2019 SCHEME

PROGRAMME OUTCOMES

PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES

1	B.Tech in Automobile Engineering
2	B.Tech in Civil Engineering
3	B.Tech in Computer Science and Engineering
4	B.Tech in Electronics and Communication Engineering
5	B.Tech in Electrical and Electronics Engineering
6	B.Tech in Mechanical Engineering
7	B.Tech in Computer Science and Engineering(Data Science)
8	B.Tech in Computer Science and Engineering(Artificial Intelligence)

PROGRAMME OUTCOME	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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SCMS SCHOOL OF ENGINEERING & TECHNOLOGY

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B.TECH IN AUTOMOBILE ENGINEERING

PROGRAMME SPECIFIC OUTCOME

PSO1	Apply basic science and mathematical principles to design, develop or reengineer automobiles.
PSO2	Design or develop subsystems required for building safe, efficient and green vehicles.
PSO3	Applying knowledge of the function of various automobile components and systems for continuous and preventive service and maintenance.

COURSE OUTCOMES

SEMESTER 1

MAT 101	**LINEAR ALGEBRA AND CALCULUS**
CO1	solve the consistent system of linear equations and apply orthogonal to a quadratic form
CO2	find the maxima and minima of multivariable functions
CO3	find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas using double and triple integrals
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	Determine the power series expansion of a given function
PHT 110	**ENGINEERING PHYSICS (B)**

CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and identifythese phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principlesof quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Apply the knowledge of ultrasonic in non-destructive testing and use the principles of acoustics to explain the nature and characterisation of acoustics design and to provide a safe and healthy enviornemnet
CO5	Apply the comprehended knowledge about laser and fibre optic communication systems invarious engineering applications
EST 100	**ENGINEERING MECHANICS**
CO1	To apply the theorems and principles related to rigid body mechanics.
CO2	To identify and depict the components of system of forces acting on the rigid body.
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses.
EST130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**
CO1	Apply fundamental concepts and circuit laws to solvesimple DC electric and magneticCircuits
CO2	Develop and solve models of magnetic circuits

CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState
CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUT101	**LIFE SKILLS**
CO1	Define and Identify different life skills required in personal and professional life
CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.
CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.
CO4	Take part in Group discussions
CO5	Use appropriate thinking and problem solving technique to solve problems
CO6	Understand the basics of teamwork and leadership
PHL120	**ENGINEERING PHYSICS LAB**
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.

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CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating.
ESL130	**ELECTRICAL AND ELECTRONICS WORKSHOP**
CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
SEMESTER 2	
MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications

CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
CYT100	**ENGINEERING CHEMISTRY**
CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.

CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.
CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, metal joining and machining processes

HUN102	PROFESSIONAL COMMUNICATION
CO1	Develop vocabulary and language skills relevant to engineering as a profession
CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
EST102	PROGRAMMING IN C
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output

CYL120	ENGINEERING CHEMISTRY LAB
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis
CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	CIVIL AND MECHANICAL WORKSHOP
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.
CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects

CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades
CO8	Apply appropriate safety measures with respect to the mechanical workshop trades

| **SEMESTER 3** ||

MA201	**LINEAR ALGEBRA AND COMPLEX ANALYSIS**
CO1	Relate the concepts of basic calculus in complex functions.
CO2	Recognise the harmonic functions and construction of harmonic conjugate.
CO3	Describe the geometry of analytic functions and identify their conformal mapping.
CO4	Identify the singularities and formulate the residues to evaluate the real definite integrals.
CO5	Apply gauss elimination method to solve the system of equations.
CO6	Diagonalise a matrix by calculating eigen values and eigen vectors.

ME201	**MECHANICS OF SOLIDS**
CO1	Acquire knowledge on the concepts of stress and strain in elastic materials.
CO2	Explain the concept of strain energy due to tension, compression and shear.
CO3	Analyse structural members subjected to different types of loading and sketch SFD and BMD

CO1	Understand the types of chassis layouts and types of tires
CO2	Acquires knowledge of the constructional details of front wheel drive
CO3	Understand the constructional details of rear drive axle and components.
CO4	Understand the constructional details of suspension systems
CO5	Understand the constructional details of braking systems
CO6	Understand the steering system and its components
HS210	**LIFESKILLS**
CO1	Know the nuances of technical communication to interpret the cues of non-verbal communication so as to develop communicative efficiency in oral and written format; and demonstrate competency to face interview and group discussion.
CO2	Recall and understand the various theories related to creativity to illustrate critical thinking and problem solving abilities.
CO3	Describe and differentiate the concepts involved in groups and teams and illustrate the ability to function effectively as an individual, and as a member or leader in diverse teams.
CO4	Define the terms as well as grasp the distinction between different terms related to ethics and values; assess the different moral and ethical theories to Engineering ethics and Human value.
CO5	Identify and discuss the different leadership styles and choose the suitable style to become an effective leader.
ME230	**FLUID MECHANICS & MACHINES LAB**
CO1	Sketch and illustrate the various components of buildings.

CO2	Develop plan, section and elevation of buildings with site plan based on functional requirements and KMBR.
CO3	Use AUTOCAD to draft 2D drawings.
CE230	**MATERIAL TESTING LAB**
CO1	Evaluate material properties.
CO2	Interpret experimental data and reach a substantiated conclusion based on standards.
CO3	Apply engineering fundamentals to identify the behavior of different materials in flexure, shear, torsion.
	SEMESTER 4
MA202	**PROBABILITY DISTRIBUTIONS TRANSFORMS AND NUMERICAL METHODS**
CO1	its mean and variance and solve problems on binomial and Poisson distributions. Explain continuous random variables and associate them with Normal, Uniform, Exponential distributions, their properties such as mean and variance and calculate
CO2	Applies Fourier integrals and transforms to analyse linear systems and signal processing problems.
CO3	Apprehend the knowledge of Laplace transforms and apply it in solving ordinary differential equations and compute convolutions.
CO4	Analyse various numerical techniques and to obtain approximate solutions to otherwise intractable mathematical problems. Evaluate the solutions of equations using numerical techniques.
AU202	**ADVANCED THERMODYNAMICS**
CO1	To impart knowledge to the student about thermodynamic concepts and different power cycles.

CO2	To make the students to solve numerical problems based on laws of thermodynamics and
AU204	**C I ENGINES & COMBUSTION**
CO1	An understanding of the diesel fuels and its various properties and the parameters that affect the combustion process of diesel fuel.
CO2	Describe various components of the fuel injection system and different types of fuel pumps.
CO3	To impart knowledge on the modern fuel systems available for CI engines
CO4	An understanding of the exhaust gas composition and various testing of I.C engines
CO5	An understanding of sources and causes of pollution by diesel engines
CO6	Summarize the knowledge about turbocharging and supercharging and an overview of the governors and cold starting devices.
AU206	**AUTO TRANSMISSION**
CO1	Acquires theoretical knowledge of operation of different types of clutches and understand the performance of vehicle under different conditions of resistance to motion
CO2	Acquires the knowledge of determination of gear ratios for vehicles and working of gearboxes and gear shifting mechanisms in each.
CO3	Acquires the knowledge of construction and operation of Ford – T-model gearbox, Wilson Gear box and electromagnetic transmission.
CO4	Acquires the theoretical knowledge of Principle of operation, Constructional details of Fluid coupling and torque converters
CO5	Acquires the knowledge of Principle of operation of automatic transmission and Continuously Variable Transmission (CVT)

CO6	Acquires the knowledge of various types of hydrostatic drives and electric drives
AU208	**COMPUTER PROGRAMMING**
CO1	Familiarize the microcontroller modules and the importance of c in automobile industry
CO2	Develop C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
CO3	Apply the concepts of Arrays, Strings and Structure in 'C' language for user defined problems.
CO4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output
HS200	**BUSINESS ECONOMICS**
CO1	Remember economics concepts and tools to make better decisions.
CO2	Remember economics concepts and tools to make better decisions.
CO3	Apply cost and benefits analysis for business projects.
CO4	Apply and analyse the financial performance of business projects.
AU232	**COMPUTER PROGRAMMING LAB**

CO1	Provide experience in programming with C language
CO2	Give exposure to computer software's like MATLAB
CO3	Programming in C covering control structures functions, arrays, structures, pointers and files
AU234	**VEHICLE SYSTEMS LAB**
CO1	Study about hand tools, special purpose tools, and their uses.
CO2	Familiarize yourself with various systems and components of an automobile.
CO3	Writing technical specifications and description of all types of chassis and transmission components of automobiles, including body and interiors.
SEMESTER 5	
ME307	**MACHINE DESIGN I**
CO1	Develop the design and practical problem-solving skills in the area of mechanisms through velocity and acceleration analysis
CO2	Develop the design and practical problem-solving skills in the area of mechanisms through static and dynamic force analysis
CO3	Understand the working and application of different types of Governors.
CO4	Interpret the precessional motion and gyroscopic couple and apply them for the stability analysis of automobiles, ships and aircrafts
CO5	Apply energy principles to determine the energy fluctuations of a flywheel and demonstrate the concepts of static and dynamic balancing to rotating and reciprocating machine parts and analyse them for the amount of required balance.

C06	Generate profile of cam to get required follower motion for any application. Analyze kinematic parameters of gears in mesh for typical power transmission application
ME309	**METALLURGY & MATERIAL SCIENCE**
CO1	Identify the crystal structures of metallic materials
CO2	Analyze the binary phase diagrams of different alloys
CO3	Correlate the microstructure with properties, processing and performance of metals
CO4	Recognize the failure of metals with structural change
CO5	Select materials for design and construction
CO6	Apply core concepts in materials science to solve engineering problems
ME311	**MANUFACTURING PROCESS**
CO1	To give an exposure to different techniques of casting and molds required.
CO2	To provide an exposure to different rolling processes and different rolled products
CO3	To familiarize with different forging methods, cautions to be adopted in die design.
CO4	To give an introduction to various work and tool holding devices used in manufacturing and apply the basic principles of clamping to clamp complex shaped objects
CO5	To introduce to the bending, shearing and drawing processes of sheet metal working and allied machines

CO6	To give an understanding of welding metallurgy and weldability and to introduce various metal joining techniques.
EE311	**ELECTRICAL DRIVES & CONTROL FOR AUTOMATION**
CO1	Students will be able to understand different types of dc generators, advantages and disadvantages
CO2	Students will be able to remember the operating principles of dc motors in different applications
CO3	Students will be able to understand the working principle of the transformer and evaluate the losses and efficiency.
CO4	Students will be able to apply the three-phase induction motor in different applications.
C05	Students will be able to analyze single phase induction motors and synchronous motors.
C06	Students will be able to apply different machines in automation.
AU307	**VEHICLE BODY ENGINEERING**
CO1	To impart knowledge on the design of vehicle body to give maximum comfort for the passengers
CO2	To discuss the methods of streamlining vehicle body to minimize drag
AU361	**ALTERNATIVE FUELS AND ENERGY SOURCES**
CO1	The students will understand the energy conversion, utilization and storage for renewable technologies.
CO2	The students will be familiar with the potential of using renewable energy technologies as a complement to the extent possible, replacement for conventional technologies and the possibility of combining renewable and non-renewable energy technologies in hybrid systems.
CO3	To understand the environmental aspects of energy usage and conversion

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AU341	DESIGN PROJECT
CO1	Think innovatively on the development of components, products, processes or technologies in the engineering field
CO2	Identify and analyze a current problem of interest
CO3	Develop a methodology and work plan to solve the problem
ME333	HEAT ENGINES LAB
CO1	To give hands-on experience in testing different properties of fuels & lubricants.
CO2	To perform characteristic tests on petrol and diesel engines.
ME335	PRODUCTION ENGINEERING LAB
CO1	To give an idea about different manufacturing processes and to perform different types of tests on various works.

SEMESTER 6

ME302	HEAT AND MASS TRANSFER
CO1	Solve problems involving steady state heat conduction with and without heat generation in simple geometries
CO2	Evaluate heat transfer coefficients for Natural convection and Forced convection situations using empirical relations.
CO3	Design Heat Exchangers and Fins and evaluate its performance.

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CO4	Solve problems involving transient heat conduction and understand the basics of Heat pipe, Boiling and Condensation
CO5	Estimate radiation heat transfer between black body and gray body surfaces.
C06	Solve problems involving mass transfer due to diffusion, chemical reaction and convection.
ME304	**DYNAMICS OF MACHINERY**
CO1	Develop the design and practical problem-solving skills in the area of mechanisms through static force analysis
CO2	Develop the design and practical problem-solving skills in the area of mechanisms through dynamic force analysis
CO3	Apply energy principles to determine the energy fluctuations of a flywheel and demonstrate the concepts of static and dynamic balancing to rotating and reciprocating machine parts and analyse them for the amount of required balance.
CO4	Interpret the precessional motion and gyroscopic couple and apply them for the stability analysis of automobiles, ships and aircrafts
CO5	Understand the basics of single degree of freedom vibrations, their measurements, transmission and control
CO6	Apply the concepts of multiple degrees of freedom vibrations in the design problem of mechanisms
ME314	**MACHINE DESIGN II**
CO1	The students will describe the design process, purpose of material selection, solve stresses and stress concentrations under variable loading.
CO2	The students will demonstrate the ability by correctly performing the design and analysis of different types of shafts and welded joints
CO3	The students will demonstrate the ability by correctly performing the design and analysis of clutches and brakes

CO4	The students will demonstrate the ability by correctly performing the design and analysis of sliding and rolling contact bearings
CO5	The students will apply the multidimensional static failure and analyze forces and design of gears.
CO6	The students will demonstrate the ability by performing correctly, material selection and design of engine parts.
AU302	**AUTOMOTIVE ELECTRICAL AND ELECTRONICS**
CO1	To understand the construction and working of different batteries and energy storage devices.
CO2	To understand the construction and working of the charging system and the starting system of automobiles.
CO3	To understand the construction and working of various types ignition systems
CO4	To understand the construction and working of various lighting systems and also the working of various instrumentation devices.
CO5	To understand the working principle and application of various sensors in automobiles
CO6	To understand how various electronic fuel injection systems work.
HS300	**PRINCIPLES OF MANAGEMENT**
CO1	Identify and discuss the relevance and different perspectives of management concepts.
CO2	Describe and utilize management techniques for meeting current and future management challenges faced by the organization.
CO3	Compare the management theories and models critically and demonstrate its validity in the real world.

CO4	Understand the different decision-making situations and outline the steps involved in solving problems faced by management.
CO5	Identify the skills required by a manager with varying working situations
AU362	**HYBRID AND FUEL CELL VEHICLES**
CO1	Understand the construction and working of various hybrid electric topologies.
CO2	Discuss the construction and working of various electric motors
CO3	Explain the various energy storage systems available.
CO4	Explain the procedure to match electric motor and ic engine.
CO5	Understand the construction and working of various types of fuel cells.
ME332	**COMPUTER AIDED DESIGN AND ANALYSIS LAB**
CO1	To provide working knowledge on Computer Aided Design methods and procedures
CO2	To impart training on solid modelling software
CO3	To impart training on finite element analysis software
AU332	**AUTO ELECTRICAL & ELECTRONICS LAB**
CO1	To familiarize the design and construction of various automotive electrical Systems

CO2	Identify the charging and discharging capacity of a battery through suitable tests
CO3	Students will understand how to design and construct various electrical system circuits
AU352	**COMPREHENSIVE EXAM**
CO1	Recall the comprehensive knowledge gained in courses relevant to civil engineering.
CO2	Comprehend the questions (Oral and written) and answer them with confidence.

SEMESTER 7

AU401	**AUTOMOTIVE SYSTEM DESIGN**
CO1	To impart basic definition and terminologies related to vehicle motion
CO2	To impart the aspects of design parameters of multi-cylinder engines.
CO3	To impart the design aspects of valve gears in an engine.
CO4	To impart the design aspects of engine structure and lubricating systems.
CO5	To impart the design aspects of cooling system components.
CO6	To impart the design aspects of the gear box and its components.
AU403	**VEHICLE DYNAMICS**
CO1	Acquires theoretical knowledge of vibrations and its effect and performance of automobiles.

CO2	Acquires the knowledge of tire dynamics tire vibrations and understeer and oversteer conditions.
CO3	Acquires the knowledge of types of suspension systems and dampers.
CO4	Acquires the knowledge of stability of a vehicle on slope, banked track and curved track
CO5	Acquires the knowledge of Principle of operation of brake, efficiency of braking and stopping distance.
CO6	Acquires the knowledge of various aerodynamic effect on a moving vehicle and aerodynamic aids
AU405	**AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING**
CO1	Explain the thermodynamic cycle of refrigeration Compute C.O.P and classify refrigerants
CO2	Understand various types of refrigerants and their properties, components of refrigeration system
CO3	Analyse the load needed for air conditions on various conditions
CO4	Understand the duct system in automotive air conditioning systems.
CO5	Understand working of Automotive heater system and its components
CO6	Understand maintenance and service procedure of Air conditioner
AU407	**ADVANCED IC ENGINES**
CO1	An understanding of the special types of engines
CO2	To understand about Dual Fuel Engine, Multi fuel engine

CO3	To understand about the lean burn engines
CO4	To understand about the gas turbines
CO5	To understand the difference between gas turbine and I C Engines"
CO6	To understand about stratified charge engine
AU409	**SIMULATION AND ANALYSIS OF IC ENGINE PROCESSES**
CO1	Analyze and calculate the adiabatic flame temperature for an IC engine process.
CO2	Analyze and calculate the adiabatic flame temperature for an SI engine under part throttle and full throttle conditions.
CO3	Analyze and calculate the adiabatic flame temperature for an CI engine under naturally aspirated and supercharged conditions.
CO4	Describe the factors that affect the breathing ability (intake/exhaust) of an Internal combustion engine.
CO5	Explain the working of scavenging process in two stroke engine
CO6	Describe how friction and heat transfer affects the performance of an internal combustion engine.
AU463	**OPERATION MANAGEMENT IN AUTO INDUSTRY**
CO1	To identify and discuss the relevance and different perspectives of operation management concepts
CO2	To describe and utilize operation management techniques for meeting current and future management challenges faced by the organization
CO3	To compare the operation management theories and models critically and to inspect and question its validity in the real world

CO4	To assess different decision making situations and develop methods to solve problems faced by operation management
CO5	To make use of operation management in order to execute the role of a manager in auto industry

AU431	**AUTOTRONICS LAB**
CO1	Understand the construction and working of various sensors.
CO2	Understand the function of various electronic components like transistor, capacitor, Darlington pair, microcontrollers, diodes etc.
CO3	Perform vehicle diagnostics and identify errors in vehicle operations.
CO4	Understand the relationship between temperature and resistance of a thermistor.
CO5	Understand the relationship between temperature and voltage of a thermistor.
CO6	Understand the relationship between temperature and current characteristics of an AD – 590 sensor.

AU451	**SEMINAR AND PROJECT PRELIMINARY**
CO1	Analyse a current topic of research / professional interest and present the matter effectively as a technical report and orally before an audience.
CO2	Identify problems relevant to the present civil engineering scenario and prepare a work plan based on knowledge gained from different courses and detailed literature review.

SEMESTER 8

AU402	**TWO & THREE WHEELERS**
CO1	To introduce the subject. Understanding of Power Plants

CO2	To understand the Fuel Supply System & Ignition systems.
CO3	To have a thorough understanding of Transmission System
CO4	To introduce the Chassis & Sub system.
CO5	To have a detailed look at Brakes & Wheels.
CO6	To impart knowledge on the Maintenance & Specifications of Two & Three Wheeler.
AU404	**ENGINE & VEHICLE MANAGEMENT SYSTEMS**
CO1	To understand the difference between open loop and closed control systems and the basic operating principle of engine ECU.
CO2	Analyze the input and output variables for electronic engine control and engine mapping
CO3	To understand the working of electronic fuel control systems and their response to various operating conditions
CO4	To understand how various system parameters affect combustion, noise and emissions in CI engines.
CO5	To understand how electronic control of automatic transmission takes place.
CO6	To understand how various advance driver assist systems work
AU464	**SPECIAL TYPE OF VEHICLES**
CO1	Acquires theoretical knowledge of construction and operation of tyre and tracked vehicles.
CO2	Acquires the knowledge of construction of hydraulic systems and final drives of earth moving and construction equipments
CO3	Acquires the knowledge of construction and operation of Excavators and graders.

CO4	Acquires the knowledge of construction and operation of Haulage vehicle and Lift Truck.
CO5	Acquires the knowledge of construction and operation of Cranes and Compaction vehicles.
CO6	Acquires the knowledge of construction and operation of Scrapers, Dozers and Loaders
AU462	**VEHICLE MAINTENANCE**
CO1	Understand the importance of vehicle inspection and maintenance
CO2	Understand the owner maintenance schedule of various automobiles
CO3	Diagnose the causes of common vehicle problems and provide remedial action
CO4	Understand the maintenance of electric vehicle
CO5	Possess the knowledge about the inspection and maintenance of modern vehicle systems
AU492	**FINAL PROJECT**
CO1	Apply the technical knowledge gained in solving real life engineering problems and elaborate it through a detailed design.
CO2	Develop prototypes / methodologies to solve the key issues related to Civil Engineering systems and conduct appropriate tests to measure and evaluate the performance of prototype/methodology.
CO3	Communicate the team's logistical and technical approaches to the final project using appropriate graphical/modelling tools through project report and presentation.

B.TECH IN CIVIL ENGINEERING	
PROGRAMME SPECIFIC OUTCOME	
PSO1	Graduates shall demonstrate good understanding of engineering fundamentals and demonstrate sound knowledge in analysis, design and laboratory investigations in various domains of Civil Engineering.
PSO2	Graduates will exhibit a passion for continuous self-learning and/ or pursue higher studies and engineering research.
PSO3	Graduates will possess ability to interact and function within multidisciplinary teams with competence in modern tool usage.
COURSE OUTCOMES	
SEMESTER 1	
MAT 101	**LINEAR ALGEBRA AND CALCULUS**
CO1	solve the consistent system of linear equations and apply orthogonal to a quadratic form
CO2	find the maxima and minima of multivariable functions

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CO3	find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas using double and triple integrals
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	Determine the power series expansion of a given function
PHT 110	**ENGINEERING PHYSICS (B)**
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and identifythese phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principlesof quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Apply the knowledge of ultrasonic in non-destructive testing and use the principles of acoustics to explain the nature and characterisation of acoustics design and to provide a safe and healthy enviornemnet
CO5	Apply the comprehended knowledge about laser and fibre optic communication systems invarious engineering applications
EST 100	**ENGINEERING MECHANICS**

CO1	To apply the theorems and principles related to rigid body mechanics.
CO2	To identify and depict the components of system of forces acting on the rigid body.
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses.
EST130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**
CO1	Apply fundamental concepts and circuit laws to solvesimple DC electric and magneticCircuits
CO2	Develop and solve models of magnetic circuits
CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState
CO4	Describe working of a voltage amplifier

CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUT101	**LIFE SKILLS**
CO1	Define and Identify different life skills required in personal and professional life
CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.
CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.
CO4	Take part in Group discussions
CO5	Use appropriate thinking and problem solving technique to solve problems
CO6	Understand the basics of teamwork and leadership
PHL120	**ENGINEERING PHYSICS LAB**

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CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus.
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating.
ESL130	**ELECTRICAL AND ELECTRONICS WORKSHOP**
CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools

CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
	SEMESTER 2
MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
CYT100	**ENGINEERING CHEMISTRY**

CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.

CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.
CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines

CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, metal joining and machining processes
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession
CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs

CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output
CYL120	**ENGINEERING CHEMISTRY LAB**
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses

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CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis
CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	**CIVIL AND MECHANICAL WORKSHOP**
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.

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CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades
CO8	Apply appropriate safety measures with respect to the mechanical workshop trades

SEMESTER 3

MAT201	**PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS**
CO1	Understand the concept and the solution of partial differential equation.
CO2	Analyse and solve one dimensional wave equation and heat equation.
CO3	Understand complex functions, its continuity differentiability with the use of Cauchy- Riemann equations.
CO4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function

CO5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
CET201	**MECHANICS OF SOLIDS**
CO1	Recall the fundamental terms and theorems associated with mechanics of linear elastic deformable bodies.
CO2	Explain the behavior and response of various structural elements under various loading conditions
CO3	Apply the principles of solid mechanics to calculate internal stresses/strains, stress resultants and strain energies in structural elements subjected to axial/transverse loads and bending/twisting moments.
CO4	Choose appropriate principles or formula to find the elastic constants of materials making use of the information available
CO5	Perform stress transformations, identify principal planes/ stresses and maximum shear stress at a point in a structural member.
CO6	Analyse the given structural member to calculate the safe load or proportion the cross section to carry the load safely.
CET203	**FLUID MECHANICS AND HYDRAULICS**
CO1	Recall the relevant principles of hydrostatics and hydraulics of pipes and open channels

CO2	Identify or describe the type, characteristics or properties of fluid flow
CO3	Estimate the fluid pressure, perform the stability check of bodies under hydrostatic condition
CO4	Compute discharge through pipes or estimate the forces on pipe bends by applying hydraulic principles of continuity, energy and/or momentum
CO5	Analyze or compute the flow through open channels, perform the design of prismatic channels
CET205	**SURVEYING AND GEOMATICS**
CO1	Apply surveying techniques and principles of leveling for the preparation of contour maps, computation of area-volume and sketching mass diagram
CO2	Apply the principles of surveying for triangulation
CO3	Apply different methods of traverse surveying and traverse balancing
CO4	Identify the possible errors in surveying and apply the corrections in field measurements
CO5	Apply the basic knowledge of setting out of different types of curves

CO6	Employ surveying techniques using advanced surveying equipments
HUT200	**PROFESSIONAL ETHICS**
CO1	Understand the core values that shape the ethical behaviour of a professional.
CO2	Adopt a good character and follow an ethical life.
CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
MCN201	**SUSTAINABLE ENGINEERING**
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO2	Explain the different types of environmental pollution problems and their sustainable solutions

CO3	Discuss the environmental regulations and standards
CO4	Outline the concepts related to conventional and non-conventional energy
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
CEL201	**CIVIL ENGINEERING PLANNING AND DRAFTING LAB**
CO1	Illustrate ability to organise civil engineering drawings systematically and professionally
CO2	Prepare building drawings as per the specified guidelines.
CO3	Assess a complete building drawing to include all necessary information
CO4	Create a digital form of the building plan using any drafting software
CEL203	**SURVEY LAB**
CO1	Use conventional surveying tools such as chain/tape and compass for plotting and areadetermination.

CO2	Apply levelling principles in field
CO3	Solve triangulation problems using theodolite
CO4	Employ total station for field surveying
CO5	Demonstrate the use of distomat and handheld GPS

SEMESTER 4

MAT202	**PROBABILITY, STATISTICS AND NUMERICAL METHODS**
CO1	Understand the concept, properties and important models of discrete random variablesand,using them, analyse suitable random phenomena.
CO2	Understand the concept, properties and important models of continuous randomvariables and,using them, analyse suitable random phenomena.
CO3	Perform statistical inferences concerning characteristics of a population based onattributes of samples drawn from the population
CO4	Compute roots of equations, evaluate definite integrals and perform interpolation ongiven numerical data using standard numerical techniques

CO5	Apply standard numerical techniques for solving systems of equations, fitting curveson given numerical data and solving ordinary differential equations.
CET202	**ENGINEERING GEOLOGY**
CO1	Recall the fundamental concepts of surface processes, subsurface process, minerals, rocks, groundwater and geological factors in civil engineering constructions.
CO2	Identify and describe the surface processes, subsurface process, earth materials, groundwater and geological factors in civil engineering constructions.
CO3	Apply the basic concepts of surface and subsurface processes, minerals, rocks, groundwater and geological characteristics in civil engineering constructions.
CO4	Analyze and classify geological processes, earth materials and groundwater.
CO5	Evaluation of geological factors in civil engineering constructions.
CET204	**GEOTECHNICAL ENGINEERING-I**
CO1	Explain the fundamental concepts of basic and engineering properties of soil
CO2	Describe the laboratory testing methods for determining soil parameters

CO3	Solve the basic properties of soil by applying functional relationships
CO4	Calculate the engineering properties of soil by applying the laboratory test results and the fundamental concepts of soil mechanics
CO5	Analyze the soil properties to identify and classify the soil
CET206	**TRANSPORTATION ENGINEERING**
CO1	Apply the basic principles of Highway planning and design highway geometric elements
CO2	Apply standard code specifications in judging the quality of highway materials; designing of flexible pavements
CO3	Explain phenomena in road traffic by collection, analysis and interpretation of traffic data through surveys; creative design of traffic control facilities
CO4	Understand about railway systems, tunnel, harbour and docks
CO5	Express basics of airport engineering and design airport elements
EST200	**DESIGN AND ENGINEERING**

CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing engineering.
CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
MCN202	**CONSTITUTION OF INDIA**
CO1	Explain the background of the present constitution of India and features.
CO2	Utilize the fundamental rights and duties.
CO3	Understand the working of the union executive, parliament and judiciary.
CO4	Understand the working of the state executive, legislature and judiciary.
CO5	Utilize the special provisions and statutory institutions.
CO6	Show national and patriotic spirit as responsible citizens of the country

CEL202	MATERIAL TESTING LAB-I
CO1	The understand the behaviour of engineering materials under various forms andstages of loading.
CO2	Characterize the elastic properties of various materials.
CO3	Evaluate the strength and stiffness properties of engineering materials undervarious loading conditions.
CEL204	FLUID MECHANICS LAB
CO1	Apply fundamental knowledge of Fluid Mechanics to corresponding experiments
CO2	Apply theoretical concepts in Fluid Mechanics to respective experiments
CO3	Analyse experimental data and interpret the results
CO4	Document the experimentation in prescribed manner

SEMESTER 5

CET301	**STRUCTURAL ANALYSIS-I**
CO1	Apply the principles of solid mechanics to analysetrusses.
CO2	Apply energy principles to analyse staticallydeterminate structures.
CO3	Identify the problemswith static indeterminacy andunderstand the basic concepts of tackling suchproblems by means of the method of consistentdeformations.
CO4	Apply suitable methods of analysis for varioustypes of structures including cables, suspensionbridges and arches.
CO5	Analyse the effects of moving loads on structuresusing influence lines.
CO6	Apply specific methods such as slope deflectionand moment distribution methods of structuralanalysis for typical structures with differentcharacteristics.
CET303	**DESIGN OF CONCRETE STRUCTURES**
CO1	Recall the fundamental concepts of limit state design and code provisions for design of concrete members under bending, shear, compression and torsion.
CO2	Analyse reinforced concrete sections to determine theultimate capacity in bending, shear and compression.

CO3	Design and detailbeams, slab, stairs and footings using IS code provisions.
CO4	Design and detail columns using IS code and SP 16design charts.
CO5	Explain the criteria for earthquake resistant design ofstructures andductile detailing of concrete structuressubjected to seismic forces.
CET305	**GEOTECHNICAL ENGINEERING-II**
CO1	Understand soil exploration methods
CO2	Explain the basic concepts, theories and methods of analysis in foundationengineering
CO3	Calculate bearing capacity, pile capacity, foundation settlement and earth pressure
CO4	Analyse shallow and deep foundations
CO5	Solve the field problems related to geotechnical engineering
CET307	**HYDRAULICS AND WATER RESOURCES ENGINEERING**

CO1	Describe and estimate the different components of hydrologic cycle by processing hydro-meteorological data
CO2	Determine the crop water requirements for the design of irrigation canals by recollectingthe principles of irrigation engineering
CO3	Perform the estimation of streamflow and/or describe the river behavior and controlstructures
CO4	Describe and apply the principles of reservoir engineering to estimate the capacity ofreservoirs and their useful life
CO5	Demonstrate the principles of groundwater engineering and apply them for computing theyield of aquifers and wells
CET309	**CONSTRUCTION TECHNOLOGY AND MANAGEMENT**
CO1	Describe the properties of materials used in construction
CO2	Explain the properties of concrete and its determination
CO3	Describe the various elements of building construction
CO4	Explain the technologies for construction

CO5	Describe the procedure for planning and executing public works
CO6	Apply scheduling techniques in project planning and control
MCN301	**DISASTER MANAGEMENT**
CO1	Define and use various terminologies in use in disaster management parlance andorganise each of these terms in relation to the disaster management cycle
CO2	Distinguish between different hazard types and vulnerability types and dovulnerability assessment
CO3	Identify the components and describe the process of risk assessment, and applyappropriate methodologies to assess risk
CO4	Explain the core elements and phases of Disaster Risk Management and developpossible measures to reduce disaster risks across sector and community
CO5	Identify factors that determine the nature of disaster response and discuss the variousdisaster response actions
CO6	Explain the various legislations and best practices for disaster management and riskreduction at national and international level
CEL331	**MATERIAL TESTING LAB-II**

CO1	To describe the basic properties of various construction materials
CO2	Characterize the physical and mechanical properties of various constructionmaterials.
CO3	Interpret the quality of various construction materialsas per IS Codal provisions.
CEL333	**GEOTECHNICAL ENGINEERING LAB**
CO1	Identify and classify soil based on standard geotechnical experimental methods.
CO2	Perform and analyze permeability tests.
CO3	Interpret engineering behavior of soils based on test results.
CO4	Perform laboratory compaction, CBR and in-place density test for fill quality control inthe field.
CO5	Evaluate the strength of soil by performing various tests viz. direct shear test, unconfinedcompressive strength test and triaxial shear test.
CO6	Evaluate settlement characteristics of soils.

SEMESTER 6	
CET302	**STRUCTURAL ANALYSIS-II**
CO1	Understand the principles of plastic theory and itsapplications in structural analysis.
CO2	Examine the type of structure and decide on themethod of analysis.
CO3	Apply approximate methods of analysis forframed structures to ascertain stress resultantsapproximately but quickly.
CO4	Apply the force method to analyse framedstructures.
CO5	Apply the displacement methods to analyseframed structures.
CO6	Remember basic dynamics, understand the basicprinciples of structural dynamics and apply thesame to simple structures.
CET304	**ENVIRONMENTAL ENGINEERING**
CO1	To appreciate the role of environmental engineering inimproving the quality of environment

CO2	To plan for collection and conveyance of water and wastewater
CO3	To enhance natural water purification processes in anengineered environment
CO4	To decide on appropriate technology for water and wastewater treatment
CET306	**DESIGN OF HYDRAULIC STRUCTURES**
CO1	Elucidate the causes of failure, principles of design of different components of hydraulicstructures
CO2	Describe the features of canal structures and perform the design of alluvial canals
CO3	Perform the hydraulic design of minor irrigation structures such as cross drainage works,canal falls, cross regulator.
CO4	Prepare the scaled drawings of different minor irrigation structures
CO5	Describe the design principles and features of dams and perform the stability analysis ofgravity dams
CET332	**GEOTECHNICAL INVESTIGATION**

CO1	The students will be able to understand the procedure,applicability, and limitations of various methods ofgeotechnical investigation
CO2	The students will be able to make engineeringjudgments and take appropriate decisions related togeotechnical investigations
CO3	The students will be able to understand the procedureand applications of penetration tests and geophysicaltests for exploration of the soil profile
CO4	The students will be able to choose the right soilsampling technique and analyse the dependability ofsamples collected
CO5	The students will be able to understand the procedureand applications of field load tests and rock qualityindices.
CET362	**ENVIRONMENTAL IMPACT ASSESSMENT**
CO1	To appreciate the need for minimizing the environmentalimpacts of developmental activities
CO2	To understand environmental legislation & clearanceprocedure in the country
CO3	To apply various methodologies for assessing theenvironmental impacts of any developmental activity
CO4	To prepare an environmental impact assessment report

CO5	To conduct an environmental audit
HUT300	**INDUSTRIAL ECONOMICS AND FOREIGN TRADE**
CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluatethe impact of government policies on the general economic welfare.
CO2	Take appropriate decisions regarding volume of output and to evaluate the social costof production.
CO3	Determine the functional requirement of a firm under various competitive conditions.
CO4	Examine the overall performance of the economy, and the regulation of economicfluctuations and its impact on various sections in the society.
CO5	Determine the impact of changes in global economic policies on the businessopportunities of a firm.
CET308	**COMPREHENSIVE COURSE WORK**
CO1	Learn to prepare for a competitive examination
CO2	Comprehend the questions in Civil Engineering field and answer them with confidence

CO3	Communicate effectively with faculty in scholarly environments
CO4	Analyze the comprehensive knowledge gained in basic courses in the field of CivilEngineering
CEL332	**TRANSPORTATION ENGINEERING LAB**
CO1	Analyse the suitability of soil as a pavement subgrade material
CO2	Assess the suitability of aggregates as a pavement construction material
CO3	Characterize bitumen based on its properties so as to recommend it as a pavementconstruction material.
CO4	Design bituminous mixes for pavement layers
CO5	Assess functional adequacy of pavements based on roughness of pavementsurface.
CEL334	**CIVIL ENGINEERING SOFTWARE LAB**
CO1	To undertake analysis and design of multi-storeyed framed structure, schedule a given set of project activities using a software.

CO2	To prepare design details of different structural components, implementation plan for a project.
CO3	To prepare a technical document on engineering activities like surveying,structural design and project planning.

SEMESTER 7

CET 401	**DESIGN OF STEEL STRUCTURES**
CO1	Explain the behavior and properties of structural steel members to resist various structural forces and actions and apply the relevant codes of practice
CO2	Analyses the behavior of structural steel members and undertake design at both serviceability and ultimate limit states
CO3	Explain the theoretical and practical aspects of Design of composite Steel Structure along with the planning and design aspects
CO4	Apply a diverse knowledge of Design of Steel engineering practices applied to real life problems
CO5	Demonstrate experience in the implementation of design of structures on engineering concepts which are applied in field Structural Engineering
MCN 401	**INDUSTRIAL SAFETY ENGINEERING**

CO1	Describe the theories of accident causation and preventive measures of industrial accidents.
CO2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping.
CO3	Explain different issues in construction industries.
CO4	Describe various hazards associated with different machines and mechanical material handling.
CO5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.
CET 423	**GROUND IMPROVEMENT TECHNIQUES**
CO1	Classify different ground improvement methods based on the soil suitability
CO2	Outline the basic concept/ design aspects of various ground improvement methods
CO3	Identify the construction procedure of different ground improvement methods
CO4	Choose different application of geosynthetics and soil stabilisation in Ground improvement

CET463	**ADVANCED ENVIRONMENTAL ENGINEERING**	
CO1	Explain various secondary treatment technologies for waste water	
CO2	Explain various tertiary treatment technologies and their applications	
CO3	Explain engineering principles to dimension various treatment units	
CO4	Identify appropriate technology for controlling air pollution	
CET433	**HIGHWAY MATERIALS AND DESIGN**	
CO1	Identify suitable materials for different types of pavements	
CO2	Interpret material test results with respect to field conditions and standards	
CO3	Apply the pavement material properties to analysis of pavements	
CO4	Evaluate material properties and design pavement mixes.	

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CO5	Analyse and design the pavement, flexible or rigid, for the conditions prevailing at site	
CET425	**APPLIED EARTH SYSTEMS**	
CO1	Explain the concept of earth as a system of interrelated components and associated exogenic/endogenic processes.	
CO2	Appraise geological agents and their respective erosion, transportation and deposition regimes and landforms formed.	
CO3	Contemplate constraints and processes that continuously affect earth's surface and its stability and consistency.	
CO4	Evaluate/investigate the significance of Plate tectonics theory to explain the geodynamic features and processes of earth's surface.	
CO5	Develop an understanding of oceanographic and atmospheric regimes and their sway on other subsystems and process thereof.	
CO6	Understand implications of human interaction with the Earth system.	
CEQ413	**SEMINAR**	
CO1	Identify academic documents from the literature which are related to her/his areas of interest	

CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest
CO3	Prepare a presentation about an academic document
CO4	Give a presentation about an academic document
CO5	Prepare a technical report
CED415	**PROJECT PHASE I**
CO1	Model and solve real world problems by applying knowledge across domains
CO2	Develop products, processes or technologies for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
CO5	Identify technology/research gaps and propose innovative/creative solutions

CO6	Organize and communicate technical and scientific findings effectively in written and oral forms
CEL411	**ENVIRONMENTAL ENGG LAB**
CO1	Analyse various physico-chemical and biological parameters of water
CO2	Compare the quality of water with drinking water standards and recommend its suitability for drinking purposes
SEMESTER 8	
CET402	**QUANTITY SURVEYING & VALUATION**
CO1	Define basic terms related to estimation, quantity surveying and contract document
CO2	Interpret the item of work from drawings and explain its general specification and unit of measurement.
CO3	Make use of given data from CPWD DAR/DSR for calculating the unit rate of different items of work associated with building construction
CO4	Develop detailed measurement (including BBS) and BoQ of a various work like buildings, earthwork for road, sanitary and water supply work

CO5	Explain various basic terms related to valuation of land and building	
CO6	Develop valuation of buildings using different methods of valuation.	
CET434	**RAILWAY & TUNNEL ENGINEERING**	
CO1	Explain the role of railways in national development and carry out geometric design of railway track by identifying component parts of railway track	
CO2	Design railway operation and control systems	
CO3	Analyze factors affecting railway accidents and understand the modern developments in railways and develop an awareness about the maintenance of railway system.	
CO4	Explain about the importance, types and methods of construction of tunnel	
CO5	Develop and analyze design aspects of ventilation, lining and lighting in tunnels	
CET476	**BUILDING SERVICES**	
CO1	Recommend appropriate water management services	

CO2	Develop a system for the management of waste
CO3	Identify suitable electrical and mechanical building services
CO4	Recall the various firefighting services
CO5	Choose relevant materials and practices for good acoustics
CO6	Propose sustainable construction materials, methods, and practices
CET438	**AIRPORT, SEAPORT & HARBOUR ENGINEERING**
CO1	Explain the basic principles of planning and design for site selection, Airport components based on air traffic characteristics
CO2	Explain the basic design principles of Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning,
CO3	Explain various aspects such as Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control methods
CO4	Explain the basic principles ,site selection characteristics, lay out, break waters, quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids – light houses, signals - types – Moorings

CO5	Explain the basics of Docks – Functions and types - dry docks, wet docks arrangement of basins and docks	
CET464	**AIR QUALITY MANAGEMENT**	
CO1	Explain the source of air pollution and different type of air pollutant	
CO2	Describe the effet of air pollutants on vegetation, animals, materials and human health	
CO3	Discuss the different methods of ambient air quality monitoring system which supports an air quality management program	
CO4	Explain the meteorological aspects of air pollutant dispersion	
CO5	Describe the variuos air pollution control strategies that can be undertaken to meet the air quality goals	
CET456	**REPAIR AND REHABILITATION OF BUILDINGS**	
CO1	Recall the basic idea and theries associated with concrete technology and masonry structures	
CO2	Understand the need and methodology of repair and rehabitation of structures the various mechanisma used and tools for diagnosis of structures	

CO3	Identifying the criterions for repairing and the types and properties of repair materials used in site. Learn various techniques for repairing dam-aged and corroded structures	
CO4	Proposing wholesome solutions for maintenance rehabitatio and applying methodologies for repairing structures or demolishning structures	
CO5	Analyse and asses the damage to strcutres using various tests	
CET 468	**CLIMATE CHANGE AND SUSTAINABILITY**	
CO1	Explain the fundamental concepts of climate and its influencing factors	
CO2	Explain the factors affecting climate change and the harmful impacts due to climate change	
CO3	Discuss the problem due to urbanization and the need for sustainable development	
CO4	Demonstrate the various adaptation and mitigation techniques for climate change	
CO5	Discuss multilateral agreements on climate change , case studies on cliamte change	
CET458	**SUSTAINABLE CONSTRUCTION**	

CO1	Explain the fundamental concepts of sustainability
CO2	Describe the proprties and uses of sustainable building materials
CO3	Identify suitable construction techniques and practices for sustainable buildings
CO4	Discuss the standards and gudelines for sustainable buildings
CO5	Comment on the role of BIM and automation in sustainable construction
CED416	**PROJECT PHASE II**
CO1	Model and solve real world problems by applying knowledge across domains
CO2	Develop products, processes or technologies for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms

CO5	Identify technology/research gaps and propose innovative/creative solutions
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms
CET404	**COMPREHENSIVE VIVA VOICE**
CO1	Model and solve real world problems by applying knowledge across domains
CO2	Develop products, processes or technologies for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
CO5	Identify technology/research gaps and propose innovative/creative solutions
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms

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B.TECH IN COMPUTER SCIENCE AND ENGINEERING	
PROGRAMME SPECIFIC OUTCOME	
PSO1	Apply knowledge of mathematics, science, engineering and computer science fundamentals to solve complex computational problems.
PSO2	Use modern tools to analyze, design and develop software solutions in the areas pertaining to system software, database, networking, web and mobile applications, information security, data analytics and machine learning.
PSO3	Employ modern computer languages, environments, and platforms to create innovative career paths, pursue higher studies and entrepreneurship.
COURSE OUTCOMES	
SEMESTER 1	
MAT101	**LINEAR ALGEBRA AND CALCULUS**
CO1	solve the consistent system of linear equations and apply orthogonal to a quadratic form
CO2	find the maxima and minima of multivariable functions

CO3	find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas using double and triple integrals
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	Determine the power series expansion of a given function
CYT100	**ENGINEERING CHEMISTRY**
CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST110	**ENGINEERING GRAPHICS**

CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.
CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.
CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.

CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, metal joining and machining processes
HUT101	**LIFE SKILLS**
CO1	Define and Identify different life skills required in personal and professional life

CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.
CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.
CO4	Take part in Group discussions
CO5	Use appropriate thinking and problem solving technique to solve problems
CO6	Understand the basics of teamwork and leadership
CYL120	**ENGINEERING CHEMISTRY LAB**
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis

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CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	**CIVIL AND MECHANICAL WORKSHOP**
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.
CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades

CO8	Apply appropriate safety measures with respect to the mechanical workshop trades
	SEMESTER 2
MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
PHT110	**ENGINEERING PHYSICS (B)**
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.

CO2	Apply the interaction of light with matter through interference, diffraction and identifythese phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principlesof quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Apply the knowledge of ultrasonic in non-destructive testing and use the principles of acoustics to explain the nature and characterisation of acoustics design and to provide a safe and healthy enviornemnet
CO5	Apply the comprehended knowledge about laser and fibre optic communication systems invarious engineering applications
EST100	**ENGINEERING MECHANICS**
CO1	To apply the theorems and principles related to rigid body mechanics.
CO2	To identify and depict the components of system of forces acting on the rigid body.
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses.

CO6	Obtain multiview projections and solid models of objects using CAD tools
EST130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**
CO1	Apply fundamental concepts and circuit laws to solvesimple DC electric and magneticCircuits
CO2	Develop and solve models of magnetic circuits
CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState
CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession

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CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem

CO5	Write readable C programs which use pointers for array processing and parameter passing	
CO6	Develop readable C programs with files for reading input and storing output	
PHL120	**ENGINEERING PHYSICS LAB**	
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus.	
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.	
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.	
CO4	Determine the wavelength of a laser beam using the plane transmission grating.	
ESL130	**ELECTRICAL AND ELECTRONICS WORKSHOP**	
CO1	Demonstrate safety measures against electric shocks.	
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.	

CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
SEMESTER 3	
MAT 201	**PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS**
CO1	Understand the concept and the solution of partial differential equation.
CO2	Analyse and solve one dimensional wave equation and heat equation.
CO3	Understand complex functions, its continuity differentiability with the use of CauchyRiemann equations.

CO4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
CO5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
MAT203	**DISCRETE MATHEMATICAL STRUCTURES**
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)
CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand)
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)
CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply)
CO6	Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)
CST201	**DATA STRUCTURES**

CO 1	Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)
CO2	Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)
CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed (Cognitive Knowledge Level: Apply)
CO4	Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)
CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze)
CO6	Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)
CST203	**LOGIC SYSTEM DESIGN**
CO1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers (Cognitive Knowledge level: Understand)
CO2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level: Apply)
CO3	Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA. (Cognitive Knowledge level: Apply)

CO4	Design sequential circuits - Registers, Counters and Shift Registers. (Cognitive ROM and PLA. (Cognitive Knowledge level: Apply)
CO5	Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)
CST205	**OBJECT ORIENTED PROGRAMMING USING JAVA**
CO1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)
CO2	Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs (Cognitive Knowledge Level: Apply)
CO3	Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)
CO4	Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
CO5	Write Graphical User Interface based application programs by utilising event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
MCN201	**SUSTAINABLE ENGINEERING**
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction

CO2	Explain the different types of environmental pollution problems and their sustainable solutions
CO3	Discuss the environmental regulations and standards
CO4	Outline the concepts related to conventional and non-conventional energy
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
EST200	**DESIGN AND ENGINEERING**
CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing engineering.
CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering
CSL201	**DATASTRUCTURES LAB**
CO1	Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements (Cognitive Knowledge Level: Analyse)

CO2	Write a time/space efficient program to sort a list of records based on a given key in the record (Cognitive Knowledge Level: Apply)
CO3	Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)
CO4	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
CO5	Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)
CO6	Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)
CSL203	**OBJECT ORIENTED PROGRAMMING LAB (IN JAVA)**
CO1	Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)
CO2	Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
CO3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
CO4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)

CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
	SEMESTER 4
MAT 206	**GRAPH THEORY**
CO1	Explain vertices and their properties, types of paths, classification of graphs and trees & their properties. (Cognitive Knowledge Level: Understand)
CO2	Demonstrate the fundamental theorems on Eulerian and Hamiltonian graphs. (Cognitive Knowledge Level: Understand)
CO3	Illustrate the working of Prim's and Kruskal's algorithms for finding minimum cost spanning tree and Dijkstra's and Floyd-Warshall algorithms for finding shortest paths. (Cognitive Knowledge Level: Apply)
CO4	Explain planar graphs, their properties and an application for planar graphs. (Cognitive Knowledge Level: Apply)
CO5	Illustrate how one can represent a graph in a computer. (Cognitive Knowledge Level: Apply)
CST 202	**COMPUTER ORGANIZATION AND ARCHITECTURE**
CO1	Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer (Cognitive knowledge: Understand)

CO2	Explain the types of memory systems and mapping functions used in memory systems (Cognitive Knowledge Level: Understand)
CO3	Demonstrate the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply)
CO4	Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it (Cognitive Knowledge Level: Apply)
CO5	Explain the implementation aspects of arithmetic algorithms in a digital computer (Cognitive Knowledge Level:Apply)
CO6	Develop the control logic for a given arithmetic problem (Cognitive Knowledge Level: Apply).
CST 204	**DATABASE MANAGEMENT SYSTEMS**
CO1	Summarize and exemplify fundamental nature and characteristics of database systems (Cognitive Knowledge Level: Understand)
CO2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams. (Cognitive Knowledge Level: Apply)
CO3	Model and design solutions for efficiently representing and querying data using relational model (Cognitive Knowledge Level: Analyze)
CO4	Demonstrate the features of indexing and hashing in database applications (Cognitive Knowledge Level: Apply)

CO5	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems (Cognitive Knowledge Level: Apply)
CO6	Explain various types of NoSQL databases (Cognitive Knowledge Level: Understand
CST 206	**OPERATING SYSTEMS**
CO1	Explain the relevance, structure and functions of Operating Systems in computing devices. (Cognitive knowledge: Understand) .
CO2	Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems. (Cognitive knowledge: Understand)
CO3	Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors (Cognitive knowledge: Understand)
CO4	Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems. (Cognitive knowledge: Understand)
CO5	Explain the memory management algorithms in Operating Systems. (Cognitive knowledge: Understand)
CO6	Explain the security aspects and algorithms for file and storage management in Operating Systems. (Cognitive knowledge: Understand)

CSL202	**DIGITAL SYSTEM LAB**
CO1	Design and implement combinational logic circuits using Logic Gates (Cognitive Knowledge Level: Apply)
CO2	Design and implement sequential logic circuits using Integrated Circuits (Cognitive Knowledge Level: Apply)
CO3	Simulate functioning of digital circuits using programs written in a Hardware Description Language (Cognitive Knowledge Level: Apply)
CO4	Function effectively as an individual and in a team to accomplish a given task of designing and implementing digital circuits (Cognitive Knowledge Level: Apply)
CSL204	**OPERATING SYSTEMS LAB**
CO1	Illustrate the use of systems calls in Operating Systems. (Cognitive knowledge: Understand)
CO2	Implement Process Creation and Inter-Process Communication in Operating Systems. (Cognitive knowledge: Apply)
CO3	Implement Fist Come First Served, Shortest Job First, Round Robin and Prioritybased CPU Scheduling Algorithms. (Cognitive knowledge: Apply)
CO4	Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. (Cognitive knowledge: Apply)

CO5	Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. (Cognitive knowledge: Apply)
	SEMESTER 5
CST 301	**FORMAL LANGUAGES AND AUTOMATA THEORY**
CO1	Classify a given formal language into Regular, Context-Free, Context Sensitive, Recursive or Recursively Enumerable. [Cognitive knowledge level: Understand
CO2	Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Nerode relation. [Cognitive knowledge level: Understand]
CO3	Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language. [Cognitive knowledge level : Apply]
CO4	Design Turing machines as language acceptors or transducers. [Cognitive knowledge level: Apply]
CO5	Explain the notion of decidability. [Cognitive knowledge level: Understand]
CST 303	**COMPUTER NETWORKS**
CO1	Explain the features of computer networks, protocols, and network design models (Cognitive Knowledge: Understand)

CO2	Describe the fundamental characteristics of the physical layer and identify the usage in network communication
CO3	Explain the design issues of data link layer, link layer protocols, bridges and switches
CO4	Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) (Cognitive Knowledge: Understand)
CO5	Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network (Cognitive Knowledge: Apply)
CO6	Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking (Cognitive Knowledge: Understand)
CST 305	**SYSTEM SOFTWARE**
CO1	Distinguish softwares into system and application software categories. (Cognitive Knowledge Level: Understand)
CO2	Identify standard and extended architectural features of machines. (Cognitive Knowledge Level: Apply)
CO3	Identify machine dependent features of system software (Cognitive Knowledge Level: Apply)
CO4	Identify machine independent features of system software. (Cognitive Knowledge Level: Understand)

CO5	Design algorithms for system softwares and analyze the effect of data structures. (Cognitive Knowledge Level: Apply)
CO6	Understand the features of device drivers and editing & debugging tools.(Cognitive Knowledge Level: Understand)
CST 307	**MICROPROCESSORS AND MICROCONTROLLERS**
CO1	Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive knowledge: Understand)
CO2	Develop 8086 assembly language programs. (Cognitive Knowledge Level: Apply)
CO3	Demonstrate interrupts, its handling and programming in 8086. (Cognitive Knowledge Level: Apply))
CO4	Illustrate how different peripherals (8255,8254,8257) and memory are interfaced with microprocessors. (Cognitive Knowledge Level: Understand)
CO5	Outline features of microcontrollers and develop low level programs. (Cognitive Knowledge Level: Understand)
CST 309	**MANAGEMENT OF SOFTWARE SYSTEMS**

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CO1	Demonstrate Traditional and Agile Software Development approaches (Cognitive Knowledge Level: Apply)
CO2	Prepare Software Requirement Specification and Software Design for a given problem. (Cognitive Knowledge Level: Apply)
CO3	Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project. (Cognitive Knowledge Level: Apply)
CO4	Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. (Cognitive Knowledge Level: Apply)
CO5	Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices. (Cognitive Knowledge Level: Apply)
MCN301	**DISASTER MANAGEMENT**
CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).
CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)

CO5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).
CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).
CSL331	**SYSTEM SOFTWARE AND MICROPROCESSORS LAB**
CO1	Develop 8086 programs and execute it using a microprocessor kit. (Cognitive Knowledge Level: Apply) .
CO2	Develop 8086 programs and, debug and execute it using MASM assemblers (Cognitive Knowledge Level: Apply)
CO3	Develop and execute programs to interface stepper motor, 8255, 8279 and digital to analog converters with 8086 trainer kit (Cognitive Knowledge Level: Apply)
CO4	Implement and execute different scheduling and paging algorithms in OS (Cognitive Knowledge Level: Apply)
CO5	Design and implement assemblers, Loaders and macroprocessors. (Cognitive Knowledge Level: Apply)
CSL 333	**DATABASE MANAGEMENT SYSTEMS LAB**
CO1	Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)

CO2	Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)
CO3	Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
CO4	Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)
CO5	Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)
CO6	Develop database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)
	SEMESTER 6
CST 302	**COMPILER DESIGN**
CO1	Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer
CO2	Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations
CO3	Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar

CO4	Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations
CO5	Illustrate code optimization and code generation techniques in compilation
CST 304	**COMPUTER GRAPHICS AND IMAGE PROCESSING**
CO1	Describe the working principles of graphics devices(Cognitive Knowledge level: Understand
CO2	Illustrate line drawing, circle drawing and polygon filling algorithms(Cognitive Knowledge level: Apply)
CO3	Demonstrate geometric representations, transformations on 2D & 3D objects, clipping algorithms and projection algorithms(Cognitive Knowledge level: Apply)
CO4	Summarize visible surface detection methods(Cognitive Knowledge level: Understand)
CO5	Summarize the concepts of digital image representation, processing and demonstrate pixel relationships(Cognitive Knowledge level: Apply)
CO6	Solve image enhancement and segmentation problems using spatial domain techniques(Cognitive Knowledge level: Apply)
CST 306	**ALGORITHM ANALYSIS AND DESIGN**

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CO1	Analyze any given algorithm and express its time and space complexities in asymptotic notations. (Cognitive Level: Apply)
CO2	Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms. (Cognitive Level: Apply)
CO3	Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations. (Cognitive Level: Apply)
CO4	Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques (Cognitive Level: Apply)
CO5	Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability (Cognitive Level: Understand)
CO6	Identify the suitable design strategy to solve a given problem. (Cognitive Level: Analyze)
CST 322	**DATA ANALYTICS**
CO1	Illustrate the mathematical concepts for data analytics (Cognitive Knowledge Level: Apply)
CO2	Explain the basic concepts of data analytics (Cognitive Knowledge Level: Understand
CO3	Illustrate various predictive and descriptive analytics algorithms (Cognitive Knowledge Level: Apply)

CO4	Describe the key concepts and applications of Big Data Analytics (Cognitive Knowledge Level: Understand)
CO5	Demonstrate the usage of Map Reduce paradigm for Big Data Analytics (Cognitive Knowledge Level: Apply)
CO6	Use R programming tool to perform data analysis and visualization (Cognitive Knowledge Level: Apply)
CST 362	**PROGRAMMING IN PYTHON**
CO1	Write, test and debug Python programs
CO2	Illustrate uses of conditional (if, if-else and if-elif-else) and iterative (while and for) statements in Python programs.
CO3	Develop programs by utilizing the Python programming constructs such as Lists, Tuples, Sets and Dictionaries.
CO4	Develop graphical user interface for solutions using Python libraries
CO5	Implement Object Oriented programs with exception handling.
CO6	Write programs in Python to process data stored in files by utilizing Numpy, Matplotlib, and Pandas.

CSD334	**MINI PROJECT**
CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)
CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes(Cognitive Knowledge Level: Apply)
CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming technique(Cognitive Knowledge Level: Apply)
CO4	Prepare technical report and deliver presentation(Cognitive Knowledge Level: Apply)
CO5	Apply engineering and management principles to achieve the goal of the project(Cognitive Knowledge Level: Apply)
CST 308	**COMPREHENSIVE COURSE WORK**
CO1	Comprehend the concepts of discrete mathematical structures (Cognitive Knowledge Level: Understand)
CO2	Comprehend the concepts and applications of data structures (Cognitive Knowledge Level: Understand)
CO3	Comprehend the concepts, functions and algorithms in Operating System (Cognitive Knowledge Level: Understand)

CO4	Comprehend the organization and architecture of computer systems (Cognitive Knowledge Level: Understand)
CO5	Comprehend the fundamental principles of database design and manipulation (Cognitive Knowledge Level: Understand)
CO6	Comprehend the concepts in formal languages and automata theory (Cognitive Knowledge Level: Understand)
CS 409	**CRYPTOGRAPHY AND NETWORK SECURITY**
CO1	Students will be able to summarize different classical encryption techniques
CO2	Students will be able to summarize DES,AES and to identify mathematical concepts for different cryptographic algorithms
CO3	Students will be able to demonstrate cryptographic algorithms for encryption/key excl
CO4	Students will be able to summarize different authentication and digital signature schemes
CO5	Students will be able to identify security issues in network, transport and application layers and outline appropriate security protocols
	SEMESTER 7

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CST401	**ARTIFICIAL INTELLIGENCE**
CO1	Explain the fundamental concepts of intelligent systems and their architecture.
CO2	Illustrate uninformed and informed search techniques for problem solving in intelligent system
CO3	Solve Constraint Satisfaction Problems using search techniques.
CO4	Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems
CO5	Illustrate different types of learning techniques used in intelligent system
CSL411	**COMPILER LAB**
CO1	Implement lexical analyzer using the tool LEX. (Cognitive Knowledge Level: Apply)
CO2	Implement Syntax analyzer using the tool YACC. (Cognitive Knowledge Level: Apply)
CO3	Design NFA and DFA for a problem and write programs to perform operations on it. (Cognitive Knowledge Level: Apply)

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CO4	Design and Implement Top-Down parsers. (Cognitive Knowledge Level: Apply)	
CO5	Design and Implement Bottom-Up parsers. (Cognitive Knowledge Level: Apply)	
CSQ413	**SEMINAR**	
CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply)	
CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).	
CO3	Prepare a presentation about an academic document (Cognitive knowledge level: Create).	
CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).	
CO5	Prepare a technical report (Cognitive knowledge level:Create).	
CSD415	**PROJECT PHASE I**	
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).	

CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply)
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply)
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze)
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
CST413	**MACHINE LEARNING**
CO1	Illustrate Machine Learning concepts and basic parameter estimation methods. (Cognitive Knowledge Level: Apply)
CO2	Demonstrate supervised learning concepts (regression, linear classification). (Cognitive Knowledge Level: Apply)
CO3	Illustrate the concepts of Multilayer neural network and Support Vector Machine (Cognitive Knowledge Level: Apply)
CO4	Describe unsupervised learning concepts and dimensionality reduction techniques. (Cognitive Knowledge Level: Apply)

CO5	Solve real life problems using appropriate machine learning models and evaluate the performance measures (Cognitive Knowledge Level: Apply)
CST423	**CLOUD COMPUTING**
CO1	Explain the various cloud computing models and services. (Cognitive Knowledge Level: Understand)
CO2	Demonstrate the significance of implementing virtualization techniques. (Cognitive Knowledge Level: Understand
CO3	Explain different cloud enabling technologies and compare private cloud platforms (Cognitive Knowledge Level: Understand)
CO4	Apply appropriate cloud programming methods to solve big data problems. (Cognitive Knowledge Level: Apply)
CO5	Describe the need for security mechanisms in cloud (Cognitive Knowledge Level: Understand)
CO6	Compare the different popular cloud computing platforms (Cognitive Knowledge Level: Understand)
	SEMESTER 8
CST402	**DISTRIBUTED COMPUTING**

CO1	Summarize various aspects of distributed computation model and logical time. (Cognitive Knowledge Level: Understand)
CO2	Illustrate election algorithm, global snapshot algorithm and termination detection algorithm. (Cognitive Knowledge Level: Apply)
CO3	Compare token based, non-token based and quorum based mutual exclusion algorithms. (Cognitive Knowledge Level: Understand)
CO4	Recognize the significance of deadlock detection and shared memory in distributed systems. (Cognitive Knowledge Level: Understand)
CO5	Explain the concepts of failure recovery and consensus. (Cognitive Knowledge Level: Understand)
CO6	Illustrate distributed file system architectures. (Cognitive Knowledge Level: Understand)
CSD416	**PROJECT PHASE II**
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).

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CO1	Describe soft computing techniques and the basic models of Artificial Neural Network(Cognitive Knowledge Level: Understand)
CO2	Solve practical problems using neural networks (Cognitive Knowledge Level: Apply)
CO3	Illustrate the operations, model and applications of fuzzy logic (Cognitive KnowledgeLevel: Apply)
CO4	Illustrate the concepts of Genetic Algorithm (Cognitive Knowledge Level: Apply)
CO5	Describe the concepts of multi-objective optimization models and the need for using hybrid soft computing approaches(Cognitive Knowledge Level: Understand)

B.TECH IN ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAMME SPECIFIC OUTCOMES

PSO1	Design and create novel systems in the field of Electronics and Communication to solve global issues
PSO2	Carry out research activities in Electronics and Communication Engineering using modern hardware and software tools specific to the field.
PSO3	Analyze the working of electronic systems in industry and interpret results to arrive at valid conclusions.

COURSE OUTCOMES

SEMESTER 1

MAT 101	LINEAR ALGEBRA AND CALCULUS
CO1	solve the consistent system of linear equations and apply orthogonal to a quadratic form
CO2	find the maxima and minima of multivariable functions
CO3	find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas using double and triple integrals
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	Determine the power series expansion of a given function

CYT 100	ENGINEERING CHEMISTRY

CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.
CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.

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CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, metal joining and machining processes
HUT101	**LIFE SKILLS**
CO1	Define and Identify different life skills required in personal and professional life
CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.
CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.

CO4	Take part in Group discussions	
CO5	Use appropriate thinking and problem solving technique to solve problems	
CO6	Understand the basics of teamwork and leadership	
CYL120	**ENGINEERING CHEMISTRY LAB**	
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses	
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs	
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds	
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis	
CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments	
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum	
ESL120	**CIVIL AND MECHANICAL WORKSHOP**	
CO1	Name different devices and tools used for civil engineering measurements	
CO2	Explain the use of various tools and devices for various field measurements	
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.	

CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.
CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades
CO8	Apply appropriate safety measures with respect to the mechanical workshop trades
SEMESTER 2	
MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
PHT 100	**ENGINEERING PHYSICS**
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.

CO2	Apply the interaction of light with matter through interference, diffraction and identifythese phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principlesof quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Apply the knowledge of ultrasonic in non-destructive testing and use the principles of acoustics to explain the nature and characterisation of acoustics design and to provide a safe and healthy enviornemnet
CO5	Apply the comprehended knowledge about laser and fibre optic communication systems invarious engineering applications
EST 100	**ENGINEERING MECHANICS**
CO1	To apply the theorems and principles related to rigid body mechanics.
CO2	To identify and depict the components of system of forces acting on the rigid body.
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses.
EST130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**
CO1	Apply fundamental concepts and circuit laws to solvesimple DC electric and magneticCircuits
CO2	Develop and solve models of magnetic circuits
CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState

CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession
CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations

CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
PHL120	**ENGINEERING PHYSICS LAB**
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating.
ESL130	**ELECTRICAL AND ELECTRONICS WORKSHOP**
CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools

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CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
SEMESTER 3	
MAT201	**PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS**
CO1	Understand the concept and the solution of partial differential equation.
CO2	Analyse and solve one dimensional wave equation and heat equation.
CO3	Understand complex functions, its continuity differentiability with the use of Cauchy- Riemann equations.
CO4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
CO5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
ECT 201	**SOLID STATE DEVICES**
CO1	To make students aware about the electrons movement and bonding ,doping and Fermi levels
CO2	To understand the Einstein relations, Poisson equations, continuity and current flow equations.
CO3	To familiarize with PN junctions energy band diagram, MOSFET work function and BJTs current components.
CO4	To familiarize the working principles and characteristics of MOSFET

CO5	To give an idea about scaling, short channel effects of MOSFET and working principle of FinFet
ECT 203	**LOGIC CIRCUIT DESIGN**
CO1	Explain the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra
CO2	Create an implementation of a combinational logic function described by a truth table using and/or/inv gates/ muxes
CO3	Compare different types of logic families with respect to performance and efficiency
CO4	Design a sequential logic circuit using the basic building blocks like flip-flops
CO5	Design and analyze combinational and sequential logic circuits through gate level Verilog models.
ECT 205	**NETWORK THEORY**
CO1	Apply Mesh / Node analysis or Network Theorems to obtain steady state response of the linear time invariant networks.
CO2	Apply Laplace Transforms to determine the transient behaviour of RLC networks.
CO3	Apply Network functions and Network Parameters to analyse the single port and two port networks.
EST 200	**DESIGN & ENGINEERING**
CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing engineering.

CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
MCN 201	**SUSTAINABLE ENGINEERING**
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO2	Explain the different types of environmental pollution problems and their sustainable solutions
CO3	Discuss the environmental regulations and standards
CO4	Outline the concepts related to conventional and non-conventional energy
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
ECL 201	**SCIENTIFIC COMPUTING LAB**
CO1	Describe the needs and requirements of scientific computing and to familiarize one programming language for scientific computing and data visualization.
CO2	Approximate an array/matrix with matrix decomposition.
CO3	Implement numerical integration and differentiation
CO4	Solve ordinary differential equations for engineering applications
ECL 203	**LOGIC DESIGN LAB**
CO1	Design and demonstrate the functioning of various combinational and sequential circuits using Ics

CO2	Apply an industry compatible hardware description language to implement digital circuits
CO3	Implement digital circuits on FPGA boards and connect external hardware to the boards
CO4	Function effectively as an individual and in a team to accomplish the given task

SEMESTER 4

MAT202	**PROBABILITY, STATISTICS AND NUMERICAL METHODS**
CO1	Understand the concept, properties and important models of discrete random variables and,using them, analyse suitable random phenomena.
CO2	Understand the concept, properties and important models of continuous random variables and,using them, analyse suitable random phenomena
CO3	Analyse random processes using auto correlation ,power spectrum and poisson process as appropriate
CO4	Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques
CO5	Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations
ECT202	**ANALOG CIRCUITS**
CO1	Design analog signal processing circuits using diodes and first order RC circuit
CO2	Analyse basic amplifiers using BJT and MOSFET
CO3	Apply the principle of oscillator and regulated power supply circuits.

ECT204	SIGNALS AND SYSTEMS
CO1	Apply properties of signals and systems to classify them
CO2	Represent signals with the help of series and transforms
CO3	Describe orthogonality of signals and convolution integral.
CO4	Apply transfer function to compute the LTI response to input signals
CO5	Apply sampling theorem to discretize continuous time signals
ECT206	COMPUTER ARCHITECTURE AND MICROCONTROLLERS
CO1	Explain the functional units, I/O and memory management w.r.t a typical computer architecture.
CO2	Distinguish between microprocessor and microcontroller.
CO3	Develop simple programs using assembly language programming.
CO4	Interface 8051 microcontroller with peripheral devices using ALP/Embedded C
CO5	Familiarize system software and Advanced RISC Machine Architecture.
MCN202	CONSTITUTION OF INDIA
CO1	Explain the background of the present constitution of India and features.

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CO2	Utilize the fundamental rights and duties.
CO3	Understand the working of the union executive, parliament and judiciary.
CO4	Understand the working of the state executive, legislature and judiciary.
CO5	Utilize the special provisions and statutory institutions.
CO6	Show national and patriotic spirit as responsible citizens of the country
HUT200	**PROFESSIONAL ETHICS**
CO1	Understand the core values that shape the ethical behaviour of a professional.
CO2	Adopt a good character and follow an ethical life.
CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
ECL202	**ANALOG CIRCUITS AND SIMULATION LAB**
CO1	Design and demonstrate the functioning of basic analog circuits using discrete components
CO2	Design and simulate the functioning of basic analog circuits using simulation tools.

CO3	Function effectively as an individual and in a team to accomplish the given task.
ECL204	**MICROCONTROLLER LAB**
CO1	Write an Assembly language program/Embedded C program for performing data manipulation.
CO2	Develop ALP/Embedded C Programs to interface microcontroller with peripherals
CO3	Perform programming/interfacing experiments with IDE for modern microcontrollers
	SEMESTER 5
ECT 303	**LINEAR INTEGRATED CIRCUITS**
CO1	Understand Op Amp fundamentals and differential amplifier configurations
CO2	Design operational amplifier circuits for various applications
CO3	Design Oscillators and active filters using op-amps
CO4	Explain the working and applications of timer, VCO and PLL ICs.
CO5	Outline the working of Voltage regulator IC's and Data converters
ECT 303	**DIGITAL SIGNAL PROCESSING**
CO1	The student will be able to State and prove the fundamental properties and relations relevant to DFT and solve basic problems involving DFT based filtering methods

CO2	The student will be able to Compute DFT and IDFT using DIT and DIF radix-2 FFT algorithms
CO3	The student will be able to Design linear phase FIR filters and IIR filters for a given specification
CO4	The student will be able to Illustrate the various FIR and IIR filter structures for the realization of the given system function
CO5	The student will be able to Explain the basic multi-rate DSP operations decimation and interpolation in both time and frequency domains using supported mathematical equations
CO6	The student will be able to Explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects
ECT305	**ANALOG & DIGITAL COMMUNICATION**
CO1	Explain the existent analog communication systems.
CO2	Apply the concepts of random processes to LTI systems
CO3	Apply waveform coding techniques in digital transmission
CO4	Apply GS procedure to develop digital receivers. Apply equalizer design to counteract ISI.
CO5	Apply digital modulation techniques in signal transmission
ECT 307	**CONTROL SYSTEMS**
CO1	Determine Transfer function of electrical and mechanical systems through mathematical modelling.
CO2	Determine Transient and Steady State behavior of first and second order systems using standard test signals.

CO3	Determine absolute stability and relative stability of a system using Routh Hurwitz and root locus techniques.
CO4	Apply frequency domain techniques of Nyquist and Bode plot to design a control system with suitable compensation techniques.
CO5	Analyse system Controllability and Observability using state space representation.
HUT 300	**INDUSTRIAL ECONOMICS AND FORIEGN TRADE**
CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare.
CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production.
CO3	Determine the functional requirement of a firm under various competitive conditions.
CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.
CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm.
MCN 301	**DISASTER MANAGEMENT**
CO 1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle.
CO 2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment
CO 3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk
CO 4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community

CO 5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions
CO 6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level
ECL 331	**ANALOG INTEGRATED CIRCUITS & SIMULATION LAB**
CO 1	Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs.
CO 2	Design and simulate the application circuits with Analog Integrated Circuits using simulation tools.
CO 3	Function effectively as an individual and in a team to accomplish the given task.
ECL 333	**DIGITAL SIGNAL PROCESSING LAB**
CO 1	Simulate Digital Signals.
CO 2	Verify the properties of DFT computationally
CO 3	Familiarize the DSP Hardware and interface with computer
CO 4	Implement LTI systems with Linear Convolution
CO 5	Implement FFT and IFFT and use it on real time signals
CO 6	Implement FIR low pass Filter
CO 7	Implement real time LTI systems with block convolution and FFT

SEMESTER 6	
ECT 302	**ELECTROMAGNETICS**
CO1	Summarize the basic mathematical concepts related to electromagnetic vector field
CO2	Analyze Maxwell's equation in different forms and apply them to diverse engineering problems.
CO3	Analyze electromagnetic wave propagation and wave polarization
CO4	Analyze the characteristics of transmission lines and solve the transmission line problems using Smith chart.
CO5	Analyze and evaluate the propagation of EM waves in Wave guides.
ECT 304	**VLSI CIRCUIT DESIGN**
CO1	Explain the various methodologies in ASIC and FPGA design.
CO2	Design VLSI Logic circuits with various MOSFET logic families.
CO3	Compare different types of memory elements
CO4	Design and analyse data path elements such as Adders and multipliers
CO5	Explain MOSFET fabrication techniques and layout design rules.
ECT 306	**INFORMATION THEORY & CODING**

CO1	Explain measures of information – entropy, conditional entropy, mutual information
CO2	Apply Shannon's source coding theorem for data compression.
CO3	Apply the concept of channel capacity for characterize limits of error-free transmission.
CO4	Apply linear block codes for error detection and correction
CO5	Apply algebraic codes with reduced structural complexity for error correction
CO6	Understand encoding and decoding of convolutional and LDPC codes
ECT342	**EMBEDDED SYSTEMS**
CO1	Understand the embedded system fundamentals and system design.
CO2	Understand the peripheral devices and their interfacing with the processor
CO3	To understand the ARM processor architecture and pipeline processor organization.
CO4	To write programs in assembly and high level languages for ARM processor.
CO5	To understand the basics of real time operating systems and their use in embedded
HUT310	**MANAGEMENT FOR ENGINEERS**
CO1	Explain the characteristics of management in the contemporary context

CO2	Describe the functions of mangement
CO3	Demonstrate ability in decision making process and productivity analysis
CO4	Illustrate project management technique and develop a project schedule
CO5	Summarise the functional areas of management
CO6	Comprehend the concept of entrepreneurship and create business plans
ECT 308	**COMPREHENSIVE COURSE WORK**
CO1	Apply the knowledge of circuit theorems and solid state physics to solve the problems in electronic Circuits
CO2	Design a logic circuit for a specific application
CO3	Design linear IC circuits for linear and non-linear circuit applications.
CO4	Explain basic signal processing operations and Filter designs
CO5	Explain existent analog and digital communication systems
ECL 332	**COMMUNICATION LAB**
CO1	Set up prototype circuits for waveform coding and digital modulation techniques working in a team
CO2	Simulate the error performance of a digital communication system using standard binary and M-ary modulation schemes

CO3	Develop hands on skills to emulate a communication system with software designed radio working in a team
ECD 334	**MINIPROJECT**
CO1	Be able to practice acquired knowledge within the selected area of technology for project development.
CO2	Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.
CO3	Reproduce, improve and refine technical aspects for engineering projects.
CO4	Work as a team in development of technical projects.
CO5	Communicate and report effectively project related activities and findings.
SEMESTER 7	
ECT 401	**MICROWAVES & ANTENNAS**
CO1	Understand the basic concept of antennas and its parameters.
CO2	Analyze the far field pattern of Short dipole and Half wave dipole antenna.
CO3	Design of various broad band antennas, arrays and its radiation patterns
CO4	Illustrate the principle of operation of cavity resonators and various microwave
CO5	Explain various microwave hybrid circuits and microwave semiconductor devices

ECT 431	OPTICAL FIBER COMMUNICATION
CO1	Understand the working and classification of optical fibers in terms of propagation modes.
CO2	Solve problems of transmission characteristics and losses in optical fiber.
CO3	Explain the constructional features and the characteristics of optical sources and Detectors.
CO4	Describe the operations of optical amplifiers
CO5	Understand the concept of WDM, FSO and LiFi
MCN 401	INDUSTRIAL SAFETY ENGINEERING
CO1	Students will be able to describe the theories of accident causation and preventive measures of industrial accidents
CO2	Students will be able to describe explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
CO3	Students will be able to describe explain different issues in construction industries
CO4	Students will be able to describe various hazards associated with different machines and mechanical material handling
CO5	Students will be able to describe different hazard identification tools in different industries with the knowledge of different types of chemical hazards
ECL 411	ELECTROMAGNETICS LAB
CO1	Familiarize the basic Microwave components and to analyse few microwave measurements and its parameters.

CO2	Understand the principles of fiber-optic communications and the different kind of losses, signal distortion and other signal degradation factors.
CO3	Design and simulate basic antenna experiments with simulation tools.
ECQ413	**SEMINAR**
CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply)
CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze)
CO3	Prepare a presentation about an academic document (Cognitive knowledge level: Create)
CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply)
CO5	Prepare a technical report (Cognitive knowledge level:Create)
ECD 415	**PROJECT PHASE I**
CO1	Model and solve real world problems by applying knowledge across domains
CO2	Develop products, processes or technologies for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
CO5	Identify technology/research gaps and propose innovative/creative solutions

CO6	Organize and communicate technical and scientific findings effectively in written and oral forms

SEMESTER 8	

ECT 402	**WIRELESS COMMUNICATION**
CO1	Summarize the basics of cellular system and cellular design fundamentals.
CO2	Describe the wireless channel models and discuss capacity of wireless channels.
CO3	Analyze the performance of the modulation techniques for flat-fading channels and multicarrier modulation.
CO4	Illustrate how receiver performance can be enhanced by various diversity techniques.
CO5	Identify advantages of various equalization techniques and multiple-access techniques in wireless communication.
CO6	Calculate system parameters such antenna height, range, maximum usable frequency in different modes of radio wave propagation.
ECT 434	**SECURE COMMUNICATION**
CO1	Explain network security services and mechanisms and the types of attacks they are designed for
CO2	Model the symmetric encryption process and different encryption techniques
CO3	Apply the concepts of group, ring, field,modular arithmetic, Euclidean algorithm,Finite fields and polynomial arithmetic
CO4	Illustrate the principles of modern symmetric ciphers like the Data Encryption Standard and Advanced Encryption Standard

CO5	Outline the concepts of public key cryptography, RSA algorithm, key distribution and management for public key systems
CO6	Explain the requirements for authentication and the types of functions used to produce an authenticator
ECT 426	**REAL TIME OPERATING SYSTEMS**
CO1	Summarize the functions and structure of general-purpose operating systems.
CO2	Use different scheduling algorithms on processes and threads.
CO3	Interpret a real time operating system along with its synchronization, communication and interrupt handling tools.
CO4	Illustrate task constraints and analyse the different scheduling algorithms on tasks.
CO5	Illustrate the applications of real time operating systems.
ECT 418	**MECHATRONICS**
CO1	Understand the basic working principles of sensors for real world mechatronic applications.
CO2	Understand the basic working principles of actuators in mechatronic systems.
CO3	Implement PLC Programming for simple simulation models of mechatronics systems.
CO4	Explain the standard fabrication techniques and principle of operation of MEMS devices.
CO5	Examine commonly encountered mechatronics systems for real time applications.

ECD 416	PROJECT PHASE II
CO1	Model and solve real world problems by applying knowledge across domains
CO2	Develop products, processes or technologies for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
CO5	Identify technology/research gaps and propose innovative/creative solutions
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms

B.TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME SPECIFIC OUTCOME

PSO1	To design and develop innovative products and services in the field of electrical and electronics engineerin
PSO2	To keep pace with the rapid changes in the technology
PSO3	To assist the learners in pursuing higher and professional studies
PSO4	To nurture self-confidence, self-sufficiency, social commitment and employability among students

PROGRAM EDUCATIONAL OBJECTIVES

PEO1	Ability to analyze and apply the knowledge of electrical fundamentals, circuit design, control engineering, field theory, power system and allied topics.
PE02	To understand technologies and gain the practical skills to design, simulate and analyze electrical system to engage in lifelong learning and successfully adapt in multi-disciplinary environment
PEO3	Design, develop and implement Electrical and inter disciplinary projects to meet industry demand and to provide solution to real time problems in current scenario

COURSE OUTCOMES

SEMESTER 1

MAT 101	LINEAR ALGEBRA AND CALCULUS
CO1	solve the consistent system of linear equations and apply orthogonal to a quadratic form
CO2	find the maxima and minima of multivariable functions
CO3	find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas using double and triple integrals
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	Determine the power series expansion of a given function

CYT 100	ENGINEERING CHEMISTRY
CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.

CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.
CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.

CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, metal joining and machining processes
CYL120	**ENGINEERING CHEMISTRY LAB**

CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis
CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	**CIVIL AND MECHANICAL WORKSHOP**
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.

CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades
CO8	Apply appropriate safety measures with respect to the mechanical workshop trades

SEMESTER 2

MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering

PHT 100	ENGINEERING PHYSICS
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and identifythese phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principlesof quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Apply the knowledge of ultrasonic in non-destructive testing and use the principles of acoustics to explain the nature and characterisation of acoustics design and to provide a safe and healthy enviornemnet
CO5	Apply the comprehended knowledge about laser and fibre optic communication systems invarious engineering applications
EST 100	ENGINEERING MECHANICS
CO1	To apply the theorems and principles related to rigid body mechanics.
CO2	To identify and depict the components of system of forces acting on the rigid body.
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.

CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses.
EST130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**
CO1	Apply fundamental concepts and circuit laws to solvesimple DC electric and magneticCircuits
CO2	Develop and solve models of magnetic circuits
CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState
CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.

CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession
CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions

PHL120	**ENGINEERING PHYSICS LAB**	
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus.	
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.	
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.	
CO4	Determine the wavelength of a laser beam using the plane transmission grating.	
ESL130	**ELECTRICAL AND ELECTRONICS WORKSHOP**	
CO1	Demonstrate safety measures against electric shocks.	
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.	
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.	
CO4	Identify and test various electronic components	
CO5	Draw circuit schematics with EDA tools	

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CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
	SEMESTER 3
MAT201	**PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS**
CO1	Understand the concept and the solution of partial differential equation.
CO2	Analyse and solve one dimensional wave equation and heat equation.
CO3	Understand complex functions, its continuity differentiability with the use of Cauchy- Riemann equations.
CO4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
CO5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
EET 201	**CIRCUITS AND NETWORKS**
CO1	Apply circuit theorems to simplify and solve complex DC and AC electric networks.

CO2	Analyse dynamic DC and AC circuits and develop the complete response to excitations.
CO3	Solve dynamic circuits by applying transformation to s-domain.
CO4	Analyse three-phase networks in Y and Δ configurations.
CO5	Solve series /parallel resonant circuits.
CO6	CO 6 Develop the representation of two-port networks using network parameters and analyse.
EET 203	**MEASUREMENTS AND INSTRUMENTATION**
CO1	Identify and analyse the factors affecting performance of measuring system .
CO2	Choose appropriate instruments for the measurement of voltage, current in ac and dc measurements
CO3	Explain the operating principle of power and energy measurement
CO4	Outline the principles of operation of Magnetic measurement systems.
CO5	Describe the operating principle of DC and AC bridges, transducers based systems

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CO6	Understand the operating principles of basic building blocks of digital systems, recording and display units
EET 205	**ANALOG ELECTRONICS**
CO1	Understand the design of biasing scheme for transistor circuits.
CO2	Analyse Modelling of BJT and FET amplifier circuits.
CO3	Ability to identify a power amplifier with appropriate specifications for electronic circuit applications.
CO4	Understand the operation of oscillator circuits using BJT.
CO5	To understand the basic concepts of Operational amplifier.
CO6	Ability to design and develop various OPAMP application circuits.
EST 200	**DESIGN ENGINEERING**
CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing engineering.

CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
MCN 201	**SUSTAINABLE ENGINEERING**
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO2	Explain the different types of environmental pollution problems and their sustainable solutions
CO3	Discuss the environmental regulations and standards
CO4	Outline the concepts related to conventional and non-conventional energy
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
EEL 201	**CIRCUITS AND MEASUREMENTS LAB**
CO1	Analyse voltage current relations of RLC circuits
CO2	Verify DC network theorems by setting up various electric circuits
CO3	Measure power in a single and three phase circuits by various methods

CO4	Calibrate various meters used in electrical systems
CO5	Determine magnetic characteristics of different electrical devices
CO6	Analyse the characteristics of various types of transducer systems
CO7	Determine electrical parameters using various bridges
CO8	Analyse the performance of various electronic devices for an instrumentation systems and, to develop the team management and documentation capabilities
EEL 203	**ANALOG ELECTRONICS LAB**
CO1	Use the various electronic instruments and for conducting experiments.
CO2	Design and develop various electronic circuits using diodes and Zener diodes.
CO3	Design and implement amplifier and oscillator circuits using BJT and JFET
CO4	Design and implement basic circuits using IC (OPAMP and 555 timers).
CO5	Simulate electronic circuits using any circuit simulation software.

CO6	Use PCB layout software for circuit design

SEMESTER 4

MAT202	**PROBABILITY, STATISTICS AND NUMERICAL METHODS**
CO1	Understand the concept, properties and important models of discrete random variables and,using them, analyse suitable random phenomena.
CO2	Understand the concept, properties and important models of continuous random variables and,using them, analyse suitable random phenomena
CO3	Analyse random processes using auto correlation ,power spectrum and poisson process as appropriate
CO4	Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques
CO5	Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations
EET 202	**DC MACHINES AND TRANSFORMERS**
CO1	Acquire knowledge about constructional details of DC machines
CO2	Describe the performance characteristics of DC generators

CO3	Describe the principle of operation of DC motors and select appropriate motor types for different application
CO4	Acquire knowledge in testing of DC machines to assess its performance
CO5	Describe the constructional details and modes of operation of single phase and three phase transformers
CO6	Analyse the performance of transformers under various conditions
EET 204	**ELECTROMAGNETICS**
CO1	Apply vector analysis and coordinate systems to solve static electric and magnetic field problems.
CO2	Apply Gauss Law, Coulomb's law and Poisson's equation to determine electrostatic field parameters
CO3	Determine magnetic fields from current distributions by applying Biot-Savart's law and Amperes Circuital law.
CO4	Apply Maxwell Equations for the solution of time varying fields
CO5	Analyze electromagnetic wave propagation in different media
EET 206	**DIGITAL ELECTRONICS**

CO1	Identify the various number systems, binary codes and formulate digital functions using Boolean Algebra
CO2	Design and implement combinational logic circuits
CO3	Design and implement sequential logic circuits
CO4	Compare the operation of various analog to digital and digital to analog conversion circuits
CO5	Expplain the basic concepts of programmable logic devices and verilog
HUT 200	**PROFESSIONAL ETHICS**
CO1	Understand the core values that shape the ethical behaviour of a professional.
CO2	Adopt a good character and follow an ethical life.
CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

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MCN 202	**CONSTITUTION OF INDIA**
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO2	Explain the different types of environmental pollution problems and their sustainable solutions
CO3	Discuss the environmental regulations and standards
CO4	Outline the concepts related to conventional and non-conventional energy
EEL 202	**ELECTRCAL MACHINES-1 LAB**
CO1	Student will be able to understand and analyze performance curves of DC motors and DC generator by performing Load test
CO2	Student will be able to get knowledge on plotting OCC of self excited DC shunt Generator and check conditions of voltage build up by performing suitable experiment
CO3	Student will be able to acquire knowledge to develop equivalent circuit and predetermine their regulation and efficiency by performing OC and SC tests on transformers
CO4	Student will be able to analyse the efficiency and regulation of the transformer by performing load test
CO5	Student will be able to analyse the efficiency of a DC machine when working as motor and generator by conducting suitable test

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CO6	Student will be able to examine the efficiency by performing Sumpner's test on two similar transformers
EEL 204	**DIGITAL ELECTRONICS LAB**
CO1	Formulate digital functions using Boolean Algebra and verify experimentally
CO2	Design and implement combinational logic circuits.
CO3	Design and implement sequential logic circuits.
CO4	Design and fabricate a digital circuit using the knowledge acquired from the laboratory
	SEMESTER 5
EET 301	**POWER SYSTEMS-1**
CO1	Understand and analyze the concept and theory of various power plants, design of solar pV Panel, smart grid, micro grid and economics of power generation that will encourage students to take up innovative ideas.
CO2	Understand and model the three phase transmission lines (short, medium and long)and derive expressions of inductance and capacitance of single phase and three phase system
CO3	Understand and Analyze about sag and tension, corona, grading of underground cables and string efficiency of insulators

CO4	Understand on HVDC, HVAC transmission, FACTs devices and protective relaying schemes and switch gear in power system
CO5	Understand on protection of generators, transformers, transmission lines distribution management
EET 303	**MICRO PROCESSORS AND MICROCONTROLLERS**
CO1	Describe the architecture and timing diagram of 8085 microprocessor
CO2	Develop assembly language programs in 8085 microprocessor
CO3	Identify the different ways of interfacing memory and I/O with 8085 microprocessor.
CO4	Understand the architecture of 8051 microcontroller and embedded systems.
CO5	Develop assembly level and embedded C programs in 8051 microcontroller
EET 305	**SIGNALS AND SYSTEMS**
CO1	Explain the basic operations on signals and systems.
CO2	Apply Fourier Series and Fourier Transform concepts for continuous time signals and Analyze the continuous time systems with Laplace Transform.

CO3	Describe the concept of stability of continuous time systems and sampled data systems.
CO4	Analyze the discrete time system using Z Transform.
CO5	Apply Fourier Series and Fourier Transform concepts for Discrete time domain.
EET307	**SYNCHRONOUS AND INDUCTION MACHINES**
CO1	Analyse the performance of different types of alternators
CO2	Analyse the performance of a synchronous motor
CO3	Analyse the performance of different types of induction motors
CO4	Describe operating principle of induction machine as generator
CO5	Explain the types of single phase induction motors and their working principle
HUT 300	**INDUSTRIAL ECONOMICS AND FORIEGN TRADE**
CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare.

CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production.
CO3	Determine the functional requirement of a firm under various competitive conditions.
CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.
CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm.
MCN 301	**DISASTER MANAGEMENT**
CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle.
CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment
CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk
CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community
CO5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions
CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level

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EEL 331	MICROPROCESSORS AND MICROCONTROLLER LAB
CO1	Write an Assembly language program/Embedded C program for performing data manipulation.
CO2	Develop ALP/Embedded C Programs to interface microcontroller with peripherals
CO3	Perform programming/interfacing experiments with IDE for modern microcontrollers
EEL 333	ELECTRICAL MACHINES LAB-2
CO1	Students will be able to understand and analyze performance curves of single phase and three phase induction motors
CO2	Students will be able to get knowledge on V curves and inverted V curves of synchronous machines
CO3	Students will be able to acquire knowledge on performance of alternators by conducting different test
SEMESTER 6	
EET 302	LINEAR CONTROL SYSTEMS
CO1	Students will be able to Describe the role of various control blocks and components in feedback systems.

CO2	Students will be able to Analyse the time domain responses of the linear systems.
CO3	Students will be able to Apply Root locus technique to assess the performance of linear systems.
CO4	Students will be able to Analyse the stability of the given LTI systems.
CO5	Students will be able to analyse the frequency domain response of the given LTI systems.
CO6	Students will be able to design compensators using time domain and frequency domain techniques
EET 304	**POWER SYSTEMS-2**
CO1	Students will be able to understand and analyze different types of faults in power system, per unit representation and sequence impedance networks
CO2	Students will be able to get knowledge on load flow studies with various iterative methods
CO3	Students will be able to acquire knowledge on power system stability both steady state and transient conditions
CO4	Students will be able to acquire knowledge on Load frequency control of single area and two area system and automatic voltage regulation
CO5	Students will be able to Understand about economic load dispatch and unit commitment

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EET 306	**POWER ELECTRONICS**
CO1	Explain the operation of modern power semiconductor devices and its characteristics
CO2	Analyse the working of controlled rectifiers.
CO3	Explain the working of AC voltage controllers, inverters and PWM techniques
CO4	Compare the performance of different dc-dc converters
CO5	Describe basic drive schemes for ac and dc motors.
EET 352	**OBJECT ORIENTED PROGRAMMING**
CO1	Explain object oriented programming concepts and creation of classes for Java applications
CO2	Develop Java programs using arrays, strings, packages and inheritance concept
CO3	Build Java applications using abstract classes, interfaces, run time errors and exceptions
CO4	Develop Java applets and applications for file I/O operations

CO5	Apply the concept of multithreading in Java applications.
HUT 310	**MANAGEMENT FOR ENGINEERS**
CO1	Explain the characteristics of management in the contemporary context
CO2	Describe the functions of mangement
CO3	Demonstrate ability in decision making process and productivity analysis
CO4	Illustrate project management technique and develop a project schedule
CO5	Summarise the functional areas of management
CO6	Comprehend the concept of entrepreneurship and create business plans
EET 308	**COMPREHENSIVE COURSE WORK**
CO1	Apply the knowledge of circuit theorems to solve the problems in electrical networks
CO2	Evaluate the performance of DC machines and Transformers under different loading conditions

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CO3	Identify appropriate digital components to realise any combinational or sequential logic.
CO4	Apply the knowledge of Power generation, transmission and distribution to select appropriate components for power system operation.
CO5	Apply appropriate mathematical concepts to analyse continuous time and discrete time signals and systems

EEL 332	**POWER SYSTEMS LAB**
CO1	Develop mathematical models and conduct steady state and transient analysis of power system networks using standard software.
CO2	Develop a frequency domain model of power system networks and conduct the stability analysis.Measure power in a single and three phase circuits by various methods
CO3	Conduct appropriate tests for any power system component as per standards.
CO4	Conduct site inspection and evaluate performance ratio of solar power plant

EEL 334	**POWER ELECTRONICS LAB**
CO1	Determine the characteristics of SCR and design triggering circuits for SCR based circuits.
CO2	Design, set up and analyse single phase AC voltage controllers.

CO3	Design, set up and test suitable gate drives for MOSFET/IGBT
CO4	Design, set up and test basic inverter topologies
CO5	Design and set up dc-dc converters
CO6	Develop simulation models of dc-dc converters, rectifiers and inverters using modern simulation tools.
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	SEMESTER 7
EET 401	**ADVANCED CONTROL SYSTEMS**
CO1	Students will able to develop the state variable representation of physical systems
CO2	Students will analyse the performance of linear and nonlinear systems using state variable approach
CO3	Students will design state feedback controller for a given system
CO4	Students will able to understand the characteristics of nonlinear systems
CO5	Students will able to apply the tools like describing function approach or phase plane approach for assessing the performance of nonlinear systems
CO6	Students will able to apply Lyapunov method for the stability analysis of physical systems.
EET463	**ILLUMINATION TECHNOLOGY**
CO1	Students will be able to identify and analyse the different lighting schemes , requirements of good lighting system and artificial lamps and luminaire
CO2	Students will understand the concept of polar curve and illumination with different sources and measuring instruments for illumination

CO3	Students will be able to describe explain different issues in construction industries
CO4	Students will be able to describe various hazards associated with different machines and mechanical material handling
CO5	Students will be able to describe different hazard identification tools in different industries with the knowledge of different types of chemical hazards
MCN 401	**INDUSTRIAL SAFETY ENGINEERING**
CO1	Students will be able to describe the theories of accident causation and preventive measures of industrial accidents
CO2	Students will be able to describe explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
CO3	Students will be able to describe explain different issues in construction industries
CO4	Students will be able to describe various hazards associated with different machines and mechanical material handling
CO5	Students will be able to describe different hazard identification tools in different industries with the knowledge of different types of chemical hazards
CET445	**NATURAL DISASTER AND MITIGATION**
CO1	Explain interactions between subsystems that give rise to hazards & their potential for disasters

CO2	Explain the evolving concepts & thoughts of management of Hazards & disasters
CO3	Analyse the cause behind natural disasters and evaluate their magnitude & impacts
CO4	Create management plans for hazards & disasters and understand the roles of agencies involved
CO5	Explain the concept of sustainable development and EIA and their role in mitigating disasters
EEL 411	**CONTROL SYSTEM LAB**
CO1	Students will be able to demonstrate the knowledge of simulation tools for control system design.
CO2	Students will be able to develop the mathematical model of a given physical system by conducting appropriate experiments.
CO3	Students will be able to analyse the performance and stability of physical systems using classical and advanced control approaches.
CO4	Students will be able to design controllers for physical systems to meet the desired specifications
EED415	**PROJECT PHASE -1**
CO1	Model and solve real world problems by applying knowledge across domains

CO2	Develop products , processes or technology for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute task utilizing available resources within timelines following ethical and professional norms
CO5	Identify technology / research gaps and propose innovative / creative solutions
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms
EEQ413	**SEMINAR**
CO1	Identify academic documents from the literature which are related to her/his areas of interest
CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest
CO3	Prepare a presentation about an academic document (Cognitive knowledge level:
CO4	Give a presentation about an academic document
CO5	Prepare a technical report

SEMESTER 8	
EET 402	**ELECTRICAL SYSTEM DESIGN**
CO1	Students will be able to describe the theories of accident causation and preventive measures of industrial accidents
CO2	Students will be able to explain about personal protective equipment, its selection,safety performance indicators and importance of housekeeping.
CO3	Students will be able to explain different issues in construction industries.
CO4	Students will be able to describe various hazards associated with different machines and mechanical material handling
CO5	Students will be able to utilize different hazard identification tools in different industries with the knowledge of different types of chemical hazards
EET434	**SMART GRID TECHNOLOGIES**
CO1	Students will able to explain the basic concept of distributed energy resources, micro-grid and smart grid
CO2	Students can able to choose appropriate Information and Communication Technology (ICT) in smart grid
CO3	Students can able to select infrastructure and technologies for consumer domain of smart grid

CO4	Students can able to select infrastructure and technologies for smart substation and distribution automation
CO5	Students can formulate cloud computing infrastructure for smart grid considering cyber security.Students can categorize power quality issues and appraise it in smart grid context
EET 426	**SPECIAL ELECTRICAL MACHINES**
CO1	Understand and analyze the performance of different types of permanent magnet motors
CO2	Understand the performance of a stepper motor
CO3	Analyze the performance of different types of reluctance motors
CO4	Acquire knowledge on the construction and principle of operation of servomotors
CO5	Understand single phase special motors and linear motors
EET468	**INDUSTRIAL INSTRUMENTATION AND AUTOMATION**
CO1	Identify the sensors/transducers suitable for industrial applications.
CO2	Design the signal conditioning circuits for industrial instrumentation and automation.

CO3	Analyze the concepts of data transmission and virtual instrumentation related to automation
CO4	Develop the logic for the process control applications using PLC programming
CO5	Describe the fundamental concepts of DCS and SCADA systems
EED416	**PROJECT PHASE -II**
CO1	Model and solve real world problems by applying knowledge across domains
CO2	Develop products, processes or technologies for sustainable and socially relevant applications
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
CO5	Identify technology/research gaps and propose innovative/creative solutions
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms

B.TECH IN MECHANICAL ENGINEERING

PROGRAMME SPECIFIC OUTCOME

PSO1	Apply the knowledge of mathematics, physics, basics of other engineering disciplines, mechanics, thermal sciences, fluid mechanics and management principles for solving complex and diverse problems in the field of mechanical engineering.
PSO2	Implement the principles of design, analysis and interpretation of data to the mechanical systems and processes
PSO3	Use modern tools such as CAD/CAM/ CIM/CFD, IT, IOT and 3D printing techniques in the mechanical engineering practice.

COURSE OUTCOMES

SEMESTER 1

MAT 101	LINEAR ALGEBRA AND CALCULUS
CO1	solve the consistent system of linear equations and apply orthogonal to a quadratic form
CO2	find the maxima and minima of multivariable functions
CO3	find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas using double and triple integrals
CO4	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent

CO5	Determine the power series expansion of a given function
PHT110	**ENGINEERING PHYSICS (B)**
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and identifythese phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principlesof quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Apply the knowledge of ultrasonic in non-destructive testing and use the principles of acoustics to explain the nature and characterisation of acoustics design and to provide a safe and healthy enviornment
CO5	Apply the comprehended knowledge about laser and fibre optic communication systems invarious engineering applications
EST100	**ENGINEERING MECHANICS**
CO1	To apply the theorems and principles related to rigid body mechanics.
CO2	To identify and depict the components of system of forces acting on the rigid body.
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses.

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EST130	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO1	Apply fundamental concepts and circuit laws to solvesimple DC electric and magneticCircuits
CO2	Develop and solve models of magnetic circuits
CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState
CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUT101	LIFE SKILLS
CO1	Define and Identify different life skills required in personal and professional life
CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.
CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.
CO4	Take part in Group discussions
CO5	Use appropriate thinking and problem solving technique to solve problems

CO6	Understand the basics of teamwork and leadership
PHL120	**ENGINEERING PHYSICS LAB**
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus.
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating.
ESL130	**ELECTRICAL AND ELECTRONICS WORKSHOP**
CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards

CO7	Work in a team with good interpersonal skills
SEMESTER 2	
MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
CYT100	**ENGINEERING CHEMISTRY**
CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.

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CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.
CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.
CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps

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CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements
CO11	Describe the basic manufacturing, metal joining and machining processes
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession
CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs

CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output
CYL120	**ENGINEERING CHEMISTRY LAB**
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis

CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	**CIVIL AND MECHANICAL WORKSHOP**
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.
CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades
CO8	Apply appropriate safety measures with respect to the mechanical workshop trades
SEMESTER 3	
MAT201	**PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS**

CO1	Understand the concept and the solution of partial differential equation.
CO2	Analyse and solve one dimensional wave equation and heat equation.
CO3	Understand complex functions, its continuity differentiability with the use of Cauchy- Riemann equations.
CO4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
CO5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
MET201	**MECHANICS OF SOLIDS**
CO 1	Determine the stresses, strains and displacements of structures by tensorial and graphical (Mohr's circle) approaches
CO 2	Analyse the strength of materials using stress-strain relationships for structural and thermal loading
CO 3	Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments
CO 4	Determine the deformation of structures subjected to various loading conditions using strain energy methods
CO 5	Analyse column buckling and appreciate the theories of failures and its relevance in engineering design
MET203	**MECHANICS OF FLUIDS**
CO1	Define Properties of Fluids and Solve hydrostatic problems

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CO2	Explain fluid kinematics and Classify fluid flows
CO3	Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation
CO4	Evaluate energy loses in pipes and sketch energy gradient lines
CO5	Explain the concept of boundary layer and its applications
CO6	Use dimensional Analysis for model studies
MET 205	**METALLURGY & MATERIAL SCIENCE**
CO1	Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties.
CO2	Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.
CO3	How to quantify mechanical integrity and failure in materials.
CO4	Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials for specific applications.
CO5	Define and differentiate engineering materials on the basis of structure and properties for engineering applications.
HUT200	**PROFESSIONAL ETHICS**
CO1	Understand the core values that shape the ethical behaviour of a professional.

CO2	Adopt a good character and follow an ethical life.
CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO4	Solve moral and ethical problems through exploration and assessment by established experiments.
CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
MCN201	**SUSTAINABLE ENGINEERING**
CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
CO2	Explain the different types of environmental pollution problems and their sustainable solutions
CO3	Discuss the environmental regulations and standards
CO4	Outline the concepts related to conventional and non-conventional energy
CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
MEL201	**COMPUTER AIDED MACHINE DRAWING**
CO1	Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components.
CO2	Preparestandard assembly drawings of machine components and valvesusing part drawings and bill of materials.

CO3	Apply limits and tolerances to components and choose appropriate fits for given assemblies
CO4	Interpret the symbols of welded, machining and surface roughness on the component drawings.
CO5	Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software.
MEL203	**MATERIALS TESTING LAB**
CO1	To understand the basic concepts of analysis of circular shafts subjected to torsion.
CO2	To understand the behaviour of engineering component subjected to cyclic loading and failure concepts
CO3	Evaluate the strength of ductile and brittle materials subjected to compressive, Tensile shear and bending forces
CO4	Evaluate the microstructural morphology of ductile or brittle materials and its fracture modes (ductile /brittle fracture) during tension test
CO5	To specify suitable material for applications in the field of design and manufacturing.
	SEMESTER 4
MAT202	**PROBABILITY, STATISTICS AND NUMERICAL METHODS**
CO1	Understand the concept, properties and important models of discrete random variablesand,using them, analyse suitable random phenomena.
CO2	Understand the concept, properties and important models of continuous randomvariables and,using them, analyse suitable random phenomena.

CO3	Perform statistical inferences concerning characteristics of a population based onattributes of samples drawn from the population
CO4	Compute roots of equations, evaluate definite integrals and perform interpolation ongiven numerical data using standard numerical techniques
CO5	Apply standard numerical techniques for solving systems of equations, fitting curveson given numerical data and solving ordinary differential equations.
MET202	**ENGINEERING THERMODYNAMICS**
CO1	Understand basic concepts and laws of thermodynamics
CO2	Conduct first law analysis of open and closed systems
CO3	Determine entropy and availability changes associated with different processes
CO4	Understand the application and limitations of different equations of state
CO5	Determine change in properties of pure substances during phase change processes
CO6	Evaluate properties of ideal gas mixtures
MET 204	**MANUFACTURING PROCESS**
CO1	Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications.
CO2	Categorize welding processes according to welding principle and material.

CO3	Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials.
CO4	Student will estimate the working loads for pressing, forging, wire drawing etc. processes
CO5	Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints.
MET206	**FLUID MACHINERY**
CO1	Explain the characteristics of centrifugal and reciprocating pump
CO2	Calculate forces and work done by a jet on fixed or moving plate and curved plates
CO3	Explain the working of turbines and Select a turbine for specific application.
CO4	Analyse the working of air compressors and Select the suitable one based on application
CO5	Analyse gas turbines and Identify the improvements in basic gas turbine cycles.
CO6	Explain the characteristics of centrifugal and reciprocating pumps
EST200	**DESIGN AND ENGINEERING**
CO1	Explain the different concepts and principles involved in design engineering.
CO2	Apply design thinking while learning and practicing engineering.

CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
MCN202	**CONSTITUTION OF INDIA**
CO1	Explain the background of the present constitution of India and features.
CO2	Utilize the fundamental rights and duties.
CO3	Understand the working of the union executive, parliament and judiciary.
CO4	Understand the working of the state executive, legislature and judiciary.
CO5	Utilize the special provisions and statutory institutions.
CO6	Show national and patriotic spirit as responsible citizens of the country
MEL202	**FM & HM LAB**
CO1	Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter)
CO2	Calibrate flow measuring devices (notches, orifice meter and Venturi meter)
CO3	Evaluate the losses in pipes
CO4	Determine the metacentric height and stability of floating bodies

CO5	Determine the efficiency and plot the characteristic curves of different types of pumps and turbines
MEL 204	**MACHINE TOOLS LAB- I**
CO1	The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality.
CO2	Apply cutting mechanics to metal machining based on cutting force and power consumption.
CO3	Select appropriate machining processes and process parameters for different metals.
CO4	Fabricate and assemble various metal components by welding and students will be able to visually examine their work and that of others for discontinuities and defects.
CO5	Infer the changes in properties of steel on annealing, normalizing, hardening and tempering.
	SEMESTER 5
MET301	**MECHANICS OF MACHINERY**
CO1	Explain the fundamentals of kinematics, various planar mechanisms and interpret the basic principles of mechanisms and machines
CO2	Perform analysis and synthesis of mechanisms
CO3	Solve the problem on cams and gear drives, including selection depending on requirement.
CO4	Calculate the gyroscopic effect in various situations

CO5	Analyse rotating and reciprocating masses for its unbalance
MET303	**THERMAL ENGINEERING**
CO1	Explain the working of steam power cycle and related components
CO2	Discuss the working of steam turbines and methods for evaluating the performance
CO3	Illustrate the performance testing and evaluation of IC engines
CO4	Explain the combustion phenomenon and pollution in IC engines
CO5	Discuss the principles of refrigeration and air-conditioning and basic design considerations
MET305	**INDUSTRIAL & SYSTEMS ENGINEERING**
CO1	Implement various tools and techniques in industrial engineering
CO2	Calculate the inventory system for a given requirement
CO3	Explain the importance of industrial relations
CO4	Select the lean manufacturing tools to find and eliminate wastes
CO5	Identify the framework of agile manufacturing

CO6	Identify core and extended modules of enterprise resource planning
MET 307	**MACHINE TOOLS AND METROLOGY**
CO1	Analyze various machining process and calculate relevant quantities such us velocities, forces and powers.
CO2	Analyze of the tool nomenclature with surface roughness obtainable in each machining processes.
CO3	Understand the limitations of various machining process with regard to shape formation and surface texture.
CO4	Demonstrate knowledge of the underlying principles of measurement, as they relate to mechanical measurement, electronic instrumentation, and thermal effects.
CO5	Get an exposure to advanced measuring devices and machine tool metrology.
HUT 300	**INDUSTRIAL ECONOMICS & FOREIGN TRADE**
CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. (Cognitive knowledge level: Understand)
CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: Apply)
CO3	Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: Analyse)
CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: Analyse)
CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm. (Cognitive knowledge level: Analyse)

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MCN301	DISASTER MANAGEMENT
CO1	Define and use various terminologies in use in disaster management parlance andorganise each of these terms in relation to the disaster management cycle
CO2	Distinguish between different hazard types and vulnerability types and dovulnerability assessment
CO3	Identify the components and describe the process of risk assessment, and applyappropriate methodologies to assess risk
CO4	Explain the core elements and phases of Disaster Risk Management and developpossible measures to reduce disaster risks across sector and community
CO5	Identify factors that determine the nature of disaster response and discuss the variousdisaster response actions
CO6	Explain the various legislations and best practices for disaster management and riskreduction at national and international level
MEL331	MACHINE TOOLS LAB II
CO1	Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments and by different indirect methods.
CO2	Determine limits and fits and allocate tolerances for machine components
CO3	CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.
CO4	Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.
CO5	Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools.

MEL333	THERMAL ENGINEERING LAB 1
CO1	Measure thermo-physical properties of solid, liquid and gaseous fuels
CO2	Identify various systems and subsystems of Diesel and petrol engines
CO3	Analyse the performance characteristics of internal combustion engines
CO4	Investigate the emission characteristics of exhaust gases from IC Engines
CO5	Interpret the performance characteristics of air compressors / blowers

SEMESTER 6

MET 302	HEAT &MASS TRANSFER
CO1	Apply principles of heat and mass transfer to engineering problems
CO2	Analyse and obtain solutions to problems involving various modes of heat transfer
CO3	Design heat transfer systems such as heat exchangers, fins, radiation shields etc.
CO4	Define laminar and turbulent boundary layers and ability to formulate energy equation in flow systems.
MET304	DYNAMICS AND DESIGN OF MACHINERY

CO1	Do engine force analysis and to draw turning moment diagrams
CO2	Analyse free and forced vibrations of single degree of freedom systems
CO3	Determine the natural frequencies of a two degree of freedom vibrating system and to
CO4	calculate the stresses in a structural member due to combined loading
CO5	Design machine elements subjected to fatigue loading and riveted joints
CO6	Design welded joint and close coiled helical compression spring
MET 306	**ADVANCED MANUFACTURING ENGINEERING**
CO1	To be conversant with the advanced machining process and to appreciate the effect of process parameters on the surface integrity aspects during the advanced machining process.
CO2	CNC programming, select appropriate tooling and fixtures.
CO3	To categorize the various nontraditional material removal process based on energy sources and mechanism employed.
CO4	Analyze the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes.
CO5	Explain the processes used in additive manufacturing for a range of materials and applications.
MET 352	**AUTOMOBILE ENGINEERING**

CO1	Explain different automotive systems and subsystems .
CO2	Illustrate the principles of transmission, suspension, steering and braking systems of an automobile.
CO3	Build a basic knowledge about the technology in electric vehicles.
CO4	Summarize the concept of aerodynamics in automobiles.
MET362	**PRODUCT DESIGN AND DEVELOPMENT**
CO1	Determine the life cycle of a product and product development process
CO2	Develop knowledge of robust design and conceptual design
CO3	Introduce the concept of Design for Manufacturing and Assembly in product design.
CO4	Use value engineering in the development of product
CO5	Incorporate ergonomics and rapid prototyping in product development.
HUT 310	**MANAGEMENT FOR ENGINEERS**
CO1	Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand).
CO2	Describe the functions of management (Cognitive Knowledge level: Understand)

CO3	Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand).
CO4	Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply).
CO5	Summarize the functional areas of management (Cognitive Knowledge level: Understand).
CO6	Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand).
MET308	**COMPREHENSIVE COURSE WORK**
CO1	Learn to prepare for a competitive examination
CO2	Comprehend the questions in Mechanical Engineering field and answer them with confidence
CO3	Communicate effectively with faculty in scholarly environments
CO4	Analyze the comprehensive knowledge gained in basic courses in the field of Mechanical Engineering
MEL332	**COMPUTER AIDED DESIGN & ANALYSIS LAB**
CO1	Gain working knowledge in Computer Aided Design and modelling procedures.
CO2	Gain knowledge in creating solid machinery parts.
CO3	Gain knowledge in assembling machine elements.

CO4	Gain working knowledge in Finite Element Analysis.
CO5	Solve simple structural, heat and fluid flow problems using standard software
MEL334	**THERMAL ENGINEERING LAB-II**
CO1	Evaluate thermal properties of materials in conduction, convection and radiation
CO2	Analyse the performance of heat exchangers
CO3	Illustrate the operational performances of refrigeration and air conditioning systems
CO4	Perform calibration of thermocouples and pressure gauges
	SEMESTER 7
MET401	**DESIGN OF MACHINE ELEMENTS**
CO1	Design shafts based on strength, rigidity and design for static and fatigue loads, design flat belts and connecting rod of IC engines
CO2	Design clutches and brakes
CO3	Analyse sliding contact bearings and understand design procedure of journal, ball and roller bearings.
CO4	Design Spur gear and helical gear

CO5	Design Bevel gears and worm gears
MEL411	**MECHANICAL ENGINEERING LAB**
CO1	Get practical knowledge on design and analysis of mechanisms in the machines.
CO2	Measure the cutting forces associated with milling machining operations.
CO3	Apply the basic concepts of hydraulic and pneumatic actuators and their applications in product and processes
CO4	Use appropriate systems for data acquisition and control of product and processes
MEQ413	**SEMINAR**
CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
CO3	Prepare a presentation about an academic document (Cognitive knowledge level: Create).
CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).
CO5	Prepare a technical report (Cognitive knowledge level: Create).
MED415	**PROJECT PHASE I**

CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)
MET413	**ADVANCED METHODS IN NONDESTRUCTIVE TESTING**
CO1	Understand the theoretical and practical knowledge in methods of non-destructive testing processes
CO2	Understand the knowledge of advanced methods in ultrasonic testing which enables them to perform inspection of samples.
CO3	Illustrate complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation.
CO4	Understand the recent advances in the field of non-destructive testing
CO5	Outline the recent and advanced developments in radiography testing
MET443	**AEROSPACE ENGINEERING**

CO1	Explain the characteristics of atmosphere
CO2	Discuss airfoil theory, 2D, 3D or Finite aero foils
CO3	Explain perform analysis of flight dynamics of aircrafts
CO4	Understand different flight instruments
CO5	Discuss the principles of wind tunnel testing
MET463	**OPERATIONS MANAGEMENT**
CO1	Understand operations, production system and perform facility location analysis.
CO2	Impart knowledge of facility layout, layout planning and perform line balancing.
CO3	Compute demand forecast and forecast accuracy.
CO4	Perform aggregate planning and materials requirement planning.
CO5	Apply various algorithms for production scheduling.
	SEMESTER 8
MET402	**MECHATRONICS**

CO1	Explain the sensors and actuators used in mechatronics
CO2	Design hydraulic and pneumatic circuits for automation
CO3	Explain the manufacturing processes used in MEMS
CO4	Demonstrate the various components of a CNC machine
CO5	Create a PLC program
CO6	Explain the robotic sensors and vision system
MED416	**PROJECT PHASE II**
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

MET414	QUALITY MANAGEMENT (PROGRAM ELECTIVE III)
CO1	To be conversant with important terms for quality management in organisations
CO2	Have a complete theoretical and practical understanding of the contributions of Quality Gurus
CO3	Demonstrate knowledge of the underlying principles of strategic quality management
CO4	Identify various human dimensions of TQM
CO5	Implement different tools and techniques in TQM
CO6	Identify core and extended modules of ISO 9000 family of standards
MET464	MICRO AND NANO MANUFACTURING (PROGRAM ELECTIVE III)
CO1	Explain different techniques used in micro and nano manufacturing
CO2	Describe conventional techniques used in micro manufacturing.
CO3	Describe non-conventional micro-nano manufacturing approaches.
CO4	Outline the working principle and applications of micro and nano finishing processes
CO5	Explain the basics of micro and nano fabrication techniques.

CO6	Apply and select metrology systems in micro and nano manufacturing.
MET466	**TECHNOLOGY MANAGEMENT (PROGRAM ELECTIVE IV)**
CO1	Be conversant with important terms for technology management in organisations
CO2	Explain the need of technology forecasting
CO3	Understand the essence of technology acquisition
CO4	Describe the elements of technology strategy
CO5	Outline the basics of innovation
CO6	Identify human factors in technology management
MET436	**ACOUSTICS AND NOISE CONTROL (PROGRAM ELECTIVE IV)**
CO1	Explain various acoustic terminologies and understand the physics behind acoustic wave propagation
CO2	Evaluate reflection and transmission coefficients in sound transmission through different media and understand the concept of standing waves
CO3	Explain the mechanism of hearing, concept of noise, various noise criteria and standards
CO4	Explain different noise measures and various noise measurement devices

CO5	Apply noise control measures to different machines and devices
MET468	**ADDITIVE MANUFACTURING (PROGRAM ELECTIVE V)**
CO1	Discuss various additive manufacturing processes
CO2	Explain slicing operations in additive manufacturing
CO3	Use liquid and solid based additive manufacturing system
CO4	Select powder based and use of pre requirement of AM
CO5	Apply rapid prototyping techniques for obtaining solutions
MET458	**ADVANCED ENERGY ENGINEERING (PROGRAM ELECTIVE V)**
CO1	Explain the concept of various types of power generation
CO2	Explain solar and wind power generation and its economics
CO3	Explain biomass energy sources and its economics
CO4	Explain various renewable energy sources
CO5	Explain environmental impacts of various energy generation

B.TECH IN COMPUTER SCIENCE AND ENGINEERING(DATA SCIENCE)	
COURSE OUTCOMES	
SEMESTER 1	
MAT 101	**LINEAR ALGEBRA AND CALCULUS**
CO1	solve systems of linear equations, diagonalize matrices and characterise quadratic forms
CO2	compute the partial and total derivatives and maxima and minima of multivariable functions
CO3	compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas
CO4	perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	determine the Taylor and Fourier series expansion of functions and learn their applications.
PHT 100	**ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)**
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.
CO2	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.

CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
CO5	Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system
CYT100	**ENGINEERING CHEMISTRY**
CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.
EST 100	**ENGINEERING MECHANICS**
CO1	Recall principles and theorems related to rigid body mechanics

CO2	Identify and describe the components of system of forces acting on the rigid body
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object
CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.
CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools

EST120	BASICS OF CIVIL AND MECHANICAL ENGINEERING
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.
CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
CO8	Explain the basic principles of Refrigeration and Air Conditioning
CO9	Describe the working of hydraulic machines
CO10	Explain the working of power transmission elements

CO11	Describe the basic manufacturing, metal joining and machining processes
EST 130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**
CO1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits
CO2	Develop and solve models of magnetic circuits
CO3	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steadystate
CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUT101	**LIFE SKILLS**
CO1	Define and Identify different life skills required in personal and professional life
CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.

CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.
CO4	Take part in Group discussions
CO5	Use appropriate thinking and problem solving technique to solve problems
CO6	Understand the basics of teamwork and leadership
PHL 120	**ENGINEERING PHYSICS LAB**
CO1	Develop analytical/experimental skills and impart prerequisite hands on experience forengineering laboratories
CO2	Understand the need for precise measurement practices for data recording
CO3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
CO4	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
CO5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
CYL120	**ENGINEERING CHEMISTRY LAB**

CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis
CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	**CIVIL AND MECHANICAL WORKSHOP**
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.

CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades
CO8	Apply appropriate safety measures with respect to the mechanical workshop trades
ESL 130	**ELECTRICAL & ELECTRONICS WORKSHOP**
CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards

CO7	Work in a team with good interpersonal skills
	SEMESTER 2
MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
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CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
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CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency
CO7	Illustrate the working and features of IC Engines
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CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession

CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing

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CO6	Develop readable C programs with files for reading input and storing output
PHL120	**ENGINEERING PHYSICS LAB**
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus.
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating.
CYL120	**ENGINEERING CHEMISTRY LAB**
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
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CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
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CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
SEMESTER 3	
MAT 203	**DISCRETE MATHEMATICAL STRUCTURES**
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)

CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand)
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)
CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply)
CO6	Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)
CST 201	**DATA STRUCTURES**
CO 1	Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)
CO2	Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)
CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed (Cognitive Knowledge Level: Apply)
CO4	Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)
CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze)

CO6	Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)
CST 203	**LOGIC SYSTEM DESIGN**
CO1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers (Cognitive Knowledge level: Understand)
CO2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level: Apply)
CO3	Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA. (Cognitive Knowledge level: Apply)
CO4	Design sequential circuits - Registers, Counters and Shift Registers. (Cognitive ROM and PLA. (Cognitive Knowledge level: Apply)
CO5	Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)
CST 205	**OBJECT ORIENTED PROGRAMMING USING JAVA**
CO1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)
CO2	Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs (Cognitive Knowledge Level: Apply)
CO3	Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)

CO4	Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
CO5	Write Graphical User Interface based application programs by utilising event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
CSL 201	**DATA STRUCTURES LAB**
CO1	Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements (Cognitive Knowledge Level: Analyse)
CO2	Write a time/space efficient program to sort a list of records based on a given key in the record (Cognitive Knowledge Level: Apply)
CO3	Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)
CO4	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
CO5	Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)
CO6	Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)
CSL 203	**OBJECT ORIENTED PROGRAMMING LAB (IN JAVA)**
CO1	Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)

CO2	Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
CO3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
CO4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
	SEMESTER 4
MAT256	**PROBABILITY AND STATISTICAL MODELLING**
CO1	Explain the concept, properties and important models of discrete random variables and use them to analyze suitable random phenomena(Cognitive Knowledge Level: Apply)
CO2	Summarize the properties and relevant models of continuous random variables and use them to analyze suitable random phenomena(Cognitive Knowledge Level: Apply)
CO3	Make use of concepts of sampling and theory of estimation to solve application level problems (Cognitive Knowledge Level: Apply)
CO4	Organize the basic concepts in hypothesis testing and develop decision procedures for the most frequently encountered testing problems(Cognitive Knowledge Level: Apply)
CO5	Build statistical methods like correlation and regression analysis to interpret experimental data (Cognitive Knowledge Level: Apply)

CST 202	**COMPUTER ORGANISATION AND ARCHITECTURE**
CO1	Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer (Cognitive knowledge: Understand)
CO2	Explain the types of memory systems and mapping functions used in memory systems (Cognitive Knowledge Level: Understand)
CO3	Demonstrate the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply))
CO4	Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it (Cognitive Knowledge Level: Apply)
CO5	Explain the implementation aspects of arithmetic algorithms in a digital computer (Cognitive Knowledge Level:Apply)
CO6	Develop the control logic for a given arithmetic problem (Cognitive Knowledge Level: Apply)
CST 204	**DATABASE MANAGEMENT SYSTEMS**
CO1	Summarize and exemplify fundamental nature and characteristics of database systems (Cognitive Knowledge Level: Understand)
CO2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams. (Cognitive Knowledge Level: Apply)
CO3	Model and design solutions for efficiently representing and querying data using relational model (Cognitive Knowledge Level: Analyze)

CO4	Demonstrate the features of indexing and hashing in database applications (Cognitive Knowledge Level: Apply)	
CO5	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems (Cognitive Knowledge Level: Apply)	
CO6	Explain various types of NoSQL databases (Cognitive Knowledge Level: Understand)	
CST 206	**OPERATING SYSTEMS**	
CO1	Explain the relevance, structure and functions of Operating Systems in computing devices. (Cognitive knowledge: Understand)	
CO2	Illustrate the concepts of process management and process scheduling mechanismsemployed in Operating Systems. (Cognitive knowledge: Understand)	
CO3	Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors (Cognitive knowledge: Understand)	
CO4	Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems. (Cognitive knowledge: Understand)	
CO5	Explain the memory management algorithms in Operating Systems. (Cognitive knowledge: Understand)	
CO6	Explain the security aspects and algorithms for file and storage management in Operating Systems. (Cognitive knowledge: Understand)	
ADL202	**PYTHON AND STATISTICAL MODELLING LAB**	

CO1	Experiment with concepts of iteration, function, string and list (Cognitive Knowledge Level: Apply)
CO2	Identify the importance of tuples, dictionary traversal, dictionary methods, files and operations (Cognitive Knowledge Level: Apply)
CO3	Model graphical representation of data, measures of central tendency and measures of dispersion (Cognitive Knowledge Level: Apply)
CO4	Solve problems based on Binomial distribution, Poisson distribution, samplingand regression analysis (Cognitive Knowledge Level: Apply)
CO5	Make use of various correlation tests and utilize statistical analysis software(Cognitive Knowledge Level: Apply)
CSL204	**OPERATING SYSTEMS LAB**
CO1	Illustrate the use of systems calls in Operating Systems. (Cognitive knowledge:Understand)
CO2	Implement Process Creation and Inter Process Communication in OperatingSystems. (Cognitive knowledge: Apply)
CO3	Implement Fist Come First Served, Shortest Job First, Round Robin and Prioritybased CPU Scheduling Algorithms. (Cognitive knowledge: Apply)
CO4	Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. (Cognitive knowledge: Apply)
CO5	Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. (Cognitive knowledge: Apply)

CO6	Implement modules for Storage Management and Disk Scheduling in Operating Systems. (Cognitive knowledge: Apply)

SEMESTER 5	

CS501	**FORMAL LANGUAGES AND AUTOMATA THEORY**
CO1	Classify a given formal language into Regular, Context-Free, Context Sensitive, Recursive or Recursively Enumerable. [Cognitive knowledge level: Understand
CO2	Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Nerode relation. [Cognitive knowledge level: Understand]
CO3	Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language. [Cognitive knowledge level : Apply]
CO4	Design Turing machines as language acceptors or transducers. [Cognitive knowledge level: Apply]
CO5	Explain the notion of decidability. [Cognitive knowledge level: Understand]

CS503	**COMPUTER NETWORKS**
CO1	Explain the features of computer networks, protocols, and network design models (Cognitive Knowledge: Understand)
CO2	Describe the fundamental characteristics of the physical layer and identify the usage in network communication

CO3	Explain the design issues of data link layer, link layer protocols, bridges and switches
CO4	Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) (Cognitive Knowledge: Understand)
CO5	Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network (Cognitive Knowledge: Apply)
CO6	Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking (Cognitive Knowledge: Understand)
CDT305	**DATA ANALYTICS**
CO1	Explain the key concepts of data analytics (Cognitive Knowledge Level: Understand)
CO2	Apply appropriate techniques to convert raw data into suitable format for practical data analytics tasks (Cognitive Knowledge Level: Apply)
CO3	Extend the concept of association rule mining in real world scenario (Cognitive Knowledge Level: Understand)
CO4	Select appropriate clustering and classification algorithms for various applications and extend data analytics methods to the new domains of data (Cognitive Knowledge Level: Apply)
CO5	Understand the basics of text analytics and text classification (Cognitive Knowledge Level: Understand)
CDT307	**BIG DATA PROCESSING**

CO1	Understand big data and trivial data and build and maintain reliable, scalable, distributed systems (Cognitive Knowledge Level: Understand)
CO2	Infer knowledge about the distributed storage and processing of large datasets and extend the effective data storage mechanisms using HDFS and HBase (Cognitive Knowledge Level: Understand)
CO3	Model the distributed processing of large data sets across clusters using simple programming models (Cognitive Knowledge Level: Apply)
CO4	Identify the basics of stream computing and build applications using Hive (Cognitive Knowledge Level: Apply)
CO5	Build applications using Pig and spark (Cognitive Knowledge Level: Apply)
CST 309	**MANAGEMENT OF SOFTWARE SYSTEMS**
CO1	Demonstrate Traditional and Agile Software Development approaches (Cognitive Knowledge Level: Apply)
CO2	Prepare Software Requirement Specification and Software Design for a given problem. (Cognitive Knowledge Level: Apply)
CO3	Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project. (Cognitive Knowledge Level: Apply)
CO4	Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. (Cognitive Knowledge Level: Apply)
CO5	Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices. (Cognitive Knowledge Level: Apply)

CDL331	**DATA ANALYTICS LAB**
CO1	Illustrate the data mining concepts using a data mining toolkit and visualize the result.(Cognitive knowledge: Understand)
CO2	Implement the data pre-processing tasks in data sets. (Cognitive knowledge: Apply)
CO3	Implement the algorithms for supervised data mining tasks such association rule mining, classification, clustering and regression.(Cognitive knowledge: Apply)
CO4	Implement the algorithms for unsupervised data mining tasks Cognitive knowledge: Apply)
CO5	Implement the algorithms for text mining.(Cognitive knowledge: Apply)
CSL 333	**DATABASE MANAGEMENT SYSTEMS LAB**
CO1	Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)
CO2	Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)
CO3	Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
CO4	Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)

CO5	Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)
CO6	Develop database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)
	SEMESTER 6
CST 302	**COMPILER DESIGN**
CO1	Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer
CO2	Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations
CO3	Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar
CO4	Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations
CO5	Illustrate code optimization and code generation techniques in compilation
CDT304	**MACHINE LEARNING CONCEPTS**
CO1	Differentiate various learning approaches and to interpret the concepts of supervised learning (Cognitive Knowledge Level: Understand)

CO2	Illustrate the working of classifier models and identify the classifier model for typical machine learning applications (Cognitive Knowledge Level: Understand)
CO3	Apply theoretical foundations of trees to identify the best split and understand the concept of probabilistic models (Cognitive Knowledge Level: Apply)
CO4	Compare the different dimensionality reduction techniques (Cognitive Knowledge Level: Understand)
CO5	Design systems that uses the appropriate graph models of machine learning (Cognitive Knowledge Level: Understand)
CST 306	**ALGORITHM ANALYSIS AND DESIGN**
CO1	Analyze any given algorithm and express its time and space complexities in asymptotic notations. (Cognitive Level: Apply)
CO2	Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms. (Cognitive Level: Apply)
CO3	Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations. (Cognitive Level: Apply)
CO4	Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques(Cognitive Level: Apply)
CO5	Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability (Cognitive Level: Understand)
CO6	Identify the suitable design strategy to solve a given problem. (Cognitive Level: Analyze)

CDT308	COMPREHENSIVE COURSE WORK
CO1	Comprehend the concepts and applications of data structures (Cognitive Knowledge Level: Understand)
CO2	Comprehend the concepts, functions and algorithms in Operating System (Cognitive Knowledge Level: Understand))
CO3	Comprehend the organization and architecture of computer systems (Cognitive Knowledge Level: Understand)
CO4	Comprehend the fundamental principles of database design and manipulation (Cognitive Knowledge Level: Understand)
CO5	Comprehend the concepts in data analytics (Cognitive Knowledge Level: Understand)
CDL332	BIG DATA PROCESSING LAB
CO1	Illustrate the setting up of and Installing Hadoop in one of the three operating modes.(Cognitive knowledge:Understand)
CO2	Implement the file management tasks in Hadoop and explore the shell commands (Cognitive knowledge: Apply)
CO3	Implement different tasks using Hadoop Map Reduce programming model. (Cognitive knowledge: Apply)
CO4	Implement Pig Scripting operations and Spark Application functionalities. (Cognitive knowledge: Apply)

CO5	Implement data extraction from files and other sources and perform various data manipulation tasks on them using R Program.(Cognitive knowledge:Apply)
CDD324	**MINI PROJECT**
CO1	Identify technically and economically feasible problems of social relevance (Cognitive Knowledge Level: Apply)
CO2	Identify and survey the relevant literature for getting exposed to related solutions (Cognitive Knowledge Level: Apply)
CO3	Perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques (Cognitive Knowledge Level: Apply)
CO4	Prepare technical report and deliver presentation(Cognitive Knowledge Level:Apply)
CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)
	SEMESTER 7
CDT 401	**CONCEPTS IN CLOUD COMPUTING**
CO1	Explain the various cloud computing and service models. (Cognitive Knowledge Level: Understand)
CO2	Demonstrate the significance of implementing virtualization techniques. (Cognitive Knowledge Level: Understand)

CO3	Explain different cloud enabling technologies and compare private cloud platforms. (Cognitive Knowledge Level: Understand)
CO4	Apply appropriate cloud programming methods to solve big data problems. (Cognitive Knowledge Level: Apply)
CO5	Describe the need for security mechanisms in cloud. (Cognitive Knowledge Level: Understand)
CDL 411	**CLOUD COMPUTING LAB**
CO1	Develop network application programs and protocols. (Cognitive Knowledge Level: Apply)
CO2	Analyze network traffic (Cognitive Knowledge Level: Apply)
CO3	Implement Infrastructure as a service (Cognitive knowledge: Apply)
CO4	Implement platform as a service.(Cognitive knowledge: Apply)
CO5	Implement Software as a service (Cognitive knowledge:Apply)
CDQ413	**SEMINAR**
CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).

CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
CO3	Prepare a presentation about an academic document (Cognitive knowledge level:Create).
CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).
CO5	Prepare a technical report (Cognitive knowledge level:Create).
CDD415	**PROJECT PHASE I**
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level:Apply).

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AMT 413	**ADVANCED CONCEPTS OF MICROPROCESSOR AND MICRO CONTROLLER**
CO1	Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive knowledge: Understand)
CO2	Develop 8086 assembly language programs. Demonstrate interrupts, its handling in 8086 (Cognitive Knowledge Level: Apply)
CO3	Illustrate how different peripherals are interfaced with 8086 microprocessors (8259,8255,8254,8257) (Cognitive Knowledge Level: Understand)
CO4	Illustrate the architecture and features of advanced microprocessors (Cognitive knowledge: Understand)
CO5	Outline features of microcontrollers and develop low level programs. (Cognitive Knowledge Level: Understand)
CDT 423	**CONCEPTS IN ARTIFICIAL INTELLIGENCE**
CO1	Illustrate the fundamental concept of intelligent systems and their architecture. (Cognitive Knowledge level: Understand)
CO2	Use appropriate search algorithms for problem solving in an intelligent system. (Cognitive knowledge level: Apply)
CO3	Solve complex problems using search techniques.(Cognitive Knowledge level: Apply)
CO4	Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems. (Cognitive Knowledge level: Apply)

CO5	Apply of supervised machine learning algorithms for real world applications (Cognitive Knowledge level: Apply)

SEMESTER 8	

CDT 402	**DEEP LEARNING FORDATA SCIENCE**
CO1	Illustrate the basic concepts of neural networks, deep learning and its practical issues (Cognitive Knowledge Level : Apply)
CO2	Describe the standard regularization and optimization techniques for the effective training of deep neural networks. (Cognitive Knowledge Level: Understand)
CO3	Build convolutional Neural Network (CNN) models for different use cases. (Cognitive Knowledge Level: Apply)
CO4	Apply the concepts of Recurrent Neural Network (RNN), Long Short Term Memory(LSTM), Gated Recurrent Unit (GRU). (Cognitive Knowledge Level: Apply)
CO5	Explain the concepts of auto encoder, generative models (Cognitive Knowledge Level: Understand)
CDD416	**PROJECT PHASE II**
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).

CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
AIT 424	**INTRODUCTION TO BUSINESS ANALYTICS**
CO1	Explain the concept of Business Analytics process and the role of Business Analytics in decision making. (Cognitive Knowledge level: Understand)
CO2	Use appropriate methods for solving problems in Descriptive analytics (Cognitive knowledge level: Apply)
CO3	Use appropriate methods to solve problems using Predictive analytics techniques. (Cognitive Knowledge level: Apply)
CO4	Use appropriate forecasting techniques to inference analyze business trends. (Cognitive Knowledge level: Apply)
CO5	Formulate linear programming model for solving a problem (Cognitive Knowledge level: Apply)
CDT 464	**BIG DATA SECURITY**

CO1	Explain the basics of Big Data and their challenges. (Cognitive knowledge level: Understand)
CO2	Explain the difference between predictive analytics and descriptive analytics (Cognitive knowledge level: Understand)
CO3	Trace out the role played by authentication in security(Cognitive knowledge level: Apply)
CO4	Describe the security concerns of big-data. (Cognitive knowledge level: Understand)
CO5	Escalate the applications of security analytics. (Cognitive knowledge level: Apply)

B.TECH IN COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE)	
COURSE OUTCOMES	
SEMESTER 1	
MAT 101	**LINEAR ALGEBRA AND CALCULUS**
CO1	solve systems of linear equations, diagonalize matrices and characterise quadratic forms
CO2	compute the partial and total derivatives and maxima and minima of multivariable functions
CO3	compute multiple integrals and apply them to find areas and volumes of geometrical shapes,mass and centre of gravity of plane laminas
CO4	perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
CO5	determine the Taylor and Fourier series expansion of functions and learn their applications.
PHT 100	**ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)**
CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.

CO2	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
CO4	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
CO5	Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system
CYT100	**ENGINEERING CHEMISTRY**
CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or acompound. Understand the basic concept of SEM for surface characterisation ofnanomaterials.
CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge ofconducting polymers and advanced polymers in engineering.
CO5	Study various types of water treatment methods to develop skills for treatingwastewater.

EST 100	**ENGINEERING MECHANICS**
CO1	Recall principles and theorems related to rigid body mechanics
CO2	Identify and describe the components of system of forces acting on the rigid body
CO3	Apply the conditions of equilibrium to various practical problems involving different force system.
CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses
EST110	**ENGINEERING GRAPHICS**
CO1	Draw the projection of points and lines located in different quadrants
CO2	Prepare multiview orthographic projections of objects by visualizing them in differentPositions
CO3	Draw sectional views and develop surfaces of a given object

CO4	Prepare pictorial drawings using the principles of isometric and perspective projections tovisualize objects in three dimensions.
CO5	Convert 3D views to orthographic views and vice versa
CO6	Obtain multiview projections and solid models of objects using CAD tools
EST120	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO1	Recall the role of civil engineer in society and to relate the various disciplines of CivilEngineering.
CO2	Explain different types of buildings, building components, building materials andbuilding construction
CO3	Describe the importance, objectives and principles of surveying.
CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators andRamps
CO5	Discuss the Materials, energy systems, water management and environment for greenbuildings.
CO6	Analyse thermodynamic cycles and calculate its efficiency

CO7	Illustrate the working and features of IC Engines	
CO8	Explain the basic principles of Refrigeration and Air Conditioning	
CO9	Describe the working of hydraulic machines	
CO10	Explain the working of power transmission elements	
CO11	Describe the basic manufacturing, metal joining and machining processes	
EST 130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**	
CO1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits	
CO2	Develop and solve models of magnetic circuits	
CO3	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state	
CO4	Describe working of a voltage amplifier	

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CO5	Outline the principle of an electronic instrumentation system
CO6	Explain the principle of radio and cellular communication
HUT101	**LIFE SKILLS**
CO1	Define and Identify different life skills required in personal and professional life
CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotionsand stress.
CO3	Explain the basic mechanics of effective communication and demonstrate these throughpresentations.
CO4	Take part in Group discussions
CO5	Use appropriate thinking and problem solving technique to solve problems
CO6	Understand the basics of teamwork and leadership
PHL 120	**ENGINEERING PHYSICS LAB**

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CO1	Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories
CO2	Understand the need for precise measurement practices for data recording
CO3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
CO4	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
CO5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
CYL120	**ENGINEERING CHEMISTRY LAB**
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis

CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
CO6	Function as a member of a team, communicate effectively and engage in furtherlearning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
ESL120	**CIVIL AND MECHANICAL WORKSHOP**
CO1	Name different devices and tools used for civil engineering measurements
CO2	Explain the use of various tools and devices for various field measurements
CO3	Demonstrate the steps involved in basic civil engineering activities like plotmeasurement, setting out operation, evaluating the natural profile of land, plumbingand undertaking simple construction work.
CO4	Choose materials and methods required for basic civil engineering activities like fieldmeasurements, masonry work and plumbing.
CO5	Compare different techniques and devices used in civil engineering measurements
CO6	Identify Basic Mechanical workshop operations in accordance with the material andObjects
CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshopTrades

CO8	Apply appropriate safety measures with respect to the mechanical workshop trades
ESL 130	**ELECTRICAL & ELECTRONICS WORKSHOP**
CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.
CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills
	SEMESTER 2

MAT102	**VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORM**
CO1	Compute the derivatives and line integrals of vector functions and learn their applications
CO2	Evaluate surface and volume integrals and learn their inter-relations and applications
CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
CO5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
PHT 100	**ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)**
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CO3	Apply the fundamental laws of electrical engineering tosolve simple ac circuits in steadyState
CO4	Describe working of a voltage amplifier
CO5	Outline the principle of an electronic instrumentation system

CO6	Explain the principle of radio and cellular communication
HUN102	**PROFESSIONAL COMMUNICATION**
CO1	Develop vocabulary and language skills relevant to engineering as a profession
CO2	Analyze, interpret and effectively summarize a variety of textual content
CO3	Create effective technical presentations
CO4	Discuss a given technical/non-technical topic in a group setting and arrive atgeneralizations/consensus
CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs
CO6	Create professional and technical documents that are clear and adhering to all thenecessary conventions
EST102	**PROGRAMMING IN C**
CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution

CO2	Develop readable* C programs with branching and looping statements, which usesArithmetic, Logical, Relational or Bitwise operators.
CO3	Write readable C programs with arrays, structure or union for storing the data to beProcessed
CO4	Divide a given computational problem into a number of modules and develop a readablemulti-function C program by using recursion if required, to find the solution to the computational problem
CO5	Write readable C programs which use pointers for array processing and parameter passing
CO6	Develop readable C programs with files for reading input and storing output
PHL120	**ENGINEERING PHYSICS LAB**
CO1	Apply modern instruments like CRO, strain gauge tomeasure the basic physical quantitiesviz. frequency and amplitude of a wave pattern,strain etc.Carryout measurement of wave pattern in a stretched string and the correspondingfrequency values using a Melde's string apparatus.
CO2	Determine the wavelength of monochromatic beam of light and thickness of micro-thinobject etc. by forming Newton's rings pattern and an air wedge fringe pattern.
CO3	Carryout the measurement of wavelength by diffraction of plane transmission grating andthe spectra formed by a monochromatic beam of light and a laser.
CO4	Determine the wavelength of a laser beam using the plane transmission grating.

CYL120	**ENGINEERING CHEMISTRY LAB**
CO1	Understand and practice different techniques ofquantitative chemical analysis togenerate experimental skills and apply these skills to various analyses
CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill touse TLC for the identification of drugs
CO3	Develop the ability to understand and explain the use of modern spectroscopictechniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
CO4	Acquire the ability to understand, explain and use instrumental techniques for chemicalAnalysis
CO5	Learn to design and carry out scientific experiment as well as accurately record and analyse the results of such experiments
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CO1	Demonstrate safety measures against electric shocks.
CO2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteriesand standard symbols.
CO3	Develop the connection diagram, identify the suitable accessories and materials necessaryfor wiring simple lighting circuits for domestic buildings.

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CO4	Identify and test various electronic components
CO5	Draw circuit schematics with EDA tools
CO6	Assemble and test electronic circuits on boards
CO7	Work in a team with good interpersonal skills

SEMESTER 3

MAT 203	**DISCRETE MATHEMATICAL STRUCTURES**
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)
CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand)
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)

CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply)
CO6	Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)
CST 201	**DATA STRUCTURES**
CO 1	Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)
CO2	Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)
CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed (Cognitive Knowledge Level: Apply)
CO4	Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)
CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze)
CO6	Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)
CST 203	**LOGIC SYSTEM DESIGN**

CO1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers (Cognitive Knowledge level: Understand)
CO2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level: Apply)
CO3	Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA. (Cognitive Knowledge level: Apply)
CO4	Design sequential circuits - Registers, Counters and Shift Registers. (Cognitive ROM and PLA. (Cognitive Knowledge level: Apply)
CO5	Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)
CST 205	**OBJECT ORIENTED PROGRAMMING USING JAVA**
CO1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)
CO2	Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs (Cognitive Knowledge Level: Apply)
CO3	Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)
CO4	Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)

CO5	Write Graphical User Interface based application programs by utilising event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
CSL 201	**DATA STRUCTURES LAB**
CO1	Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements (Cognitive Knowledge Level: Analyse)
CO2	Write a time/space efficient program to sort a list of records based on a given key in the record (Cognitive Knowledge Level: Apply)
CO3	Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)
CO4	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
CO5	Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)
CO6	Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)
CSL 203	**OBJECT ORIENTED PROGRAMMING LAB (IN JAVA)**
CO1	Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)

CO2	Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
CO3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
CO4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
	SEMESTER 4
MAT 236	**MATHEMATICS FOR ARTIFICIAL INTELLIGENCE**
CO1	Make use of the concepts, rules and results about linear equations, matrix algebra, vector spaces, eigen values & eigenvectors and orthogonality & diagonalization to solve computational problems (Cognitive Knowledge Level: Apply)
CO2	Perform calculus operations on functions of several variables and matrices, including partial derivatives and gradients (Cognitive Knowledge Level: Apply)
CO3	Utilize the concepts, rules and results about probability, random variables, additive & multiplicative rules, conditional probability, probability distributions and Bayes' theorem to find solutions of computational problems (Cognitive Knowledge Level: Apply)
CO4	Train Machine Learning Models using unconstrained and constrained optimization methods (Cognitive Knowledge Level: Apply)

CS202	**COMPUTER ORGANIZATION AND ARCHITECTURE**
CO1	Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer (Cognitive knowledge: Understand)
CO2	Explain the types of memory systems and mapping functions used in memory systems (Cognitive Knowledge Level: Understand)
CO3	Demonstrate the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply)
CO4	Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it (Cognitive Knowledge Level: Apply)
CO5	Explain the implementation aspects of arithmetic algorithms in a digital computer (Cognitive Knowledge Level:Apply)
CO6	Develop the control logic for a given arithmetic problem (Cognitive Knowledge Level: Apply).
CS204	**DATABASE MANAGEMENT SYSTEMS**
CO1	Summarize and exemplify fundamental nature and characteristics of database systems (Cognitive Knowledge Level: Understand)
CO2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams. (Cognitive Knowledge Level: Apply)

CO3	Model and design solutions for efficiently representing and querying data using relational model (Cognitive Knowledge Level: Analyze)
CO4	Demonstrate the features of indexing and hashing in database applications (Cognitive Knowledge Level: Apply)
CO5	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems (Cognitive Knowledge Level: Apply)
CO6	Explain various types of NoSQL databases (Cognitive Knowledge Level: Understand
CS206	**OPERATING SYSTEMS**
CO1	Explain the relevance, structure and functions of Operating Systems in computing devices. (Cognitive knowledge: Understand) .
CO2	Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems. (Cognitive knowledge: Understand)
CO3	Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors (Cognitive knowledge: Understand)
CO4	Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems. (Cognitive knowledge: Understand)
CO5	Explain the memory management algorithms in Operating Systems. (Cognitive knowledge: Understand)

CO6	Explain the security aspects and algorithms for file and storage management in Operating Systems. (Cognitive knowledge: Understand)
AIL202	**DATABASE MANAGEMENT SYSTEMS LAB**
CO1	Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)
CO2	Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)
CO3	Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
CO4	Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)
CO5	Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)
CO6	Develop database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)
CSL204	**OPERATING SYSTEMS LAB**

CO1	Illustrate the use of systems calls in Operating Systems. (Cognitive knowledge: Understand)
CO2	Implement Process Creation and Inter-Process Communication in Operating Systems. (Cognitive knowledge: Apply)
CO3	Implement Fist Come First Served, Shortest Job First, Round Robin and Prioritybased CPU Scheduling Algorithms. (Cognitive knowledge: Apply)
CO4	Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. (Cognitive knowledge: Apply)
CO5	Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. (Cognitive knowledge: Apply)
	SEMESTER 5
CS501	**FORMAL LANGUAGES AND AUTOMATA THEORY**
CO1	Classify a given formal language into Regular, Context-Free, Context Sensitive, Recursive or Recursively Enumerable. [Cognitive knowledge level: Understand
CO2	Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Nerode relation. [Cognitive knowledge level: Understand]
CO3	Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language. [Cognitive knowledge level : Apply]

CO4	Design Turing machines as language acceptors or transducers. [Cognitive knowledge level: Apply]
CO5	Explain the notion of decidability. [Cognitive knowledge level: Understand]
CS503	**COMPUTER NETWORKS**
CO1	Explain the features of computer networks, protocols, and network design models (Cognitive Knowledge: Understand)
CO2	Describe the fundamental characteristics of the physical layer and identify the usage in network communication
CO3	Explain the design issues of data link layer, link layer protocols, bridges and switches
CO4	Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) (Cognitive Knowledge: Understand)
CO5	Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network (Cognitive Knowledge: Apply)
CO6	Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking (Cognitive Knowledge: Understand)
AMT 305	**INTRODUCTION TO MACHINE LEARNING**

CO1	Illustrate Machine Learning concepts and basics of supervised learning concepts. (Cognitive Knowledge Level: Apply)
CO2	CO2 Describe dimensionality reduction techniques and supervised learning concepts (regression, linear classification). (Cognitive Knowledge Level: Apply)
CO3	CO3 Solve real life problems using appropriate machine learning models and evaluate the performance measures and Illustrate the concepts of Multilayer neural network . (Cognitive Knowledge Level: Apply)
CO4	CO4 Illustrate basics of parameter estimation models and the working of classifier SVM classifier model (Cognitive Knowledge Level: Apply)
CO5	CO5 Describe unsupervised learning concepts (Cognitive Knowledge Level: Apply)
AIT307	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**
CO1	Explain the fundamental concepts of intelligent systems and their architecture. (Cognitive Knowledge Level: Understanding)
CO2	Explain the fundamental concepts of intelligent systems and their architecture. (Cognitive Knowledge Level: Understanding)
CO3	Solve Constraint Satisfaction Problems using search techniques. (Cognitive Knowledge Level: Apply)
CO4	Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems. (Cognitive Knowledge Level: Apply)

CO5	Illustrate different types of learning techniques used in intelligent systems (Cognitive Knowledge Level: Understand)
CST 309	**MANAGEMENT OF SOFTWARE SYSTEMS**
CO1	Demonstrate Traditional and Agile Software Development approaches (Cognitive Knowledge Level: Apply)
CO2	Prepare Software Requirement Specification and Software Design for a given problem. (Cognitive Knowledge Level: Apply)
CO3	Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project. (Cognitive Knowledge Level: Apply)
CO4	Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. (Cognitive Knowledge Level: Apply)
CO5	Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices. (Cognitive Knowledge Level: Apply)
AML311	**PYTHON AND MACHINE LEARNING LAB**
CO1	Develop applications in Python programming. (Cognitive Knowledge Level: Apply)
CO2	Implement machine learning algorithms using packages and libraries in Python for various applications.(Cognitive Knowledge Level: Apply)

CO3	Implement python programs for supervised learning methods through Neural network, Regression and classification.(Cognitive Knowledge Level: Apply)
CO4	Implement clustering algorithms.(Cognitive Knowledge Level: Apply)
CO5	Apply dimensionality reduction as a dataset preprocessing step. (Cognitive Knowledge Level: Apply)
AIL 333	**AI ALGORITHMS LAB**
CO1	State the basics of learning problems with hypothesis and version spaces (Cognitive Knowledge Level: Understand).
CO2	Demonstrate real-world problems as state space problems, optimization problems or constraint satisfaction problems. (Cognitive Knowledge Level: Apply)
CO3	Simulate given problem scenario and analyze its performance. (Cognitive Knowledge Level: Apply)
CO4	Develop programming solutions for given problem scenario. (Cognitive Knowledge Level: Apply)
CO5	Design and develop an expert system by using appropriate tools and techniques. (Cognitive Knowledge Level: Apply)

SEMESTER 6

CST 302	**COMPILER DESIGN**
CO1	Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer
CO2	Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations
CO3	Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar
CO4	Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations
CO5	Illustrate code optimization and code generation techniques in compilation
AIT304	**ROBOTICS AND INTELLIGENT SYSTEM**
CO1	Understand the concepts of manipulator and mobile robotics. (Cognitive Knowledge Level: Understand)
CO2	Choose the suitable sensors, actuators and control for robot design. (Cognitive Knowledge Level: Apply)
CO3	Developing kinematic model of mobile robot and understand robotic vision intelligence. (Cognitive Knowledge Level: Apply)

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CO4	Discover the localization and mapping methods in robotics. (Cognitive Knowledge Level: Apply)
CO5	Plan the path and navigation of robot by applying artificial intelligence algorithm. (Cognitive Knowledge Level: Apply)
CST 306	**ALGORITHM ANALYSIS AND DESIGN**
CO1	Analyze any given algorithm and express its time and space complexities in asymptotic notations. (Cognitive Level: Apply)
CO2	Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms. (Cognitive Level: Apply)
CO3	Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations. (Cognitive Level: Apply)
CO4	Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques (Cognitive Level: Apply)
CO5	Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability (Cognitive Level: Understand)
CO6	Identify the suitable design strategy to solve a given problem. (Cognitive Level: Analyze)
CAT308	**COMPREHENSIVE COURSE WORK**

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CO1	Comprehend the organization and architecture of computer systems (Cognitive Knowledge Level: Understand)
CO2	Comprehend the concepts and applications of data structures (Cognitive Knowledge Level: Understand)
CO3	Comprehend the concepts, functions and algorithms in Operating System (Cognitive Knowledge Level: Understand))
CO4	Comprehend the concepts of artificial intelligence(Cognitive Knowledge Level: Understand
CO5	Comprehend the fundamental principles of database design and manipulation (Cognitive Knowledge Level: Understand)
AIL332	**ROBOTICS LAB**
CO1	Interface different peripherals to arduino board
CO2	Assemble a mobile robot with different sensors and actuators..
CO3	Familiarise about localisation of mobile robots
CO4	Impart intelligence to robot using standard algorithms.

CO5	Familiarise the robot navigation
CAD334	**MINI PROJECT**
CO1	Identify technically and economically feasible problems of social relevance (Cognitive Knowledge Level: Apply)
CO2	Identify and survey the relevant literature for getting exposed to related solutions (Cognitive Knowledge Level: Apply)
CO3	Perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques (Cognitive Knowledge Level: Apply)
CO4	Prepare technical report and deliver presentation(Cognitive Knowledge Level:Apply)
CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)
	SEMESTER 7
AIT401	**FOUNDATIONS OF DEEP LEARNING**
CO1	Illustrate the basic concepts of neural networks, deep learning and its practical issues (Cognitive Knowledge Level : Apply)

CO2	Outline the standard regularization and optimization techniques for the effective training of deep neural networks. (Cognitive Knowledge Level: Understand)
CO3	Build convolutional Neural Network (CNN) models for different use cases. (Cognitive Knowledge Level: Apply)
CO4	Apply the concepts of Recurrent Neural Network (RNN), Long Short Term Memory(LSTM), Gated Recurrent Unit (GRU). (Cognitive Knowledge Level: Apply)
CO5	Explain the concepts of auto encoder, generative models (Cognitive Knowledge Level: Understand)
AIL 411	**DEEP LEARNING LAB**
CO1	Implement advanced machine learning concepts using python. (Cognitive Knowledge Level: Apply)
CO2	Apply basic data pre-processing and tuning techniques. (Cognitive Knowledge Level: Apply)
CO3	Experiment behaviour of neural networks and CNN on datasets. (Cognitive Knowledge Level: Analyse)
CO4	Design and Implement sequence modelling schemes.(Cognitive Knowledge Level: Apply)
CO5	Implement auto encoders on standard datasets and analyse the performance. (Cognitive Knowledge Level: Apply)

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CAQ413	**SEMINAR**
CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
CO3	Prepare a presentation about an academic document (Cognitive knowledge level:Create).
CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).
CO5	Prepare a technical report (Cognitive knowledge level:Create).
CAD415	**PROJECT PHASE I**
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).

CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level:Apply).
AIT 413	**ADVANCED CONCEPTS OF MICROPROCESSOR AND MICRO CONTROLLER**
CO1	Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive knowledge: Understand)
CO2	Develop 8086 assembly language programs. Demonstrate interrupts, its handling in 8086 (Cognitive Knowledge Level: Apply)
CO3	Illustrate how different peripherals are interfaced with 8086 microprocessors (8259,8255,8254,8257) (Cognitive Knowledge Level: Understand)
CO4	Illustrate the architecture and features of advanced microprocessors (Cognitive knowledge: Understand)
CO5	Outline features of microcontrollers and develop low level programs. (Cognitive Knowledge Level: Understand)
AIT 453	**GAME PROGRAMMING**

CO1	Make use of the concepts of linear algebra and probability to solve computational problems. (Cognitive Knowledge Level: Apply)
CO2	Explain the concepts of Game Theory. (Cognitive Knowledge Level: Understand)
CO3	Use the concepts of Strategic Form Games, Mixed strategies and Matrix Games in computational problems.(Cognitive Knowledge Level: Apply)
CO4	Develop algorithms for path finding in games involving searching. (Cognitive Knowledge Level: Apply)
CO5	Develop solutions for strategic games using OpenGL.(Cognitive Knowledge Level: Apply)
SEMESTER 8	
AIT 402	**ROBOTIC PROCESS AUTOMATION**
CO1	Understand Robotic Process Automation Concepts. (Cognitive Knowledge Level: Understand)
CO2	Apply UiPath programming techniques to deploy robot configurations (Cognitive Knowledge Level: Apply)
CO3	Explore various data extraction techniques and perform integrations with various popular applications (Cognitive Knowledge Level: Apply)

CO4	Design and develop a programmed robot that includes logging and exception handling (Cognitive Knowledge Level: Apply)
CO5	Deploy and control Bots with UiPath Orchestrator. (Cognitive Knowledge Level: Apply)
CAD416	**PROJECT PHASE II**
CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
AIT 414	**AI FOR CYBER SECURITY**

CO1	Demonstrates popular and successful AI approaches and models that can be adapted to detect potential attacks and protect the corporate systems. (Cognitive Knowledge Level: Understand)
CO2	Identify and predict security threats using artificial intelligence (Cognitive Knowledge Level: Apply)
CO3	Incorporate AI capabilities to build smart cyber security systems with defensive mechanisms. (Cognitive Knowledge Level: Apply)
CO4	Develop intelligent systems that can detect unusual and suspicious patterns and attacks (Cognitive Knowledge Level: Apply)
CO5	Evaluate cyber security algorithms and analyse the performance to learn how to improve them (Cognitive Knowledge Level: Analyze)
AIT 424	**INTRODUCTION TO BUSINESS ANALYTICS**
CO1	Explain the concept of Business Analytics process and the role of Business Analytics in decision making. (Cognitive Knowledge level: Understand)
CO2	Use appropriate methods for solving problems in Descriptive analytics (Cognitive knowledge level: Apply)
CO3	Use appropriate methods to solve problems using Predictive analytics techniques. (Cognitive Knowledge level: Apply)
CO4	Use appropriate forecasting techniques to inference analyze business trends. (Cognitive Knowledge level: Apply)

CO5	Formulate linear programming model for solving a problem (Cognitive Knowledge level: Apply)