of light due to polarization, interference and diffraction. Familiarize with the basics of crystals and their structures. Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles. Summarize various types of polarization of dielectrics and classify the magnetic materials. Explain the basic concepts of Quantum Mechanics and the band theory of solids. CO6: Identify the type of semiconductor using Hall effect
2	BS&H	Linear Algebra & Calculus	<ul style="list-style-type: none"> Develop and use of matrix algebra techniques that are needed by engineers for practical applications. Utilize mean value theorems to real life problems. Familiarize with functions of several variables which is useful in optimization. Learn important tools of calculus in higher dimensions. Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.
3	Engineering Science	Basic Electrical & Electronics Engineering	<ul style="list-style-type: none"> Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2) Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2) Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3) Calculate electrical load and electricity bill of residential and commercial buildings
4	Engineering Science	Engineering Graphics	<ul style="list-style-type: none"> Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. Understand and draw projection of solids in various positions in first quadrant. Explain principles behind development of surfaces. <p>Prepare isometric and perspective sections of simple solids.</p>


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5	Engineering Science	Introduction to Programming	<ul style="list-style-type: none"> • Understand basics of computers, the concept of algorithm and algorithmic thinking. • Analyse a problem and develop an algorithm to solve it. • Implement various algorithms using the C programming language. • Understand more advanced features of C language. • Develop problem-solving skills and the ability to debug and optimize the code.
6	Engineering Science	IT Workshop	<ul style="list-style-type: none"> • Perform Hardware troubleshooting. • Understand Hardware components and inter dependencies. • Safeguard computer systems from viruses/worms. • Document/ Presentation preparation. • Perform calculations using spreadsheets
7	BS&H	Engineering Physics Lab	<ul style="list-style-type: none"> • Operate optical instruments like travelling microscope and spectrometer. • Estimate the wavelengths of different colours using diffraction grating. • Plot the intensity of the magnetic field of circular coil carrying current with distance. • Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively. • Calculate the band gap of a given semiconductor. • Identify the type of semiconductor using Hall effect
8	Engineering Science	Electrical & Electronics Engineering Workshop	<ul style="list-style-type: none"> • Measure voltage, current and power in an electrical circuit. (L3) • Measure of Resistance using Wheat stone bridge (L4) • Discover critical field resistance and critical speed of DC shunt generators. (L4) • Investigate the effect of reactive power and power factor in electrical loads. (L5)
9	Engineering Science	Computer Programming Lab	<ul style="list-style-type: none"> • Read, understand, and trace the execution of programs written in C language. • Select the right control structure for solving the problem. • Develop C programs which utilize memory efficiently using programming constructs like pointers. • Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	<ul style="list-style-type: none"> • Understand the importance of discipline, character and service motto. • Solve some societal issues by applying acquired knowledge, facts, and techniques. • Explore human relationships by analyzing social problems. • Determine to extend their help for the fellow beings and downtrodden people. • Develop leadership skills and civic responsibilities.

I Year – II SEMESTER			
S. No	Course Code	Courses	Course outcomes
1	BS&H	Communicative English	<ul style="list-style-type: none"> Understand the context, topic, and pieces of specific information from social or Transactional dialogues. Apply grammatical structures to formulate sentences and correct word forms. Analyze discourse markers to speak clearly on a specific topic in informal discussions. Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. Create a coherent paragraph, essay, and resume.
2	BS&H	Engineering Chemistry Chemistry Fundamental Chemistry	<ul style="list-style-type: none"> Demonstrate the corrosion prevention methods and factors affecting corrosion. Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers. Explain calorific values, octane number, refining of petroleum and cracking of oils. Explain the setting and hardening of cement. Summarize the concepts of colloids, micelle and nanomaterial temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
3	Engineering Science	Differential Equations & Vector Calculus	<ul style="list-style-type: none"> Solve the differential equations related to various engineering fields. Identify solution methods for partial differential equations that model physical processes. Interpret the physical meaning of different operators such as gradient, curl and divergence. Estimate the work done against a field, circulation and flux using vector calculus.
4	Engineering Science	Basic Civil & Mechanical Engineering	<ul style="list-style-type: none"> Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation. Understand the importance of Water Storage and Conveyance Structures so that the social

			<p>responsibilities of water conservation will be appreciated.</p> <ul style="list-style-type: none"> Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
5	Professional Core	Engineering Mechanics/Network Analysis/ Data structures (Branch specific)	<ul style="list-style-type: none"> Explain the role of linear data structures in organizing and accessing data efficiently in algorithms. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges. Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.
6	BS&H	Communicative English Lab	<ul style="list-style-type: none"> Understand the different aspects of the English language proficiency with emphasis on LSRW skills. Apply communication skills through various language learning activities. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. Evaluate and exhibit professionalism in participating in debates and group discussions. <p>CO5: Create effective Course Objectives:</p>
7	BS&H	Engineering Chemistry Chemistry Fundamental Chemistry Lab	<ul style="list-style-type: none"> Determine the cell constant and conductance of solutions. Prepare advanced polymer materials. Measure the strength of an acid present in secondary batteries. Analyze the IR spectra of some organic compounds. Compare conductometric and pH metric titrations.
8	Engineering Science	Engineering Workshop	<ul style="list-style-type: none"> Identify workshop tools and their operational capabilities. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. Apply fitting operations in various applications.

			<ul style="list-style-type: none"> Apply basic electrical engineering knowledge for House Wiring Practice
9	Professional Core	Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab/Network Analysis Lab/ Data structures Lab	<ul style="list-style-type: none"> Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. Determine the Centre of gravity and Moment of Inertia of different configurations. Verify the equilibrium conditions of a rigid body under the action of different force systems.
10		Health and wellness, Yoga and Sports	<ul style="list-style-type: none"> Understand the importance of yoga and sports for Physical fitness and sound health. Demonstrate an understanding of health-related fitness components. Compare and contrast various activities that help enhance their health. Assess current personal fitness levels. Develop Positive Personality


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II Year – I SEMESTER

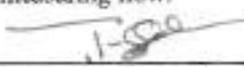
S. No	Course Code	Courses	Course outcomes
1	BS	Numerical Methods and Transform Techniques	<ul style="list-style-type: none"> Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3) Apply the Laplace transform for solving differential equations (L3) Find or compute the Fourier series of periodic signals (L3) Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
2	HSMC	Universal Human Values– Understanding Harmony & Ethical Human Conduct	<ul style="list-style-type: none"> Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2) Identify one's self, and one's surroundings (family, society nature) (L1, L2) Apply what they have learnt to their own self in different day-to-day settings in real life (L3) Relate human values with human relationship and human society. (L4) Justify the need for universal human values and harmonious existence (L5) Develop as socially and ecologically responsible engineers (L3, L6)
3	Engineering Science	Thermodynamics	<ul style="list-style-type: none"> Explain the importance of thermodynamic properties related to conversion of heat energy into work. Apply the Zeroth and First Law of Thermodynamics. Understand Second Law of Thermodynamics. Analyze the Mollier charts, T-S and h-s diagrams, Steam calorimetry, Phase Transformations Evaluate the COP of refrigerating systems and properties, processes of psychrometry and sensible and latent heat loads.
4	Professional Core	Mechanics of Solids	<ul style="list-style-type: none"> Learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components Analyse beams and draw correct and complete shear and bending moment diagrams for beams

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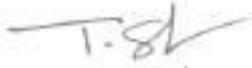
			<ul style="list-style-type: none"> • Apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, and moments. • Model & Analyze the behavior of basic structural members subjected to various loads • Design and analysis of industrial components like pressure vessels.
5	Professional Core	Material Science and Metallurgy	<ul style="list-style-type: none"> • Understand the crystalline structure of different metals and study the stability of phases in different alloy systems. • Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains. • Understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals. • Grasp the methods of making of metal powders and applications of powder metallurgy. • Comprehend the properties and applications of ceramic, composites and other advanced methods.
6	Professional Core	Mechanics of Solids and Materials Science Lab	<ul style="list-style-type: none"> • Understand the stress strain behavior of different materials. • Evaluate the hardness of different materials. • Explain the relation between elastic constants and hardness of materials. • Identify various microstructures of steels and cast irons. • Evaluate hardness of treated and untreated steels.
7	Professional Core	Computer-aided Machine Drawing	<ul style="list-style-type: none"> • Demonstrate the conventional representations of materials and machine components. • Model riveted, welded and key joints using CAD system. • Create solid models and sectional views of machine components. • Generate solid models of machine parts and assemble them. • Translate 3D assemblies into 2D drawings.
8	Engineering Science	Python programming Lab	
9	Skill Enhancement Course	Embedded Systems and IoT	<ul style="list-style-type: none"> • Comprehend Microcontroller-Transducers Interface techniques. • Establish Serial Communication link with Arduino • Analyse basics of SPI interface. • Understand the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor. • Realize the revolution of internet in mobile devices, cloud and sensor networks
10	Audit Course	Environmental Science	<ul style="list-style-type: none"> • Asp multi disciplinary nature of environmental studies and various renewable and non-renewable resources. • Understand flow and bio-geo- chemical cycles and ecological pyramids. • Understand various causes of pollution and solid waste management and related preventive measures. • Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation. • Illustrate the causes of population explosion, value education and welfare programmes.


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II Year – II SEMESTER			
S. No	Course Code	Courses	Course outcomes
1	Management Course-I	Industrial Management	<ul style="list-style-type: none"> Learn about how to design the optimal layout Demonstrate work study methods Explain Quality Control techniques Discuss the financial management aspects and Understand the human resource management methods.
2	Basic Science	Complex Variables, Probability and Statistics	<ul style="list-style-type: none"> Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic Make use of the Cauchy residue theorem to evaluate certain integrals Infer the statistical inferential methods based on small and large sampling tests Find the differentiation and integration of complex functions used in engineering problems Design the components of a classical hypothesis test
3	Professional Core	Manufacturing processes	<ul style="list-style-type: none"> Design the patterns and core boxes for metal casting processes Understand the different welding processes Demonstrate the different types of bulk forming processes Understand sheet metal forming processes Learn about the different types of additive manufacturing processes
4	Professional Core	Fluid Mechanics & Hydraulic Machines	<ul style="list-style-type: none"> Understand the basic concepts of fluid properties. Estimate the mechanics of fluids in static and dynamic conditions. Apply the Boundary layer theory, flow separation and dimensional analysis. Estimate the hydro dynamic forces of jet on vanes in different positions. Understand the working Principles and performance evaluation of hydraulic pump and turbines.
5	Professional Core	Theory of Machines	<ul style="list-style-type: none"> Understand different mechanisms and their inversions. Calculate velocity and acceleration of different links in a mechanism Apply the effects of gyroscopic couple in ships, aero planes and road vehicles. Evaluate unbalance mass in rotating machines. Analyze free and forced vibrations of single degree freedom systems.
6	Professional Core	Fluid Mechanics & Hydraulic Machines Lab	<ul style="list-style-type: none"> Demonstrate the devices used for measuring flow. Compute major losses in pipes. Illustrate the operating parameters of turbines. Explain the working of different types of pumps. Explain the devices used for measuring flow.


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7	Professional Core	Manufacturing processes Lab	<ul style="list-style-type: none"> • Make moulds for sand casting. • Fabricate different types of components using various manufacturing techniques. • Adapt unconventional manufacturing methods. • Develop Different Weld joints. • Explain different types of 3d Printing techniques.
8	Skill Enhancement course	Soft Skills	<ul style="list-style-type: none"> • Assimilate and understood the meaning and importance of soft skills and learn how to develop them. • Understand the significance of soft skills in the working environment for professional excellence. • Prepare to undergo the placement process with confidence and clarity. • Ready to face any situation in life and equip themselves to handle them effectively. • Understand and learn the importance of etiquette in both professional and personal life
9	Engineering Science	Design Thinking & Innovation	<ul style="list-style-type: none"> • Define the concepts related to design thinking. • Explain the fundamentals of Design Thinking and innovation. • Apply the design thinking techniques for solving problems in various sectors. • Analyse to work in a multidisciplinary environment. • Evaluate the value of creativity.


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ECE – ELECTRONICS AND COMMUNICATION ENGINEERING

I Year – I SEMESTER			
S. No	Course Code	Courses	Course outcomes
1	BS	Engineering Physics	<ul style="list-style-type: none"> Analyze the intensity variation of light due to polarization, interference and diffraction. Familiarize with the basics of crystals and their structures. Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles. Summarize various types of polarization of dielectrics and classify the magnetic materials. Explain the basic concepts of Quantum Mechanics and the band theory of solids. CO6: Identify the type of semiconductor using Hall effect
2	BS&H	Linear Algebra & Calculus	<ul style="list-style-type: none"> Develop and use of matrix algebra techniques that are needed by engineers for practical applications. Utilize mean value theorems to real life problems. Familiarize with functions of several variables which is useful in optimization. Learn important tools of calculus in higher dimensions. Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.
3	Engineering Science	Basic Electrical & Electronics Engineering	<ul style="list-style-type: none"> Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2) Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2) Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3) Calculate electrical load and electricity bill of residential and commercial buildings
4	Engineering Science	Engineering Graphics	<ul style="list-style-type: none"> Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. Understand and draw projection of solids in various positions in first quadrant. Explain principles behind development of surfaces. Prepare isometric and perspective sections of simple solids.

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5	Engineering Science	Introduction to Programming	<ul style="list-style-type: none"> • Understand basics of computers, the concept of algorithm and algorithmic thinking. • Analyse a problem and develop an algorithm to solve it. • Implement various algorithms using the C programming language. • Understand more advanced features of C language. • Develop problem-solving skills and the ability to debug and optimize the code.
6	Engineering Science	IT Workshop	<ul style="list-style-type: none"> • Perform Hardware troubleshooting. • Understand Hardware components and inter dependencies. • Safeguard computer systems from viruses/worms. • Document/ Presentation preparation. • Perform calculations using spreadsheets
7	BS&H	Engineering Physics Lab	<ul style="list-style-type: none"> • Operate optical instruments like travelling microscope and spectrometer. • Estimate the wavelengths of different colours using diffraction grating. • Plot the intensity of the magnetic field of circular coil carrying current with distance. • Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively. • Calculate the band gap of a given semiconductor. • Identify the type of semiconductor using Hall effect
8	Engineering Science	Electrical & Electronics Engineering Workshop	<ul style="list-style-type: none"> • Measure voltage, current and power in an electrical circuit. (L3) • Measure of Resistance using Wheat stone bridge (L4) • Discover critical field resistance and critical speed of DC shunt generators. (L4) • Investigate the effect of reactive power and power factor in electrical loads. (L5)
9	Engineering Science	Computer Programming Lab	<ul style="list-style-type: none"> • Read, understand, and trace the execution of programs written in C language. • Select the right control structure for solving the problem. • Develop C programs which utilize memory efficiently using programming constructs like pointers. • Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	<ul style="list-style-type: none"> • Understand the importance of discipline, character and service motto. • Solve some societal issues by applying acquired knowledge, facts, and techniques. • Explore human relationships by analyzing social problems. • Determine to extend their help for the fellow beings and downtrodden people. • Develop leadership skills and civic responsibilities.

I Year – II SEMESTER			
S. No	Course Code	Courses	Course outcomes
1	BS&H	Communicative English	<ul style="list-style-type: none"> Understand the context, topic, and pieces of specific information from social or Transactional dialogues. Apply grammatical structures to formulate sentences and correct word forms. Analyze discourse markers to speak clearly on a specific topic in informal discussions. Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. Create a coherent paragraph, essay, and resume.
2	BS&H	Engineering Chemistry / Chemistry / Fundamental Chemistry	<ul style="list-style-type: none"> Demonstrate the corrosion prevention methods and factors affecting corrosion. Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers. Explain calorific values, octane number, refining of petroleum and cracking of oils. Explain the setting and hardening of cement. Summarize the concepts of colloids, micelle and nanomaterial temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
3	Engineering Science	Differential Equations & Vector Calculus	<ul style="list-style-type: none"> Solve the differential equations related to various engineering fields. Identify solution methods for partial differential equations that model physical processes. Interpret the physical meaning of different operators such as gradient, curl and divergence. Estimate the work done against a field, circulation and flux using vector calculus.
4	Engineering Science	Basic Civil & Mechanical Engineering	<ul style="list-style-type: none"> Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation. Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be

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			<p>appreciated.</p> <ul style="list-style-type: none"> Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
5	Professional Core	Engineering Mechanics/Network Analysis/Data structures (Branch specific)	<ul style="list-style-type: none"> Explain the role of linear data structures in organizing and accessing data efficiently in algorithms. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges. Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.
6	BS&H	Communicative English Lab	<ul style="list-style-type: none"> Understand the different aspects of the English language proficiency with emphasis on LSRW skills. Apply communication skills through various language learning activities. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. Evaluate and exhibit professionalism in participating in debates and group discussions. <p>CO5: Create effective Course Objectives:</p>
7	BS&H	Engineering Chemistry / Chemistry / Fundamental Chemistry Lab	<ul style="list-style-type: none"> Determine the cell constant and conductance of solutions. Prepare advanced polymer materials. Measure the strength of an acid present in secondary batteries. Analyze the IR spectra of some organic compounds. Compare conductometric and pH metric titrations.
8	Engineering Science	Engineering Workshop	<ul style="list-style-type: none"> Identify workshop tools and their operational capabilities. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. Apply fitting operations in various applications. Apply basic electrical engineering knowledge for House Wiring Practice

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9	Professional Core	Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab/Network Analysis Lab/ Data structures Lab	<ul style="list-style-type: none"> • Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. • Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. • Determine the Centre of gravity and Moment of Inertia of different configurations. • Verify the equilibrium conditions of a rigid body under the action of different force systems.
10		Health and wellness, Yoga and Sports	<ul style="list-style-type: none"> • Understand the importance of yoga and sports for Physical fitness and sound health. • Demonstrate an understanding of health-related fitness components. • Compare and contrast various activities that help enhance their health. • Assess current personal fitness levels. • Develop Positive Personality


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II Year –I Semester

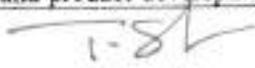
S. No	Category	Name of the Subject	Course outcomes
1	BS	Probability theory and stochastic process	<ul style="list-style-type: none"> • This gives basic understanding of random variables and operations that can be performed on them. • To know the Spectral and temporal characteristics of Random Process. • To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics
2	HSMC	Universal Human Values– Understanding Harmony and Ethical Human Conduct	<ul style="list-style-type: none"> • Classify different number systems and apply to generate various codes. • Use the concept of Boolean algebra in minimization of switching functions • Design different types of combinational logic circuits. • Apply knowledge of flip-flops in designing of Registers and counters • The operation and design methodology for synchronous sequential circuits and algorithmic state machines. • Produce innovative designs by modifying the traditional design techniques.
3	Engineering Science	Signals and Systems	<ul style="list-style-type: none"> • To study about signals and systems. • To analyze the spectral characteristics of signal using Fourier series and Fourier transforms. • To understand the characteristics of systems. • To introduce the concept of sampling process • To know various transform techniques to analyze the signals and systems.
4	Professional Core	Electronic Devices and Circuits	<ul style="list-style-type: none"> • To learn and understand the basic concepts of semiconductor physics. • Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes. • To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed. • Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics. • To learn and understand the purpose of transistor biasing and its significance. • Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.
			<ul style="list-style-type: none"> • To solve a typical number base conversion and analyze new error coding techniques. • Theorems and functions of Boolean algebra and behavior of logic gates

5	Professional Core	Switching Theory and Logic Design	<ul style="list-style-type: none"> To optimize logic gates for digital circuits using various techniques. Boolean function simplification using Karnaugh maps and Quine-McCluskey methods To understand concepts of combinational circuits. <p>To develop advanced sequential circuits.</p>
6	Professional Core Science	Electronic Devices and Circuits Lab	-----
7	Professional Core	Switching Theory and Logic Design Lab	-----
8	Skill Enhancement Course	Data Structures using Python	
9	Audit Course	Environmental Science	<ul style="list-style-type: none"> To make the students to get awareness on environment To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life To save earth from the inventions by the engineers.

II Year -- II Semester

S. No	Category	Name of the subject	Course outcomes
1	Management Course- I	Managerial Economics and Financial Analysis	<ul style="list-style-type: none"> To inculcate the basic knowledge of microeconomics and financial accounting To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost To Know the Various types of market structure and pricing methods and strategy To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions. To provide fundamental skills on accounting and to explain the process of preparing financial statements.
2	Engineering Science	Linear Control Systems	<ul style="list-style-type: none"> To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices To analyze the system in terms of absolute stability and relative stability by different approaches To design different control systems for different applications as per given specifications To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

3	Professional Core	Electromagnetic Waves And Transmission Lines	<ul style="list-style-type: none"> Understand the fundamentals of electric fields, coulomb's law and gauss law Familiar with of Biot-Savart Law, Ampere's Circuital Law and Maxwell equations Aware of electromagnetic wave propagation in dielectric and conducting media Study the equivalent circuit of transmission lines and parameters of the transmissionlines Learn the working of smith chart and its usage in the calculation of transmission lineparameters
4	Professional Core	Electronic Circuit Analysis	<ul style="list-style-type: none"> To learn hybrid- π parameters a high frequency and compare with low frequencyparameters. Learn and understand the purpose of cascading of single stage amplifiers and derivethe overall voltage gain. Analyze the effect of negative feedback on amplifier characteristics and derive thecharacteristics. Learn and understand the basic principle of oscillator circuits and perform the analysisof different oscillator circuits. Compare and analyze different Power amplifiers like Class A, Class B, Class C, ClassAB and other types of amplifiers. Analyze different types of tuned amplifier circuits.
5	Professional Core	Analog Communications	<ul style="list-style-type: none"> Describe the Modulation and Demodulation techniques of standard AM. Compare different types of Amplitude Modulation and Demodulation techniques. Analyse the concepts of generation and detection of Angle Modulated signals. Outline the Radio Receivers with different sections. Interpret the Radio Transmitters completely. Illustrate the noise performance in Analog Modulation techniques and also the concepts ofPulse Analog Modulation and Demodulation techniques.
6	Professional Core	Signals and Systems Lab	-----
7	Professional Core	Electronic Circuit Analysis lab	-----
8	Skill Enhancement course	Soft Skills	<ul style="list-style-type: none"> To prepare to face global competition for employment and excellence in profession. To help the students understand and build interpersonal and interpersonal skills thatwill enable them to lead meaningful professional life.
9	Engineering Science	Design Thinking &Innovation	<ul style="list-style-type: none"> Bring awareness on innovative design and new product development. Explain the basics of design thinking. Familiarize the role of reverse engineering in product development. Train how to identify the needs of society and convert into demand. Introduce product planning and product development process.


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CSE/CS

I Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS&H	Engineering Physics	<ul style="list-style-type: none"> Analyze the intensity variation of light due to polarization, interference and diffraction. Familiarize with the basics of crystals and their structures. Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles. Summarize various types of polarization of dielectrics and classify the magnetic materials. Explain the basic concepts of Quantum Mechanics and the band theory of solids. CO6: Identify the type of semiconductor using Hall effect
2	BS&H	Linear Algebra & Calculus	<ul style="list-style-type: none"> Develop and use of matrix algebra techniques that are needed by engineers for practical applications. Utilize mean value theorems to real life problems. Familiarize with functions of several variables which is useful in optimization. Learn important tools of calculus in higher dimensions. Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.
3	Engineering Science	Basic Electrical & Electronics Engineering	<ul style="list-style-type: none"> Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2) Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2) Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3) Calculate electrical load and electricity bill of residential and commercial buildings
4	Engineering Science	Engineering Graphics	<ul style="list-style-type: none"> Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. Understand and draw projection of solids in various positions in first quadrant. Explain principles behind development of surfaces. Prepare isometric and perspective sections of simple solids.
5	Engineering Science	Introduction to Programming	<ul style="list-style-type: none"> Understand basics of computers, the concept of algorithm and algorithmic thinking. Analyse a problem and develop an algorithm to solve it. Implement various algorithms using the C programming language. Understand more advanced features of C language. Develop problem-solving skills and the ability to debug and optimize the code.
6	Engineering Science	IT Workshop	<ul style="list-style-type: none"> Perform Hardware troubleshooting. Understand Hardware components and inter dependencies. Safeguard computer systems from viruses/worms. Document/ Presentation preparation. Perform calculations using spreadsheets

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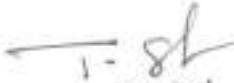
7	BS&H	Engineering Physics Lab	<ul style="list-style-type: none"> Operate optical instruments like travelling microscope and spectrometer. Estimate the wavelengths of different colours using diffraction grating. Plot the intensity of the magnetic field of circular coil carrying current with distance. Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively. Calculate the band gap of a given semiconductor. Identify the type of semiconductor using Hall effect
8	Engineering Science	Electrical & Electronics Engineering Workshop	<ul style="list-style-type: none"> Measure voltage, current and power in an electrical circuit. (L3) Measure of Resistance using Wheat stone bridge (L4) Discover critical field resistance and critical speed of DC shunt generators. (L4) Investigate the effect of reactive power and power factor in electrical loads. (L5)
9	Engineering Science	Computer Programming Lab	<ul style="list-style-type: none"> Read, understand, and trace the execution of programs written in C language. Select the right control structure for solving the problem. Develop C programs which utilize memory efficiently using programming constructs like pointers. Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	<ul style="list-style-type: none"> Understand the importance of discipline, character and service motto. Solve some societal issues by applying acquired knowledge, facts, and techniques. Explore human relationships by analyzing social problems. Determine to extend their help for the fellow beings and downtrodden people. Develop leadership skills and civic responsibilities.

I Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS&H	Communicative English	<ul style="list-style-type: none"> Understand the context, topic, and pieces of specific information from social or Transactional dialogues. Apply grammatical structures to formulate sentences and correct word forms. Analyze discourse markers to speak clearly on a specific topic in informal discussions. Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. Create a coherent paragraph, essay, and resume.
			<ul style="list-style-type: none"> Demonstrate the corrosion prevention methods and factors affecting corrosion. Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers. Explain calorific values, octane number, refining of petroleum and

2	BS&H	Engineering Chemistry / Chemistry / Fundamental Chemistry	<p>cracking of oils.</p> <ul style="list-style-type: none"> Explain the setting and hardening of cement. Summarize the concepts of colloids, micelle and nanomaterials temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
3	Engineering Science	Differential Equations & Vector Calculus	<ul style="list-style-type: none"> Solve the differential equations related to various engineering fields. Identify solution methods for partial differential equations that model physical processes. Interpret the physical meaning of different operators such as gradient, curl and divergence. Estimate the work done against a field, circulation and flux using vector calculus.
4	Engineering Science	Basic Civil & Mechanical Engineering	<ul style="list-style-type: none"> Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation. Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated. Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
5	Professional Core	Engineering Mechanics/Network Analysis/ Data structures (Branch specific)	<ul style="list-style-type: none"> Explain the role of linear data structures in organizing and accessing data efficiently in algorithms. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges. Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.
6	BS&H	Communicative English Lab	<ul style="list-style-type: none"> Understand the different aspects of the English language proficiency with emphasis on LSRW skills. Apply communication skills through various language learning activities. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. Evaluate and exhibit professionalism in participating in debates and group discussions.
7	BS&H	Engineering Chemistry / Chemistry / Fundamental Chemistry Lab	<ul style="list-style-type: none"> Determine the cell constant and conductance of solutions. Prepare advanced polymer materials. Measure the strength of an acid present in secondary batteries. Analyze the IR spectra of some organic compounds. Compare conductometric and pH metric titrations.

8	Engineering Science	Engineering Workshop	<ul style="list-style-type: none"> Identify workshop tools and their operational capabilities. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. Apply fitting operations in various applications. Apply basic electrical engineering knowledge for House Wiring Practice
9	Professional Core	Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab Network Analysis Lab Data structures Lab	<ul style="list-style-type: none"> Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. Determine the Centre of gravity and Moment of Inertia of different configurations. Verify the equilibrium conditions of a rigid body under the action of different force systems.
10		Health and wellness, Yoga and Sports	<ul style="list-style-type: none"> Understand the importance of yoga and sports for Physical fitness and sound health. Demonstrate an understanding of health-related fitness components. Compare and contrast various activities that help enhance their health. Assess current personal fitness levels. Develop Positive Personality


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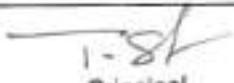
II Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS&H	Discrete Mathematics & Graph Theory	<ul style="list-style-type: none"> • Build skills in solving mathematical problems (L3) • Comprehend mathematical principles and logic (L4) • Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software (L6) • Manipulate and analyze data numerically and/or graphically using appropriate Software (L3) • How to communicate effectively mathematical ideas/results verbally or in writing (L1)
2	BS&H	Universal human values – understanding harmony and Ethical human conduct	<ul style="list-style-type: none"> • Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2) • Identify one's self, and one's surroundings (family, society nature) (L1, L2) • Apply what they have learnt to their own self in different day-to-day settings in real life (L3) • Develop as socially and ecologically responsible engineers (L3, L6)
3	Engineering Science	Digital Logic & Computer Organization	-----
4	Professional Core	Advanced Data Structures & Algorithms Analysis	-----
5	Professional Core	Object Oriented Programming Through Java	-----
6	Professional Core	Advanced Data Structures and Algorithms Lab	-----
7	Professional Core	Object Oriented Programming with Java Lab	-----
8	Skill Enhancement course	Python programming	-----
9	Audit Course	Environmental Science	<ul style="list-style-type: none"> • Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources. • Understand flow and bio-geo-chemical cycles and ecological pyramids. • Understand various causes of pollution and solid waste management and related preventive measures. • About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation. • Cases of population explosion, value education and welfare programmes.


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II Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	Management Course-I	Managerial Economics and Financial Analysis	<ul style="list-style-type: none"> Define the concepts related to Managerial Economics, financial accounting and management (L2) Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2) Apply the Concept of Production cost and revenues for effective Business decision (L3) Analyze how to invest their capital and maximize returns (L4) Develop the accounting statements and evaluate the financial performance of business entity (L5)
2	Engineering Science/ Basic Science	Probability & Statistics	<ul style="list-style-type: none"> Classify the concepts of data science and its importance (L2) Interpret the association of characteristics and through correlation and regression tools (L4) Apply discrete and continuous probability distributions (L3) Design the components of a classical hypothesis test (L6)
3	Professional Core	Operating Systems	-----
4	Professional Core	Database Management Systems	-----
5	Professional Core	Software Engineering	-----
6	Professional Core	Operating Systems Lab	-----
7	Professional Core	Database Management Systems Lab	-----
8	Skill Enhancement course	Exploratory Data Analysis with Python	-----
9	BS&H	Design Thinking & Innovation	<ul style="list-style-type: none"> Define the concepts related to design thinking. Explain the fundamentals of Design Thinking and innovation. Apply the design thinking techniques for solving problems in various sectors. Analyse to work in a multidisciplinary environment. Evaluate the value of creativity.


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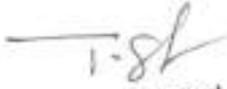
CSE- ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

I Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS&H	Engineering Physics	<ul style="list-style-type: none"> Analyze the intensity variation of light due to polarization, interference and diffraction. Familiarize with the basics of crystals and their structures. Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles. Summarize various types of polarization of dielectrics and classify the magnetic materials. Explain the basic concepts of Quantum Mechanics and the band theory of solids.
2	BS&H	Linear Algebra & Calculus	<ul style="list-style-type: none"> Develop and use of matrix algebra techniques that are needed by engineers for practical applications. Utilize mean value theorems to real life problems. Familiarize with functions of several variables which is useful in optimization. Learn important tools of calculus in higher dimensions. Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.
3	Engineering Science	Basic Electrical & Electronics Engineering	<ul style="list-style-type: none"> Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2) Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2) Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3) Calculate electrical load and electricity bill of residential and commercial buildings
4	Engineering Science	Engineering Graphics	<ul style="list-style-type: none"> Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. Understand and draw projection of solids in various positions in first quadrant. Explain principles behind development of surfaces. Prepare isometric and perspective sections of simple solids.
5	Engineering Science	Introduction to Programming	<ul style="list-style-type: none"> Understand basics of computers, the concept of algorithm and algorithmic thinking. Analyse a problem and develop an algorithm to solve it. Implement various algorithms using the C programming language. Understand more advanced features of C language. Develop problem-solving skills and the ability to debug and optimize the code.
6	Engineering Science	IT Workshop	<ul style="list-style-type: none"> Perform Hardware troubleshooting. Understand Hardware components and inter dependencies. Safeguard computer systems from viruses/worms.

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			<ul style="list-style-type: none"> • Document/ Presentation preparation. • Perform calculations using spreadsheets.
7	BS&H	Engineering Physics Lab	<ul style="list-style-type: none"> • Operate optical instruments like travelling microscope and spectrometer. • Estimate the wavelengths of different colours using diffraction grating. • Plot the intensity of the magnetic field of circular coil carrying current with distance. • Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively. • Calculate the band gap of a given semiconductor. • Identify the type of semiconductor using Hall effect
8	Engineering Science	Electrical & Electronics Engineering Workshop	<ul style="list-style-type: none"> • Measure voltage, current and power in an electrical circuit. (L3) • Measure of Resistance using Wheat stone bridge (L4) • Discover critical field resistance and critical speed of DC shunt generators. (L4) • Investigate the effect of reactive power and power factor in electrical loads. (L5)
9	Engineering Science	Computer Programming Lab	<ul style="list-style-type: none"> • Read, understand, and trace the execution of programs written in C language. • Select the right control structure for solving the problem. • Develop C programs which utilize memory efficiently using programming constructs like pointers. • Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	<ul style="list-style-type: none"> • Understand the importance of discipline, character and service motto. • Solve some societal issues by applying acquired knowledge, facts, and techniques. • Explore human relationships by analyzing social problems. • Determine to extend their help for the fellow beings and downtrodden people. • Develop leadership skills and civic responsibilities.

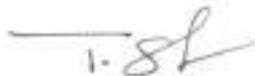

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I Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS&H	Communicative English	<ul style="list-style-type: none"> Understand the context, topic, and pieces of specific information from social or Transactional dialogues. Apply grammatical structures to formulate sentences and correct word forms. Analyze discourse markers to speak clearly on a specific topic in informal discussions. Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. Create a coherent paragraph, essay, and resume.
2	BS&H	Engineering Chemistry / Chemistry / Fundamental Chemistry	<ul style="list-style-type: none"> Demonstrate the corrosion prevention methods and factors affecting corrosion. Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers. Explain calorific values, octane number, refining of petroleum and cracking of oils. Explain the setting and hardening of cement. Summarize the concepts of colloids, micelle and nanomaterials temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
3	Engineering Science	Differential Equations & Vector Calculus	<ul style="list-style-type: none"> Solve the differential equations related to various engineering fields. Identify solution methods for partial differential equations that model physical processes. Interpret the physical meaning of different operators such as gradient, curl and divergence. Estimate the work done against a field, circulation and flux using vector calculus.
4	Engineering Science	Basic Civil & Mechanical Engineering	<ul style="list-style-type: none"> Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation. Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated. Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
			<ul style="list-style-type: none"> Explain the role of linear data structures in organizing and accessing data efficiently in algorithms. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

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5	Professional Core	Engineering Mechanics/Network Analysis/ Data structures (Branch specific)	<ul style="list-style-type: none"> Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges. Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.
6	BS&H	Communicative English Lab	<ul style="list-style-type: none"> Understand the different aspects of the English language proficiency with emphasis on LSRW skills. Apply communication skills through various language learning activities. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. Evaluate and exhibit professionalism in participating in debates and group discussions.
7	BS&H	Engineering Chemistry / Chemistry / Fundamental Chemistry Lab	<ul style="list-style-type: none"> Determine the cell constant and conductance of solutions. Prepare advanced polymer materials. Measure the strength of an acid present in secondary batteries. Analyze the IR spectra of some organic compounds. Compare conductometric and pH metric titrations.
8	Engineering Science	Engineering Workshop	<ul style="list-style-type: none"> Identify workshop tools and their operational capabilities. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. Apply fitting operations in various applications. Apply basic electrical engineering knowledge for House Wiring Practice
9	Professional Core	Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab/Network Analysis Lab/ Data structures Lab	<ul style="list-style-type: none"> Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller. Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever. Determine the Centre of gravity and Moment of Inertia of different configurations. Verify the equilibrium conditions of a rigid body under the action of different force systems.
10		Health and wellness, Yoga and Sports	<ul style="list-style-type: none"> Understand the importance of yoga and sports for Physical fitness and sound health. Demonstrate an understanding of health-related fitness components. Compare and contrast various activities that help enhance their health. Assess current personal fitness levels. Develop Positive Personality


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II Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS&H	Discrete Mathematics & Graph Theory	<ul style="list-style-type: none"> • Build skills in solving mathematical problems (L3) • Comprehend mathematical principles and logic (L4) • Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software (L6) • Manipulate and analyze data numerically and/or graphically using appropriate Software (L3) • How to communicate effectively mathematical ideas/results verbally or in writing (L1)
2	BS&H	Universal human values – understanding harmony and Ethical human conduct	<ul style="list-style-type: none"> • Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2) • Identify one's self, and one's surroundings (family, society nature) (L1, L2) • Apply what they have learnt to their own self in different day-to-day settings in real life (L3) • Relate human values with human relationship and human society. (L4) • Justify the need for universal human values and harmonious existence (L5) • Develop as socially and ecologically responsible engineers (L3, L6)
3	Engineering Science	Artificial Intelligence	-----
4	Professional Core	Advanced Data Structures & Algorithms Analysis	-----
5	Professional Core	Object Oriented Programming Through Java	-----
6	Professional Core	Advanced Data Structures and Algorithms Lab	-----
7	Professional Core	Object Oriented Programming with Java Lab	-----
8	Skill Enhancement course	Python programming	-----
9	Audit Course	Environmental Science	<ul style="list-style-type: none"> • Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources. • Understand flow and bio-geo-chemical cycles and ecological pyramids. • Understand various causes of pollution and solid waste management and related preventive measures. • About the rainwater harvesting, watershed management, ozone layer depletion and waste landreclamation. • Casus of population explosion, value education and welfare programmes.

II Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	Management Course-I	Optimization Techniques	<ul style="list-style-type: none"> State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem. Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution. Apply and Solve transportation and assignment problem by using Linear programming Simplex method. Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
2	Engineering Science/ Basic Science	Probability & Statistics	<ul style="list-style-type: none"> Classify the concepts of data science and its importance (L2) Apply discrete and continuous probability distributions (L3) Design the components of a classical hypothesis test (L6) Infer the statistical inferential methods based on small and large sampling tests (L4)
3	Professional Core	Machine Learning	<ul style="list-style-type: none"> Summarize the architecture of data warehouse Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data. Construct a decision tree and resolve the problem of model overfitting Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation Apply suitable clustering algorithm for the given data set
4	Professional Core	Database Management Systems	-----
5	Professional Core	Digital Logic & Computer Organization	-----
6	Professional Core	Machine Learning Lab	-----
7	Professional Core	Database Management Systems Lab	-----
8	Skill Enhancement course	Full Stack development-I	-----
9	BS&H	Design Thinking & Innovation	<ul style="list-style-type: none"> Define the concepts related to design thinking. Explain the fundamentals of Design Thinking and innovation. Apply the design thinking techniques for solving problems in various sectors. Analyse to work in a multidisciplinary environment. Evaluate the value of creativity.

COURSE STRUCTURE AND SYLLABUS

For UG –R20 B. TECH - COMPUTER SCIENCE & ENGINEERING COURSE STRUCTURE

I Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	HS	Communicative English	<ul style="list-style-type: none"> Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information Ask and answer general questions on familiar topics and introduce oneself/others Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs Form sentences using proper grammatical structures and correct word forms
2	BS	Mathematics - I (Calculus And Differential Equations)	<ul style="list-style-type: none"> Utilize mean value theorems to real life problems (L3) Solve the differential equations related to various engineering fields (L3) Familiarize with functions of several variables which is useful in optimization (L3) Apply double integration techniques in evaluating areas bounded by region (L3) Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3- dimensional coordinate systems(L5)
			<ul style="list-style-type: none"> Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Explain various types of emission of radiation (L2) Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index

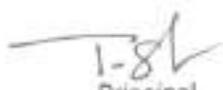
3	BS	Applied Physics	<p>profile and mode of propagation (L2).</p> <ul style="list-style-type: none"> • Identify the applications of optical fibers in medical, communication and other fields (L2). • Apply the fiber optic concepts in various fields (L3). • Describe the dual nature of matter (L1). • Explain the significance of wave function (L2). • Identify the role of Schrodinger's time independent wave equation in studying particle in one- dimensional infinite potential well (L3). • Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). • Classify the energy bands of solids (L2). • Explain the concept of dielectric constant and polarization in dielectric materials (L2). • Summarize various types of polarization of dielectrics (L2) • Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). • Classify the magnetic materials based on susceptibility and their temperature dependence (L2). • Explain the applications of dielectric and magnetic materials (L2). • Apply the concept of magnetism to magnetic devices (L3) • Outline the properties of charge carriers in semiconductors (L2). • Identify the type of semiconductor using Hall effect (L2). • Identify applications of semiconductors in electronic devices (L2). • Classify superconductors based on Meissner's effect (L2). • Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).
4	ES	Programming for Problem Solving using C	<ul style="list-style-type: none"> • To write algorithms and to draw flowcharts for solving problems • To convert flowcharts/algorithms to C Programs, compile and debug programs • To use different operators, data types and write programs that use two-way/ multi-way selection • To select the best loop construct for a given problem • To decompose a problem into functions and to develop modular reusable code • To apply File I/O operations
5	ES	Computer Engineering Workshop	<ul style="list-style-type: none"> • Assemble and disassemble components of a PC • Construct a fully functional virtual machine, Summarize various Linux operating system commands, Recognize characters & extract text from scanned images, Create audio files and podcasts

6	HS	English Communication Skills Laboratory	-----
7	BS	Applied Physics Lab	-----
8	ES	Programming for Problem Solving using C Lab	<ul style="list-style-type: none"> • Gains Knowledge on various concepts of a C language. • Able to draw flowcharts and write algorithms. • Able design and development of C problem solving skills. • Able to design and develop modular programming skills. • Able to trace and debug a program

I Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS	Mathematics – II (Linear Algebra And Numerical Methods)	<ul style="list-style-type: none"> • Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) • Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel(L3) • Evaluate the approximate roots of polynomial and transcendental equations by differential algorithms (L5) • Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) • Apply numerical integral techniques to different engineering problems (L3) • Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)
2	BS	Applied Chemistry	<ul style="list-style-type: none"> • Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers. • Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion • Synthesize nanomaterials for modern advances of engineering technology. • Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors. • Analyze the principles of different analytical instruments and their applications. • Design models for energy by different natural sources. • Obtain the knowledge of computational chemistry and molecular machines

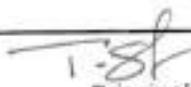
3	ES	Computer Organization	<ul style="list-style-type: none"> • Demonstrate and understanding of the design of the functional units of a digital computer system. • Relate Postulates of Boolean algebra and minimize combinational functions • Recognize and manipulate representations of numbers stored in digital computers • Build the logic families and realization of logic gates. • Design and analyze combinational and sequential circuits • Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components • Solve elementary problems by assembly language programming
4	ES	Python Programming	<ul style="list-style-type: none"> • Develop essential programming skills in computer programming concepts like data types, containers • Apply the basics of programming in the Python language • Solve coding tasks related conditional execution, loops • Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming
5	ES	Data Structures	<ul style="list-style-type: none"> • Summarize the properties, interfaces, and behaviors of basic abstract data types • Discuss the computational efficiency of the principal algorithms for sorting & searching • Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs • Demonstrate different methods for traversing trees
6	BS	Applied Chemistry Lab	-----
7	ES	Python Programming Lab	<ul style="list-style-type: none"> • Develop essential programming skills in computer programming concepts like data types, containers • Apply the basics of programming in the Python language • Solve coding tasks related conditional execution, loops • Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming
8	ES	Data Structures Lab	<ul style="list-style-type: none"> • Use basic data structures such as arrays and linked list. • Use various searching and sorting algorithms.
9	MC	Environment Science	-----


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II Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS	Mathematics III	<ul style="list-style-type: none"> • Interpret the physical meaning of different operators such as gradient, curl and divergence (L5) • Estimate the work done against a field, circulation and flux using vector calculus (L5) • Apply the Laplace transform for solving differential equations (L3) • Find or compute the Fourier series of periodic signals (L3) • Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3) • Identify solution methods for partial differential equations that model physical processes (L3)
2	CS	Object Oriented Programming through C++	<ul style="list-style-type: none"> • Classify object oriented programming and procedural programming • Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling • Build C++ classes using appropriate encapsulation and design principles • Apply object oriented or non-object oriented techniques to solve bigger computing problems
3	CS	Software Engineering	<ul style="list-style-type: none"> • Ability to transform an Object-Oriented Design into high quality, executable code • Skills to design, implement, and execute test cases at the Unit and Integration level • Compare conventional and agile software methods
4	CS	Operating Systems	<ul style="list-style-type: none"> • Describe various generations of Operating System and functions of Operating System • Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance • Solve Inter Process Communication problems using Mathematical Equations by various methods • Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques • Outline File Systems in Operating System like UNIX/Linux and Windows
5	CS	Mathematical Foundations of Computer Science	<ul style="list-style-type: none"> • Demonstrate skills in solving mathematical problems • Comprehend mathematical principles and logic • Demonstrate knowledge of mathematical modeling and Proficiency in using mathematical software

			<ul style="list-style-type: none"> Manipulate and analyze data numerically and/or graphically using appropriate Software Communicate effectively mathematical ideas/results verbally or in writing
6	CS	Object Oriented Programming through C++ Lab	<ul style="list-style-type: none"> Apply the various OOPs concepts with the help of programs.
7	CS	Operating Systems Lab	<ul style="list-style-type: none"> To use Unix utilities and perform basic shell control of the utilities To use the Unix file system and file access control To use of an operating system to develop software Students will be able to use Linux environment efficiently Solve problems using bash for shell scripting
8	CS	Software Engineering Lab	<ul style="list-style-type: none"> By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project prepare SRS document, design document, test cases and software configuration management and risk management related document. Develop function oriented and object oriented software design using tools like rationalrose. use modern engineering tools necessary for software project management, estimations, time management and software reuse generate test cases for software testing
9	SO	Skill oriented Course - I Applications of Python - Num Py Web Application Development Using FullStack - Frontend Development -Module -I	<ul style="list-style-type: none"> Explain how data is collected, managed and stored for processing Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems Understand how to apply some linear algebra operations to n-dimensional arrays Use NumPy perform common data wrangling and computational tasks in Python.
10	MC	Constitution of India	<ul style="list-style-type: none"> Understand historical background of the constitution making and its importance for building a democratic India. Understand the functioning of three wings of the government i.e., executive, legislative and judiciary. Understand the value of the fundamental rights and duties for becoming good citizen of India. Analyze the decentralization of power between central, state and local self-government. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

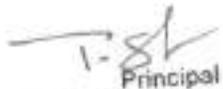

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II Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS	Probability and Statistics	<ul style="list-style-type: none"> Classify the concepts of data science and its importance (L4) or (L2) Interpret the association of characteristics and through correlation and regression tools(L4) Make use of the concepts of probability and their applications (L3) Apply discrete and continuous probability distributions (L3) Design the components of a classical hypothesis test (L6) Infer the statistical inferential methods based on small and large sampling tests (L4)
2	CS	Database Management Systems	<ul style="list-style-type: none"> Describe a relational database and object-oriented database Create, maintain and manipulate a relational database using SQL. Describe ER model and normalization for database design Examine issues in data storage and query processing and can formulate appropriate solutions Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
3	CS	Formal Languages and Automata Theory	<ul style="list-style-type: none"> Classify machines by their power to recognize languages. Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy Employ finite state machines to solve problems in computing Illustrate deterministic and non-deterministic machines Quote the hierarchy of problems arising in the computer science
4	ES	Java Programming	<ul style="list-style-type: none"> Able to realize the concept of Object Oriented Programming & Java Programming Constructs Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keyword Apply the concept of exception handling and Input/ Output operations Able to design the applications of Java & Java applet Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
			<ul style="list-style-type: none"> The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product The knowledge of understanding of the Input-Output-Cost relationships and estimation of the

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5	HS	Managerial Economics and Financial Accountancy	<p>least cost combination of inputs</p> <ul style="list-style-type: none"> The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making
6	CS	Database Management Systems Lab	<ul style="list-style-type: none"> Utilize SQL to execute queries for creating database and performing datamanipulation operations Examine integrity constraints to build efficient databases Apply Queries using Advanced Concepts of SQL Build PL/SQL programs including stored procedures, functions, cursors and triggers
7	CS	R Programming Lab	<ul style="list-style-type: none"> Access online resources for R and import new function packages into the R workspace Import, review, manipulate and summarize data-sets in R Explore data-sets to create testable hypotheses and identify appropriate statistical tests Perform appropriate statistical tests using R Create and edit visualizations with R
8	ES	Java Programming Lab	
9	SO	Skill Oriented Course - II Applications of Python-Pandas OR Web Application Development Using Full Stack -Frontend Development –Module-II	<ul style="list-style-type: none"> Use Pandas to create and manipulate data structures like Series and DataFrames. Work with arrays, queries, and dataframesQuery DataFrame structures for cleaning and processing and manipulating filesUnderstand best practices for creating basic charts
10	Minor	Operating Systems	-----
11	Honors	Any course from the Pool, as per the opted track	-----

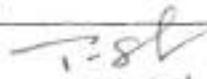

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III Year – I SEMESTER

S.No	Course Code	Courses	Course outcomes
1	PC	Computer Networks	<ul style="list-style-type: none"> • Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards. • Discuss different transmission media and different switching networks. • Analyze data link layer services, functions and protocols like HDLC and PPP. • Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols • Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.
2	PC	Design and Analysis of Algorithms	<ul style="list-style-type: none"> • Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms • List and describe various algorithmic approaches and Solve problems using divide and conquer & greedy Method • Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches • Demonstrate NP- Completeness theory, lower bound theory and String Matching
3	PC	Data Warehousing and Data Mining	<ul style="list-style-type: none"> • Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications. • Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms. • Choose appropriate classification technique to perform classification, model building and evaluation. • Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
4	Open Elective/Job Oriented	Open Elective-I Open Electives offered by other departments/Optimization in Operations Research	
5	PE	Professional Elective-I Artificial Intelligence Software Project Management Distributed Systems Advanced Unix Programming	<ul style="list-style-type: none"> • Understand the fundamental concepts in Artificial Intelligence • Analyze the applications of search strategies and problem reductions Apply the mathematical logic concepts. • Develop the Knowledge representations in Artificial Intelligence. • Explain the Fuzzy logic systems

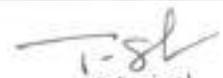
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6	PC	Data Warehousing and Data Mining Lab	<ul style="list-style-type: none"> Design a data mart or data warehouse for any organization Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results
7	PC	Computer Networks Lab	<ul style="list-style-type: none"> Know how reliable data communication is achieved through data link layer. Suggest appropriate routing algorithm for the network. Provide internet connection to the system and its installation Work on various network management tools
8	SO	Skill Oriented Course - III 1. Animation course: Animation Design 2. Continuous Integration and Continuous Delivery using Dev Ops	<ul style="list-style-type: none"> learn various tools of digital 2-D animation understand production pipeline to create 2-D animation. apply the tools to create 2D animation for films and videos understand different styles and treatment of content in 3D model creation apply tools to create effective 3D modelling texturing and lighting
9	MC	Employability Skills-I	<ul style="list-style-type: none"> Understand the corporate etiquette. Make presentations effectively with appropriate body language Be composed with positive attitude Understand the core competencies to succeed in professional and personal life
10	PR	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)	
11	Minor	Database Management Systems	<ul style="list-style-type: none"> Describe a relational database and object-oriented database Create, maintain and manipulate a relational database using SQL Describe ER model and normalization for database design Examine issues in data storage and query processing and can formulate appropriate solutions Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage Examine integrity constraints to build efficient databases Apply Queries using Advanced Concepts of SQL Build PL/SQL programs including stored procedures, functions, cursors and triggers
12	Honors	Any course from the Pool, as per the opted track	-----

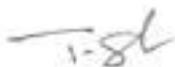

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III Year – II SEMESTER

S.No	CourseCode	Courses	Course outcomes
1	PC	Machine Learning	<ul style="list-style-type: none"> • Explain the fundamental usage of the concept Machine Learning system • Demonstrate on various regression Technique • Analyze the Ensemble Learning Methods • Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning. • Discuss the Neural Network Models and Fundamentals concepts of Deep Learning
2	PC	Compiler Design	<ul style="list-style-type: none"> • Demonstrate phases in the design of compiler • Organize Syntax Analysis, Top Down and LL(1) grammars • Design Bottom Up Parsing and Construction of LR parsers • Analyze synthesized, inherited attributes and syntax directed translation schemes • Determine algorithms to generate code for a target machine
3	PC	Cryptography and Network Security	<ul style="list-style-type: none"> • Explain different security threats and countermeasures and foundation course of cryptography mathematics. • Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography • Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more • Design applications of hash algorithms, digital signatures and key management techniques • Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .
4	PE	Professional Elective-II 1.Mobile Computing 2.Big Data Analytics 3.Object Oriented Analysis and Design 4.Network Programming	<ul style="list-style-type: none"> • Develop a strong grounding in the fundamentals of mobile Networks • Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network • Comprehend, design, and develop a lightweight network stack • Analyze the Mobile Network Layer system working • Explain about the WAP Model


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5	Open Elective /Job Oriented	Open Elective-II Open Electives offered by other departments/ MEAN Stack Development (Job Oriented Course)	-----
6	PC	Machine Learning using Python Lab	<ul style="list-style-type: none"> • Implement procedures for the machine learning algorithms • Design and Develop Python programs for various Learning algorithms • Apply appropriate data sets to the Machine Learning algorithms
7	PC	Compiler Design Lab	<ul style="list-style-type: none"> • Design simple lexical analyzers • Determine predictive parsing table for a CFG • Apply Lex and Yacc tools • Examine LR parser and generating SLR Parsing table • Relate Intermediate code generation for subset C language
8	PC	Cryptography and Network Security Lab	<ul style="list-style-type: none"> • Apply the knowledge of symmetric cryptography to implement encryption and decryption using Caesar Cipher, Substitution Cipher, Hill Cipher • Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm. • Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm
9	SO	Skill Oriented Course - IV <ul style="list-style-type: none"> • Big Data:Spark • MEAN Stack Technologies-Module I- MongoDB, Express.js, Angular JS Node.js and AJAX 	<ul style="list-style-type: none"> • Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark • Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components • Perform the filter, count, distinct, map, flatMap RDD Operations in Spark. • Build Queries using Spark SQL • Apply Spark joins on Sample Data Sets • Make use of sqoop to import and export data from hadoop to database and vice-versa

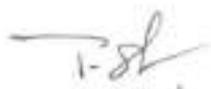

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10	MC	Employability skills-II	<ul style="list-style-type: none"> • Solve various Basic Mathematics problems by following different methods • Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems • Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. • Analyze, summarize and present information in quantitative forms including table, graphs and formulas
11	Minor	Data Structures and Algorithms\$	<ul style="list-style-type: none"> • Use basic data structures such as arrays and linked list. • Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths. • Use various searching and sorting algorithms.
12	Honors	Any course from the Pool, as per the opted track	-----

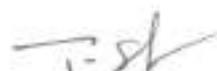

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IV B. Tech –I Semester

S.No	Course Code	Course Title	Course outcomes
1	PE	Professional Elective-III <ul style="list-style-type: none"> • Cloud Computing • Neural Networks and Soft Computing • Ad-hoc and Sensor Networks • Cyber Security & Forensics 	<ul style="list-style-type: none"> • Illustrate the key dimensions of the challenge of Cloud Computing • Classify the Levels of Virtualization and mechanism of tools. • Analyze Cloud infrastructure including Google Cloud and Amazon Cloud. • Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud • Assess control storage systems and cloud security, the risks involved its impact and develop cloud application
2	PE	Professional Elective-IV <ul style="list-style-type: none"> • Deep Learning Techniques • Social Networks & Semantic Web • Computer Vision <ul style="list-style-type: none"> • MOOCS-NPTEL/SWAYAM 	<ul style="list-style-type: none"> • Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning. • Discuss the Neural Network training, various random models. • Explain the Techniques of Keras, TensorFlow, Theano and CNTK • Classify the Concepts of CNN and RNN • Implement Interactive Applications of Deep Learning.
3	PE	Professional Elective-V <ol style="list-style-type: none"> 1. Block-Chain Technologies 2. Wireless Network Security 3. Ethical Hacking 4. MOOCS-NPTEL/SWAYAM 	<ul style="list-style-type: none"> • Demonstrate the block chain basics, Crypto currency • To compare and contrast the use of different private vs. public block chain and use cases • Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins • Classify Permission Block chain and use cases – Hyper ledger, Corda • Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others


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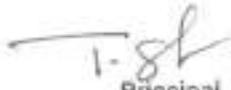
4	Open Elective /Job Oriented	Open Elective-III Open Electives offered by other departments/ API and Microservices (Job Oriented Course)	-----
5	Open Elective /Job Oriented	Open Elective-IV Open Electives offered by other departments/ Secure Coding Techniques (Job Oriented Course)	-----
6	HS	Universal Human Values 2: Understanding Harmony	-----
7	SO	1. PYTHON: Deep Learning /APSSDC offered Courses 2. MEAN Stack Technologies- Module II- MongoDB, Express.js, Angular JS Node.js, and AJAX	<ul style="list-style-type: none"> • Demonstrate the basic concepts fundamental learning techniques and layers. • Discuss the Neural Network training, various random models. • Apply various optimization algorithms to comprehend different activation functions to understand hyper parameter tuning • Build a convolutional neural network, and understand its application to build a recurrent neural network, and understand its usage to comprehend auto encoders to briefly explain transfer learning
8	PR	Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester)	-----
9	Minor	Software Engineering ^S / any other from PART-B (For Minor)	<ul style="list-style-type: none"> • Ability to transform an Object-Oriented Design into high quality, executable code • Skills to design, implement, and execute test cases at the Unit and Integration level • Compare conventional and agile software methods • Prepare SRS document, design document, test cases and software configuration management and risk management related document. • Develop function oriented and object oriented software design using tools like rational rose. • Use modern engineering tools necessary for software project management, estimations, time management and software reuse • Generate test cases for software testing
10	Honors	Any course from the Pool, as per the opted track	-----


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IV B. Tech –II Semester			
S.No	Course Code	Course Title	Course outcomes
I	Project	Major Project Work, Seminar Internship	

Suggested Courses for Honors Program

<p align="center">POOL1- AI & ML</p> <ol style="list-style-type: none"> 1. Mathematics for Machine Learning 2. Text Mining and Time Series Analysis 3. Natural Language Processing 4. Reinforcement Learning 	<p align="center">POOL2- Systems Engineering</p> <ol style="list-style-type: none"> 1. Data Communications and Information Coding Theory 2. Internet of Things 3. Service Oriented Architectures 4. Design of Secure Protocols 5. Network Coding
<p align="center">POOL3- Information Security</p> <ol style="list-style-type: none"> 1. Computational Number Theory 2. Cryptanalysis 3. Elliptic Curve Cryptography 4. Introduction to Quantum Computing and Quantum Cryptography 5. Public Key Infrastructure and Trust Management 6. Information Security Analysis and Audit <p>Principles of Cyber Security Cloud and IoT Security Web Security Block Chain Architecture Design and Use Cases</p>	<p align="center">POOL4 – Data Science</p> <ol style="list-style-type: none"> 1. Statistical Foundations for Data Science 2. Mining Massive Data Sets 3. Data Visualization 4. Medical Image Data Processing


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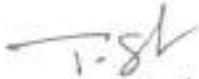
Suggested Courses for MINOR Engineering in CSE

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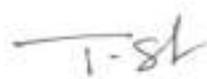
1. Any THREE courses (Any FOUR courses in case of MOOCS) need to be studied from PART-A.
2. Any ONE course (If it is in Regular Mode) need to be studied from PART-B.
3. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by the department of CSE only), Student can register at any time after the completion of II B.Tech. I Sem.
4. Students can pursue suggested MOOC Courses via NPTEL from II B.Tech II Sem and onwards, by prior information to the concern.
5. If sufficient numbers of students are not opted, as per the guidelines, dept can suggest students to pursue under MOOCS. In this case, department/students can select course such that there will not be any duplication.

Eligibility for Minor in CSE:

PART A						
Regular Mode				MOOCS*		
S.No	Subject	L-T-P	Credits	Course available in NPTEL	NPTEL Link	Credits
1	Operating Systems	3-0-2	4	Operating Systems	https://onlinecourses.swayam2.ac.in/cec21_cs20/preview	As recommended by the NPTEL (Dept need to verify the credits and suggest)
2	Data Structures and Algorithms	3-0-2	4	Data Structure and algorithms using Java	https://nptel.ac.in/courses/106105225	
3	Software Engineering	3-0-2	4	Software Engineering	https://onlinecourses.swayam2.ac.in/cec21_cs21/preview	
4	Computer Networks	3-0-2	4	Computer Networks	https://onlinecourses.swayam2.ac.in/cec22_cs05/preview	
5	Database Management Systems	3-0-2	4	Data Base Management System	https://onlinecourses.nptel.ac.in/noc22_cs51/preview	
* If sufficient number of students are not available to offer, can pursue under MOOCS						

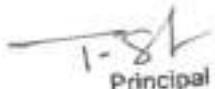

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PART B						
S.No	Subject	L-T-P	Credits	Course available in NPTEL	NPTEL Link	Credits
1	Computational Thinking	4-0-0	4			As recommended by the NPTEL (Dept need to verify the credits and suggest)
2	Object Oriented Programming through JAVA	3-0-2	4	Programming in JAVA	https://nptel.ac.in/courses/106105191	
3	Data Analytics using Python	3-0-2	4	Data Analytics with Python	https://nptel.ac.in/courses/106107220	
4	Artificial Intelligence	4-0-0	4	Artificial Intelligence: Knowledge Representation And Reasoning	https://nptel.ac.in/courses/106106140	
				OR		
				An Introduction to Artificial Intelligence	https://onlinecourses.nptel.ac.in/noc22_cs56/preview	
5	Unix and Shell Programming	3-0-2	4			
6	Cloud Computing	4-0-0	4	Cloud computing	https://onlinecourses.nptel.ac.in/noc22_cs20/preview	
				OR		
				Cloud Computing and Distributed Systems (TWO Credits)	https://onlinecourses.nptel.ac.in/noc21_cs15/preview	


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Open Electives to be offered by CSE for other Branches:

Open Elective-I: <ol style="list-style-type: none">1. Data Structures2. Object Oriented Programming through JAVA3. Data Base Management Systems4. Computer Graphics5. Advanced UNIX Programming6. Computer Organization and Architecture7. Operating Systems	Open Elective-II: <ol style="list-style-type: none">1. Python Programming2. Web Technologies3. Soft Computing4. Distributed Computing5. AI and ML for Robotics6. Computer Networks7. Big Data Analytics8. Computational Tools
Open Elective-III: <ol style="list-style-type: none">1. AI Tools & Techniques2. Image Processing3. Information Security4. Mobile Application Development5. Data Science6. Cyber Security7. Introduction to Internet of Things	Open Elective-IV: <ol style="list-style-type: none">1. MEAN Stack Technologies2. Deep Learning Techniques3. Cloud computing with AWS4. Block Chain Technologies5. Cryptography & Network Security6. Introduction to Machine Learning7. Machine Learning with Python

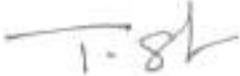

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CSE- ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

I Year – I SEMESTER			
S. No	Course Code	Courses	Course outcomes
1	HS1101	Communicative English	<ul style="list-style-type: none"> • Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information • Ask and answer general questions on familiar topics and introduce oneself/others • Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information • Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs • Form sentences using proper grammatical structures and correct word forms
2	BS1101	Mathematics – I	<ul style="list-style-type: none"> • Utilize mean value theorems to real life problems (L3) • Solve the differential equations related to various engineering fields (L3) • Familiarize with functions of several variables which is useful in optimization (L3) • Apply double integration techniques in evaluating areas bounded by region (L3) • Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3-dimensional coordinate systems(L5)
3	BS1102	Applied Chemistry	-----
4	ES1101	Programming for Problem Solving using C	<ul style="list-style-type: none"> • To write algorithms and to draw flowcharts for solving problems • To convert flowcharts/algorithms to C Programs, compile and debug programs • To use different operators, data types and write programs that use two-way/ multi-way selection • To select the best loop construct for a given problem • To design and implement programs to analyze the different pointer applications • To decompose a problem into functions and to develop modular reusable code • To apply File I/O operations


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5	ES1102	Computer Engineering Workshop	<ul style="list-style-type: none"> • Assemble and disassemble components of a PC • Construct a fully functional virtual machine, Summarize various Linux operating system commands, • Recognize characters & extract text from scanned images, Create audio files and podcasts
6	HS1102	English Communication Skills Laboratory	-----
7	BS1103	Applied Chemistry Lab	-----
8	ES1103	Programming for Problem Solving using C Lab	<ul style="list-style-type: none"> • Gains Knowledge on various concepts of a C language. • Able to draw flowcharts and write algorithms. • Able design and development of C problem solving skills. • Able to design and develop modular programming skills. • Able to trace and debug a program
9	MC1101	Environmental Science*	-----


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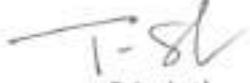
I Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS1201	Mathematics – II	<ul style="list-style-type: none"> • Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) • Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3) • Evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5) • Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) • Apply numerical integral techniques to different Engineering problems (L3) • Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)
2	ES1201	Digital Logic Design	<ul style="list-style-type: none"> • An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. • An ability to understand the different switching algebra theorems and apply them for logic functions. • An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions. • Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays. • Students will be able to design various sequential circuits starting from flip-flop to registers and counters
3	BS1202	Applied Physics	<ul style="list-style-type: none"> • Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) • Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).

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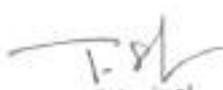
			<ul style="list-style-type: none"> Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2). Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
4	ES1202	Python Programming	<ul style="list-style-type: none"> Develop essential programming skills in computer programming concepts like data types, containers Apply the basics of programming in the Python language Solve coding tasks related conditional execution, loops Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming
5	CS1201	Data Structures	<ul style="list-style-type: none"> Summarize the properties, interfaces, and behaviors of basic abstract data types Discuss the computational efficiency of the principal algorithms for sorting & searching Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs Demonstrate different methods for traversing trees
6	BS1203	Applied Physics Lab	-----
7	ES1203	Python Programming Lab	<ul style="list-style-type: none"> Write, Test and Debug Python Programs Use Conditionals and Loops for Python Programs Use functions and represent Compound data using Lists, Tuples and Dictionaries. Use various applications using python
8	CS1202	Data Structures Lab	<ul style="list-style-type: none"> Use basic data structures such as arrays and linked list. Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths. Use various searching and sorting algorithms.
			<p>Understand historical background of the constitution making and its importance for building a democratic India.</p> <p>Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.</p>

9	MC1201	Constitution of India	<ul style="list-style-type: none"> • Understand the value of the fundamental rights and duties for becoming good citizen of India. • Analyze the decentralization of power between central, state and local self-government. • Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy. • Know the sources, features and principles of Indian Constitution. • Learn about Union Government, State government and its administration. • Get acquainted with Local administration and Pachayati Raj. • Be aware of basic concepts and developments of Human Rights. • Gain knowledge on roles and functioning of Election Commission
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II Year – I SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS	Mathematics III	<ul style="list-style-type: none"> • Interpret the physical meaning of different operators such as gradient, curl and divergence (L5) • Estimate the work done against a field, circulation and flux using vector calculus (L5) • Apply the Laplace transform for solving differential equations (L3) • Find or compute the Fourier series of periodic signals (L3) • Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3) • Identify solution methods for partial differential equations that model physical processes (L3)
2	CS	Mathematical Foundations of Computer Science	<ul style="list-style-type: none"> • Demonstrate skills in solving mathematical problems • Comprehend mathematical principles and logic • Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software • Manipulate and analyze data numerically and/or graphically using appropriate Software • Communicate effectively mathematical ideas/results verbally or in writing
3	CS	Introduction to Artificial Intelligence and Machine Learning	<ul style="list-style-type: none"> • Enumerate the history and foundations of Artificial Intelligence • Apply the basic principles of AI in problem solving • Choose the appropriate representation of Knowledge • Enumerate the Perspectives and Issues in Machine Learning • Identify issues in Decision Tree Learning
4	CS	Object Oriented Programming with Java	<ul style="list-style-type: none"> • Able to realize the concept of Object Oriented Programming & Java Programming Constructs • Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords • Apply the concept of exception handling and Input/Output operations • Able to design the applications of Java & Java applet • Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit


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5	CS	Database Management Systems	<ul style="list-style-type: none"> Describe a relational database and object-oriented database Create, maintain and manipulate a relational database using SQL Describe ER model and normalization for database design Examine issues in data storage and query processing and can formulate appropriate solutions Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
6	CS	Introduction to Artificial Intelligence and Machine Learning Lab	<ul style="list-style-type: none"> Apply the basic principles of AI in problem solving using LISP/PROLOG Implement different algorithms using LISP/PROLOG Develop an Expert System using JESS/PROLOG
7	CS	Object Oriented Programming with Java Lab	<ul style="list-style-type: none"> Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism Construct Threads, Event Handling, implement packages, developing applets
8	CS	Database Management Systems Lab	<ul style="list-style-type: none"> Utilize SQL to execute queries for creating database and performing data manipulation operations Examine integrity constraints to build efficient databases Apply Queries using Advanced Concepts of SQL Build PL/SQL programs including stored procedures, functions, cursors and triggers
9	SO	Mobile App Development	<ul style="list-style-type: none"> Identify various concepts of mobile programming that make it unique from programming for other platforms Critique mobile applications on their design pros and cons Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces, Program mobile applications for the Android operating system that use basic and advanced phone features and Deploy applications to the Android marketplace for distribution
10	MC	Essence of Indian Traditional Knowledge	<ul style="list-style-type: none"> Understand the significance of Indian Traditional Knowledge Classify the Indian Traditional Knowledge Compare Modern Science with Indian Traditional Knowledge system. Analyze the role of Government in protecting the Traditional Knowledge Understand the impact of Philosophical tradition on Indian Knowledge System.

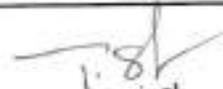

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II Year – II SEMESTER

S. No	Course Code	Courses	Course outcomes
1	BS	Probability and Statistics	<ul style="list-style-type: none"> Classify the concepts of data science and its importance Interpret the association of characteristics and through correlation and regression tools Make use of the concepts of probability and their applications Apply discrete and continuous probability distributions Design the components of a classical hypothesis test Infer the statistical inferential methods based on small and large sampling tests
2	CS	Computer Organization	<ul style="list-style-type: none"> Develop a detailed understanding of computer systems Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations Develop a detailed understanding of architecture and functionality of central processing unit Exemplify in a better way the I/O and memory organization Illustrate concepts of parallel processing, pipelining and inter processor communication
3	CS	Data Warehousing and Mining	<ul style="list-style-type: none"> Summarize the architecture of data warehouse Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data. Construct a decision tree and resolve the problem of model overfitting Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation Apply suitable clustering algorithm for the given data set
4	ES	Formal Languages and Automata Theory	<ul style="list-style-type: none"> Classify machines by their power to recognize languages. Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy Employ finite state machines to solve problems in computing Illustrate deterministic and non-deterministic machines Quote the hierarchy of problems arising in the computer science


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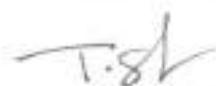
5	HS	Managerial Economics and Financial Accountancy	<ul style="list-style-type: none"> The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making
6	CS	R Programming Lab	<ul style="list-style-type: none"> Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming. Implement the concepts of R Script to extract the data from data frames and file operations. Implement the various statistical techniques using R. Extend the functionality of R by using add-on packages Use R Graphics and Tables to visualize results of various statistical operations on data
7	CS	Data Mining using Python Lab	<ul style="list-style-type: none"> Apply preprocessing techniques on real world datasets Apply apriori algorithm to generate frequent itemsets. Apply Classification and clustering algorithms on different datasets.
8	ES	Web Application Development Lab	<ul style="list-style-type: none"> Develop Single Page Applications Develop NodeJS & ReactJS Reusable Service Store the data in MySQL Get acquainted with the latest web application development trends in the IT industry
9	SO	Natural Language Processing with Python	<ul style="list-style-type: none"> Explore natural language processing (NLP) libraries in Python Learn various techniques for implementing NLP including parsing & text processing Understand how to use NLP for text feature engineering
10	Minor	Introduction to Artificial Intelligence and Machine Learning S	-----


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III B. Tech – I Semester

S.No	Course Code	Courses	Course outcomes
1	PC	Compiler Design	<ul style="list-style-type: none"> • Demonstrate phases in the design of compiler • Organize Syntax Analysis, Top Down and LL(1) grammars • Design Bottom Up Parsing and Construction of LR parsers • Analyze synthesized, inherited attributes and syntax directed translation schemes. Determine algorithms to generate code for a target machine
2	PC	Operating Systems	<ul style="list-style-type: none"> • Describe various generations of Operating System and functions of Operating System • Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance • Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques • Outline File Systems in Operating System like UNIX/Linux and Windows
3	PC	Machine Learning	<ul style="list-style-type: none"> • Explain the fundamental usage of the concept Machine Learning system • Demonstrate on various regression Technique • Analyze the Ensemble Learning Methods • Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning. • Discuss the Neural Network Models and Fundamentals concepts of Deep Learning
4	Open Elective/ Job Oriented	Open Elective-I Open Electives offered by other departments/ Optimization in Operations Research(Job oriented course)	-----
5	PE	Professional Elective-I 1. Software Engineering 2. Computer Vision 3. Data Visualization 4. DevOps 5. Machine Learning for Engineering and Science Applications (NPTEL) (https://nptel.ac.in/courses/106106198)	<ul style="list-style-type: none"> • Ability to transform an Object-Oriented Design into high quality, executable code • Skills to design, implement, and execute test cases at the Unit and Integration level <p>Compare conventional and agile software methods</p>

6	PC	Operating Systems & Compiler Design Lab	<ul style="list-style-type: none"> • Implement various scheduling, page replacement algorithms and algorithms related to deadlocks • Design programs for shared memory management and semaphores • Determine predictive parsing table for a CFG • Apply Lex and Yacc tools • Examine LR parser and generating SLR Parsing table
7	PC	Machine Learning Lab	<ul style="list-style-type: none"> • Implement procedures for the machine learning algorithms • Design and Develop Python programs for various Learning algorithms • Apply appropriate data sets to the Machine Learning algorithms • Develop Machine Learning algorithms to solve real world problems
8	SO	Skill Oriented Course - III Continuous Integration and Continuous Delivery using DevOps	<ul style="list-style-type: none"> • Understand the why, what and how of DevOps adoption • Attain literacy on Devops • Align capabilities required in the team • Create an automated CICD pipeline using a stack of tools
9	MC	Employability Skills-I	<ul style="list-style-type: none"> • Understand the corporate etiquette. • Make presentations effectively with appropriate body language • Be composed with positive attitude • Understand the core competencies to succeed in professional and personal life
10	PR	Summer Internship 2 Months (Mandatory) after second year(to be evaluated during V semester	-----
11	Minor	Machine Learning ⁵	<ul style="list-style-type: none"> • Implement procedures for the machine learning algorithms • Design and Develop Python programs for various Learning algorithms • Apply appropriate data sets to the Machine Learning algorithms • Develop Machine Learning algorithms to solve real world problems



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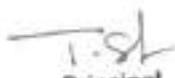
III B. Tech – II Semester

S.No	Course Code	Courses	Course outcomes
1	PC	Computer Networks	<ul style="list-style-type: none"> • Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards. • Discuss different transmission media and different switching networks. • Analyze data link layer services, functions and protocols like HDLC and PPP. • Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols • Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.
2	PC	Deep Learning	<ul style="list-style-type: none"> • Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning. • Discuss the Neural Network training, various random models. • Explain the Techniques of Keras, TensorFlow, Theano and CNTK • Classify the Concepts of CNN and RNN • Implement Interactive Applications of Deep Learning.
3	PC	Design and Analysis of Algorithms	<ul style="list-style-type: none"> • Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms • List and describe various algorithmic approaches and Solve problems using divide and conquer & greedy Method • Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations. • Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches • Demonstrate NP- Completeness theory, lower bound theory and String Matching
4	PE	Professional Elective-II 1. Software Project Management 2. Distributed Systems	<ul style="list-style-type: none"> • Apply the process to be followed in the software development life-cycle models • Apply the concepts of project management & planning • Implement the project plans through managing people, communications and change • Conduct activities necessary to successfully

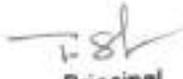
		3. Internet of Things 4. Network Programming	complete and close the Software projects <ul style="list-style-type: none"> Implement communication, modeling, and construction & deployment practices in software development
5	Open Elective/Job Oriented	Open Elective-II Open Electives offered by other departments/ MEAN Stack Development (Job Oriented Course)	<ul style="list-style-type: none"> Build static web pages using HTML 5 elements. Apply JavaScript to embed programming interface for web pages and also to perform Client side validations. Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js. Develop JavaScript applications using typescript and work with document database using MongoDB. Utilize Angular JS to design dynamic and responsive web pages.
6	PC	Computer Networks Lab	<ul style="list-style-type: none"> Know how reliable data communication is achieved through data link layer. Suggest appropriate routing algorithm for the network. Provide internet connection to the system and its installation. Work on various network management tools
7	PC	Algorithms for Efficient Coding Lab	<ul style="list-style-type: none"> Analyze the program execution time
8	PC	Deep Learning with Tensorflow	<ul style="list-style-type: none"> Implement deep neural networks to solve real world problems Choose appropriate pre-trained model to solve real time problem Interpret the results of two different deep learning models
9	SO	Skill Oriented Course - IV MEAN Stack Technologies- Module I- HTML 5, JavaScript, Node.js, Express.js and TypeScript OR Big Data : Apache Spark	<ul style="list-style-type: none"> Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles. Utilize JavaScript for developing interactive HTML web pages and validate form data. Build a basic web server using Node.js and also working with Node Package Manager (NPM). Build a web server using Express.js Make use of Typescript to optimize JavaScript code by using the concept of strict type checking
10	MC	Employability skills-I	<ul style="list-style-type: none"> Solve various Basic Mathematics problems by following different methods Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems

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			<ul style="list-style-type: none"> • Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life. • Analyze, summarize and present information in quantitative forms including table, graphs and formulas
11	Minor	Deep Learning ⁵	<ul style="list-style-type: none"> • Implement deep neural networks to solve real world problems • Choose appropriate pre-trained model to solve real time problem <p>Interpret the results of two different deep learning models</p>
Minor courses through SWAYAM			

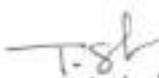

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IV B. Tech –I Semester (Tentative)			
S.No	Course Code	Course Title	Course outcomes
1	PE	Professional Elective-III 1.Reinforcement Learning 2. Soft Computing 3. Cryptography and Network Security 4. Block Chain Technologies 5. Speech Processing	<ul style="list-style-type: none"> Understand basic concepts of Reinforcement learning Identifying appropriate learning tasks for Reinforcement learning techniques Understand various methods and applications of reinforcement learning
2	PE	Professional Elective-IV 1. Robotic Process Automation 2. Cloud Computing 3. Big Data Analytics 4. NOSQL Databases 5. Video Analytics	<ul style="list-style-type: none"> Describe RPA, where it can be applied and how it's implemented. Describe the different types of variables, Control Flow and data manipulation techniques. Identify and understand Image, Text and Data Tables Automation. Describe how to handle the User Events and various types of Exceptions and strategies. Understand the Deployment of the Robot and To maintain the connection.
3	PE	Professional Elective-V 1. Social Network Analysis 2. Recommender Systems 3. AI Chatbots 4. Object Oriented Analysis and Design 5. Semantic Web	<ul style="list-style-type: none"> Analyze the nature of complex system and its solutions. Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships Analyze & Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications. Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams. Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems
4	Open Elective /Job Oriented	Open Elective-III Open Electives offered by other departments/API and Microservices (Job Oriented Course)	-----
5	Open Elective /Job Oriented	Open Elective-IV Open Electives offered by other departments/Secure Coding Techniques (Job Oriented Course)	-----
6	HS	Universal Human Values 2: Understanding Harmony	-----


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7	SO	1. Machine Learning with Go (Infosys Spring Board) OR 2. MEAN Stack Technologies-Module II- Angular JS and MongoDB	<ul style="list-style-type: none"> • Build a component-based application using Angular components and enhance their functionality using directives. • Utilize data binding for developing Angular forms and bind them with model data. • Apply Angular built-in or custom pipes to format the rendered data. • Develop a single page application by using synchronous or asynchronous Angular routing. Make use of MongoDB queries to perform CRUD operations on document database.
8	PR	Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester)	-----
9	Minor	Reinforcement Learning	<ul style="list-style-type: none"> • Understand basic concepts of Reinforcement learning • Identifying appropriate learning tasks for Reinforcement learning techniques • Understand various methods and applications of reinforcement learning
Minor Courses through SWAYAM			

IV B. Tech –II Semester						
S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	Project	Major Project Work, Seminar, Internship	-	-	-	12
Total credits						12


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ELECTRONICS AND COMMUNICATION ENGINEERING

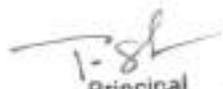
I Year –I SEMESTER

S. No.	Category	Subjects	Course Outcomes
1	HS	Communicative English	<ul style="list-style-type: none"> Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information Ask and answer general questions on familiar topics and introduce oneself/others Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs Form sentences using proper grammatical structures and correct word forms
2	BS	Mathematics –I(Calculus)	<ul style="list-style-type: none"> Utilize mean value theorems to real life problems (L3) Solve the differential equations related to various engineering fields (L3) Familiarize with functions of several variables which is useful in optimization (L3) Apply double integration techniques in evaluating areas bounded by region (L3) Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)
3	BS	Applied Chemistry	<ul style="list-style-type: none"> Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers. Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors. Analyze the principles of different analytical instruments and their applications. Design models for energy by different natural sources. Obtain the knowledge of computational chemistry and molecular machines
			<ul style="list-style-type: none"> To write algorithms and to draw flowcharts for solving problems To convert flowcharts/algorithms to C Programs, compile and debug programs To use different operators, data types and write programs that use two-way/ multi- way

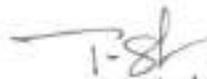
4	ES	Programming for Problem Solving Using C	<ul style="list-style-type: none"> selection To select the best loop construct for a given problem To design and implement programs to analyze the different pointer applications To decompose a problem into functions and to develop modular reusable code To apply File/Operations.
5	BS	Engineering Drawing	<ul style="list-style-type: none"> The student will learn how to visualize 2D & 3D objects.
6	LC	English Communication Skills Laboratory	-----
7	LC	Applied Chemistry Lab	-----
8	LC	Programming for Problem Solving Using C Lab	-----

I Year – II SEMESTER

S. No	Category	Subjects	Course Outcomes
1	BS	Mathematics –II (Linear Algebra and Numerical Methods)	<ul style="list-style-type: none"> Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3) Evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5) Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3) Apply numerical integral techniques to different Engineering problems (L3) Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)
2	BS	Applied Physics	<ul style="list-style-type: none"> Explain the need of coherent sources and the conditions for sustained interference(L2) Identify engineering applications of interference(L3) Analyze the differences between interference and diffraction with applications(L4) Illustrate the concept of polarization of light and its applications(L2) Classify ordinary polarized light and extraordinary polarized light(L2)


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3	ES	Object Oriented Programming through Java	<ul style="list-style-type: none"> • Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard • Illustrate the basic principles of the object-oriented programming • Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.
4	ES	Network Analysis	<ul style="list-style-type: none"> • Gain the knowledge on basic network elements. will analyze the RLC circuits behavior in detailed. • Analyze the performance of periodic wave forms. • Gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h&g). • Analyze the filter design concepts in real world applications.
5	ES	Basic Electrical Engineering	<ul style="list-style-type: none"> • Able to explain the operation of DC generator and analyze the characteristics of DC generator. • Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DC motors. • Ability to analyze the performance and speed – torque characteristics of a3- phase induction motor and understand starting methods of 3- phase induction motor. • Capability to understand the operation of various special machines.


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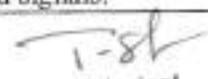
II Year –I Semester

S. No	Category	Name of the Subject	Course outcomes
1	PC	Electronic Devices and Circuits	-----
2	PC	Switching Theory and Logic Design	<ul style="list-style-type: none"> Classify different number systems and apply to generate various codes. Use the concept of Boolean algebra in minimization of switching functions Design different types of combinational logic circuits. Apply knowledge of flip-flops in designing of Registers and counters The operation and design methodology for synchronous sequential circuits and algorithmic state machines. Produce innovative designs by modifying the traditional design techniques.
3	PC	Signals and Systems	<ul style="list-style-type: none"> Differentiate the various classifications of signals and systems Analyze the frequency domain representation of signals using Fourier concepts Classify the systems based on their properties and determine the response of LTI Systems. Know the sampling process and various types of sampling techniques. Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).
4	BS	Mathematics-III (Transforms and Vector Calculus)	<ul style="list-style-type: none"> Interpret the physical meaning of different operators such as gradient, curl and divergence (L5) Estimate the work done against a field, circulation and flux using vector calculus (L5) Apply the Laplace transform for solving differential equations (L3) Find or compute the Fourier series of periodic signals (L3) Know and be able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3) Identify solution methods for partial differential equations that model physical processes (L3)

5	BS	Random Variables and Stochastic Processes	-----
6	LC	OOPS through Java Lab	-----
7	LC	Electronic Devices and Circuits -Lab	-----
8	LC	Switching Theory and Logic Design-Lab	
9	SC	Python Programming	<ul style="list-style-type: none"> • Know comprehensions, generators in python. • CO2: Know exception handling inpython • CO3: Know file I/O • CO4: Understand various data types like lists, tuples, strings etc • CO5: Know the usage of various pre-defined functions on the above data types

II Year – II Semester

S. No	Category	Name of the subject	Course outcomes
1	PC	Electronic Circuit Analysis	<ul style="list-style-type: none"> • Design and analysis of small signal high frequency transistor amplifier using BJT and FET. • Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT. • Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept. • Know the classification of the power and tuned amplifiers and their analysis with performance comparison
2	PC	Digital IC Design	<ul style="list-style-type: none"> • Understand the structure of commercially available digital integrated circuit families. • Learn the IEEE Standard 1076 Hardware Description Language (VHDL). • Model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping. • Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
3	PC	Analog Communications	<ul style="list-style-type: none"> • Familiarize with the fundamentals of analog communication systems. • Familiarize with various techniques for analog modulation and demodulation of signals. • Distinguish the figure of merits of various analog modulation methods. • Develop the ability to classify and understand various functional blocks of radio transmitters and receivers. • Familiarize with basic techniques for generating and demodulating various pulse modulated signals.


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4	ES	Linear control Systems	<ul style="list-style-type: none"> • This course introduces the concepts of feedback and its advantages to various control systems • The performance metrics to design the control system in time-domain and frequency domain are introduced. • Control systems for various applications can be designed using time-domain and frequency domain analysis. • In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.
5	HS	Management and Organizational Behavior	<ul style="list-style-type: none"> • After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure. • Will familiarize with the concepts of functional management that is HR Mand Marketing of new product developments. • The learner is able to think in strategically through contemporary management practices. • The learner can develop positive attitude through personality development and can equip with motivational theories. • The student can attain the group performance and grievance handling in managing the organizational culture.
6	LC	Electronic Circuit Analysis Lab	-----
7	LC	Analog Communications Lab	-----
8	LC	Digital IC Design Lab	-----
9	SC	Soft Skills	<ul style="list-style-type: none"> • Use language fluently, accurately and appropriately in debates and group discussions • Use their skills of listening comprehension to communicate effectively in cross-cultural contexts. • Learn and use new vocabulary. • Write resumes, project reports and reviews. • Exhibit interview skills and develop soft skills.
10	MC	Constitution of India	-----
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			


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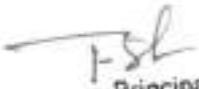
III Year - I Semester

S. No	Category	Name of the subject	Course outcomes
1	PC	Analog ICs and Applications	<ul style="list-style-type: none"> Describe the Op-Amp and internal Circuitry: 555 Timer, PLL Discuss the Applications of Operational amplifier: 555 Timer, PLL Design the Active filters using Operational Amplifier Use the Op-Amp in A to D & D to A Converters
2	PC	Electromagnetic Waves and Transmission Lines	<ul style="list-style-type: none"> Determine E and H using various laws and applications of electric & magnetic fields Apply the Maxwell equations to analyze the time varying behavior of EM waves Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media Calculate Brewster angle, critical angle and total internal reflection Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart
3	PC	Digital Communications	<ul style="list-style-type: none"> Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system. Analyze various source coding techniques. Compute and analyze Block codes, cyclic codes and convolution codes. Design a coded communication system.
4	OEI	Open Elective Course/Job oriented elective-1	<ul style="list-style-type: none"> Understand linear time invariant systems. Apply the concepts of Fourier series representations to analyze continuous and discrete time periodic signals. Understand and apply the continuous time Fourier transform, discrete time Fourier transform, Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems
			<ul style="list-style-type: none"> Students can understand the architecture of modern computer. They can analyze the Performance of a computer using performance equation

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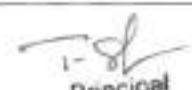
5	PEI	Professional Elective courses -1	<ul style="list-style-type: none"> • Understanding of different instruction types. • Students can calculate the effective address of an operand by addressing modes • They can understand how computer stores positive and negative numbers.
6	LC	Analog ICs and Applications LAB	-----
7	LC	Digital Communications Lab	-----
8	SC	Data Structures using Java Lab	-----
9	MC	Indian Traditional Knowledge	-----
		Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)	-----

<p>PEI:</p> <ol style="list-style-type: none"> 1. Antenna and Wave Propagation 2. Electronic Measurements and Instrumentation 3. Computer Architecture & Organization 	<p>OEL:</p> <p>Candidate should select the subject from list of subjects offered by other departments</p>
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III Year –II Semester

S. No	Category	Name of the subject	Course outcomes
1	PC	Microprocessor and Microcontrollers	<ul style="list-style-type: none"> Understand the architecture of microprocessor/ microcontroller and their operation Demonstrate programming skills in assembly language for processors and Controllers. Analyze various interfacing techniques and apply them for the design of processor / Controller based systems.
2	PC	VLSI Design	<ul style="list-style-type: none"> Demonstrate a clear understanding of CMOS fabrication flow and technology scaling. Apply the design Rules and draw layout of a given logic circuit. Design basic building blocks in Analog IC design. Analyze the behavior of amplifier circuits with various loads. Design various CMOS logic circuits for design of Combinational logic circuits. Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS. Design various applications using FPGA.
3	PC	Digital Signal Processing	<ul style="list-style-type: none"> Apply the difference equations concept in the analysis of Discrete time systems Use the FFT algorithm for solving the DFT of a given signal Design a Digital filter (FIR&IIR) from the given specifications Realize the FIR and IIR structures from the designed digital filter. Use the Multirate Processing concepts in various applications (eg: Design of phaseshifters, Interfacing of digital systems Apply the signal processing concepts on DSP Processor.
4	PE2	Professional Elective courses - 2	<ul style="list-style-type: none"> Design different modes in waveguide structures Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices. Measure various microwave parameters using a Microwave test bench


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5	OE 2	Open Elective Course/Job oriented elective -2	<ul style="list-style-type: none"> • Develop intelligent systems leveraging the paradigm of soft computing techniques. • Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions. • Recognize the feasibility of applying a soft computing methodology for a particular problem • Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks. • Design hybrid system to revise the principles of soft computing in various application
6	LC	Microprocessor and Microcontrollers - Lab	-----
7	LC	VLSI Design Lab	-----
8	LC	Digital Signal Processing Lab	-----
9	SC	ARM based/ Aurdino based Programming	<ul style="list-style-type: none"> • Comprehend Microcontroller-Transducers Interface techniques • Establish Serial Communication link with Arduino • Analyze basics of SPI interface. • Interface Stepper Motor with Arduino • Analyze Accelerometer interface techniques
10	MC	Research Methodology	-----
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			

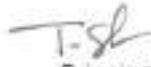
Industrial/Research Internship (Mandatory) 2 Months during summer vacation

PE2:

1. Microwave Engineering
2. Mobile & Cellular Communication
3. Embedded Systems
4. CMOS Analog IC Design

OE2:

Candidate should select the subject from list of subjects offered by other departments


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IV Year –I Semester

S. No	Category	Name of the subject	Course outcomes
1	PE	Professional Elective courses -3	<ul style="list-style-type: none"> Choose necessary components required in modern optical communications systems . Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers. Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems. Choose the optical cables for better communication with minimum losses Design, build, and demonstrate optical fiber experiments in the laboratory.
2	PE	Professional Elective courses -4	<ul style="list-style-type: none"> Understand the concepts, applications and subsystems of Satellite communications. Derive the expression for G/T ratio and to solve some analytical problems on satellitelink design. Understand the various types of multiple access techniques and architecture of earthstation design. Understand the concepts of GPS and its architecture
3	PE	Professional Elective courses -5	<ul style="list-style-type: none"> Derive the radar range equation and to solve some analytical problems. Understand the different types of radars and its applications. Understand the concept of tracking and different tracking techniques. Understand the various components of radar receiver and its performance.
4	OE	Open Elective Courses/ Job oriented elective -3	<ul style="list-style-type: none"> Understand linear time invariant systems. Apply the concepts of Fourier series representations to analyze continuous and discrete time periodic signals. Understand and apply the continuous time Fourier transform, discrete time Fourier transform, Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems


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5	OE	Open Elective Courses/ Job oriented elective -4	<ul style="list-style-type: none"> • Use the FFT algorithm for solving the DFT of a given signal • Design a Digital filter (FIR&IIR) from the given specifications • Realize the FIR and IIR structures from the designed digital filter. • Use the Multirate Processing concepts in various applications • Apply the Adaptive signal processing concepts to various signal processing applications
6	HS	*Humanities and Social Science Elective	-----
7	SC	Designer tools (HFSS, Microwave Studio CST, Cadence Virtuoso, Synopsys, Mentor Graphics, Xilinx.)	-----
Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)			-----
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			

<u>PE 3:</u> 1. Optical Communication 2. Digital Image Processing 3. Low Power VLSI Design	<u>PE5:</u> 1. Radar engineering 2. Pattern recognition & Machine Learning 3. Internet of Things
<u>PE4:</u> 1. Satellite Communications 2. Soft Computing Techniques 3. Digital IC Design using CMOS	

IV Year – II Semester

S. No.	Category	Code	Course Title	Hours per week			Credits
1	Major Project	PROJ	Project work, seminar and internship in industry	-	-	-	12
INTERNSHIP (6 MONTHS)							


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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
IV Year – I SEMESTER

S. No	Course Code	Subjects	Course outcomes
1		Switchgear & Protection	<ul style="list-style-type: none"> Understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type. Improves the ability to understand various types of protective schemes used for feeders and bus bar protection. Understand different types of static relays and their applications. Understand different types of over voltages and protective schemes required for insulation co-ordination.
2		Renewable Energy Systems	<ul style="list-style-type: none"> Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface. Design solar thermal collectors, solar thermal plants. Design solar photo voltaic systems. Develop maximum power point techniques in solar PV and wind energy systems. Explain wind energy conversion systems, wind generators, power generation. Explain basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.
3		OOPs through JAVA	<ul style="list-style-type: none"> Understand Java programming concepts and utilize Java Graphical User Interface in Program writing. Write, compile, execute and troubleshoot Java programming for networking concepts. Build Java Application for distributed environment. Design and Develop multi-tier applications. Identify and Analyze Enterprise applications.
			<ul style="list-style-type: none"> Understand various levels of illuminosity produced by different illuminating sources and able to estimate the illumination levels produced by various sources and recommend the most efficient

4		Elective – II	<p>illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.</p> <ul style="list-style-type: none"> • Identify most appropriate heating and welding techniques for suitable applications. • Identify a suitable motor for electric drives and industrial applications • Determine the speed/time characteristics of different types of traction systems and determination of various traction parameters. • Know the necessity and usage of different energy storage schemes for different applications.
5		Power Systems & Simulation Laboratory	<ul style="list-style-type: none"> • Design main dimensions of rotating machines. • Design transformers and determine main dimensions. • Design field circuit of DC machines and Synchronous machines. • Design armature of DC machines and AC machines
6		Elective - III	<ul style="list-style-type: none"> • Understand various levels of illuminosity produced by different illuminating sources and able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view. • Identify most appropriate heating and welding techniques for suitable applications. • Identify a suitable motor for electric drives and industrial applications • Determine the speed/time characteristics of different types of traction systems and determination of various traction parameters. • Know the necessity and usage of different energy storage schemes for different applications.
			<ul style="list-style-type: none"> • Formulate different state models in canonical forms. • Design of state feedback control using the pole placement technique and state observer design for a

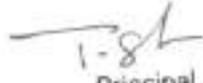
7		Linear & Digital IC Applications Laboratory	<p>given control system.</p> <ul style="list-style-type: none"> Analyse of nonlinear system using the describing function technique and determine the stability of a linear autonomous system using Lyapunov method. Determine minimization of functionals using calculus of variation studied. Formulate and solve the LQR problem and Riccati equation.
8		Industrial Training /Skill Development Programmes / Research Project	<ul style="list-style-type: none"> Know the concept of electric vehicles and hybrid electric vehicles. Familiar with different configuration of hybrid electric vehicles. Understand the power converters used in hybrid electric vehicles Know different batteries and other energy storage systems.

IV Year – II SEMESTER

S. No	Course Code	Subjects	Course outcomes
1		Power System Operation & Control	<ul style="list-style-type: none"> Compute optimal scheduling of Generators. Understand hydrothermal scheduling. Understand the unit commitment problem. Understand importance of the frequency. Understand importance of PID controllers in single area and two area systems. Understand reactive power control and compensation for transmission line.
2		Open Elective - II	<ul style="list-style-type: none"> Choose right type of instrument for measurement of ac and dc Electrical quantities. Choose right type of instrument for measurement of power and power factor. Select right type for measurement of R, L, C. Understand the effectiveness of Transducer. Understand Digital Meters.
3		Elective - IV	<ul style="list-style-type: none"> Learn about various methods used for electrical energy based heating and welding applications. Know about the mechanisms, equipment and technology used in the electric traction.

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			<ul style="list-style-type: none"> Understand the importance of electrical earthing, earthing equipment and electrical earthing measurement methods.
4		Project-II	-----


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DEPARTMENT OF CIVIL ENGINEERING
IV YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	Course Outcomes
1	PC701	Design & Drawing of Steel Structures	<ul style="list-style-type: none"> • Work with relevant IS codes • Carryout analysis and design of flexural members and detailing • Design compression members of different types with connection detailing • Design Plate Girder and Gantry Girder with connection detailing • Produce the drawings pertaining to different components of steel structures
2	PC702	Geotechnical Engineering - II	<ul style="list-style-type: none"> • The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics. • The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly. • The student must be able to use the field test data and arrive at the bearing capacity. • The student must be able to apply the principles of bearing capacity of piles and design them accordingly.
3	PC703	Remote Sensing & GIS	<ul style="list-style-type: none"> • Be familiar with ground, air and satellite based sensor platforms. • interpret the aerial photographs and satellite imageries • create and input spatial data for GIS application • apply RS and GIS concepts for application in Civil Engineering
4	PE701	Program Elective – III	<ul style="list-style-type: none"> • Explain different types of Bridges with diagrams and Loading standards • Carryout analysis and design of Slab bridges, T Beam bridges and suggest structural detailing • Carryout analysis and design of Plate girder bridges • Organize for attending inspections and maintenance of bridges and prepare reports. • Know the quality and quantity of water for various industries and Advanced water treatment methods • Learn the common methods of treatment of wastewaters and Biological treatment methods • Study of methods to reduce impacts of disposal of wastewaters into environment and CETPs. • Study of methods of treatment of

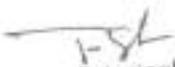
			<p>wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods</p> <ul style="list-style-type: none"> • Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatment methods • Able to design earth and rock fill dams • get familiarity with slope stability calculations, • prevention techniques for slope failures • Identify the benefits of ITS from various types • Determine various sensor applications and ITS data collection techniques • Identify ITS user services and functional areas • Determine various ITS models, evaluation methods and ITS planning. • Determine the suitable ITS technology and assess its effectiveness to solve transportation problems • Types of air conditioning, • Types of transportation system, • Firefighting, electrical services, • Concepts of green building and energy efficient systems
5	OE701	Open Elective – III	
6	PC704	Remote Sensing & GIS Lab	<ul style="list-style-type: none"> • Work comfortably on GIS software • Digitize and create thematic map and extract important features • Develop digital elevation model • Interpretation and Estimation of features from satellite imagery. • Analyze and Modelling using GIS software.
7	PC705	Geotechnical Engineering Lab	<ul style="list-style-type: none"> • Determine index properties of soil and classify them. • Determine permeability of soils. • Determine Compaction, Consolidation and shear strength characteristics.
8	PR701	Industrial Training/ Internship or Seminar	-----
9	PR702	Project Work Phase-I	-----

IV YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	Course Outcomes
1	PC801	Estimation Specifications and Contract	<ul style="list-style-type: none"> ● The student should be able to determine the quantities of different components of buildings. ● The student should be in a position to find the cost of various building components. ● The student should be capable of finalizing the value of structures.
2	PE801	Program Elective - IV	<ul style="list-style-type: none"> ● Solve simple boundary value problems using Numerical technique of Finite element method ● Develop finite element formulation of one and two dimensional problems and solve. ● Assemble Stiffness matrices, apply boundary conditions and solve for displacements ● Compute Stresses and Strains and interpret the result. ● student will be able to To design various irrigation structures. ● Use theory of vibrations to find the behavior of soil under dynamic loading. ● Design machine foundations under different loads and soil conditions. ● Understand the liquefaction phenomena. ● Conduct various laboratory and field tests to determine the dynamic soil properties and its interpretation. ● Design vibration isolators under any vibratory machines. ● To understand fundamental of Traffic Engg. ● To investigate & determine the collective factors & remedies of accident involved. ● To design & planning various road geometrics. ● To manage the traffic system from road safety point of view. ● the application of Disaster Concepts to Management ● Analyzing Relationship between Development and Disasters. ● Ability to understand Categories of Disasters and ● realization of the responsibilities to society


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3	PE802	Program Elective – V	<ul style="list-style-type: none"> • Differentiate Determinate and Indeterminate Structures • Carryout lateral Load analysis of structures • Analyze Cable and Suspension Bridge structures • Analyze structures using Moment Distribution, Kani's Method and Matrix methods • develop intensity duration frequency curves for urban drainage systems • develop design storms to size the various components of drainage systems. • apply best management practices to manage urban flooding. • prepare master drainage plan for an urbanized area • By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations. • The student should be in a position to design a reinforced earth embankment and check its stability. • The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice. • The student should be able to understand the concepts and applications of grouting. • Understand the features and functions of pavement management systems • Asses pavement performance by observing different models • Evaluate the pavement functionally and structurally • Identify and select suitable design strategies and decide the maintenance and rehabilitation measures required for a given pavement • Acquire knowledge of expert systems for managing pavements
4	PR801	Project Work Phase-II	<ul style="list-style-type: none"> • Apply all levels of Engineering knowledge in solving the Engineering problems. • Work together with team spirit. • Use Civil Engineering software at least one. • Document the projects


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