Programme Outcomes and Course Outcomes for all Programmes offered by the institution

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SREENIDHI EDUCATIONAL GROUP | SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY SNIST AUTONOMOUS

Programme Outcomes

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **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.

4. **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.

5. **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.

6. **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.

7. **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.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **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.

12. **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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Course Outcomes of CIVIL Department

Department of CIVIL Engineering

COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC06	APPLIED PHYSICS	CO1	classify the crystal structures, their parameters and draw the various crystal planes using Miller indices.
			CO2	analyze various crystal defects-its types.
			CO3	explain vibrations, radius of gyration, moment of inertia and ultrasonic.
			CO4	analyze the wave nature of light, superposition principle, differentiation between interference, diffraction and their applications
			CO5	explain about the types of emissions, laser principle, working of different types of lasers and their applications. To understand the nuclear fission and fusion, radioactivity emission of alpha, beta and gamma rays.
			CO6	contrast nano& bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods, analysis techniques like XRD & TEM.
	9FC01	Problem Solving using C	CO1	Formulate simple algorithms for arithmetic, logical problems and translate the algorithms to programs (in C language)
			CO2	Execute and test the programs and correct syntax and logical errors, implement conditional branching, iteration and recursion
			CO3	deduce a problem into functions and synthesize a complete program using divide and conquer approach.
			CO4	relate arrays, pointers and structures to formulate algorithms and programs.

			CO5	write programs to solve matrix addition and multiplication problems and searching and sorting problems.
			CO6	solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.
	9HC11	9HC11: MATRIX ALGEBRA AND CALCULUS	CO1	Check the consistency or inconsistency of a linear system and solve the problems.
			CO2	Find the Eigen values and Eigen vectors and solve the problems associated with these concepts.
			CO3	Find the nature, index and signature of the quadratic form.
			CO4	Verify the applicability of mean value theorems and express the given standard function in series form using Taylor's and Maclaurin series.
			CO5	Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
			CO6	Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	9HC01 ESSENTIAL ENGLISH LANGUAGE SKILLS	CO1	Demonstrate competence with suitable accuracy in vocabulary and language fluency.
			CO2	State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	Identify the differences of each tense and use the tenses accurately.
			CO4	Identify specialized reading strategies for specific types of texts
			CO5	Produce written work that is substantive, organized, and grammatically accurate
	9HC61	9HC61-Oral Communication LAB - I	CO1	Describe people, objects and situations using simple sentences.
			CO2	Use appropriate tenses and expressions in different contexts

				of conversations.
			CO3	Identify major areas of concern in their oral communication and address them.
			CO4	Create a SMART plan to enhance their own communication skills in English
	9HC65	9HC65 APPLIED PHYSICS LAB	CO1	Analyze the concept of radius of gyration and periodic vibrations,modulus-types, stress, strain and Hook's law.
			CO2	Analyze the LCR circuit combination, parallel, series, electrical resonance, fundamentals of R & C and time constant.
			CO3	Demonstrate the resonance concept, transverse laws of stretched strings, Sonometer, types of waves.
			CO4	Understand the concepts of interference, conditions, formation of Newton's rings- reason.
			CO5	Recognize the difference between the interference and diffraction, grating, laser characteristics, LED and forward resistance.
			CO6	Explain properties of light, dispersion, prism, minimum deviation,fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law.
	9FC61	9FC61-Problem Solving using C Lab	CO1	Enumerate the algorithms for simple problems
			CO2	Classify the given algorithms to a working and correct program
			CO3	Correct the syntax errors as reported by the compilers
			CO4	Identify and correct logical errors encountered at run time
			CO5	Write iterative as well as recursive programs
			CO6	Represent data in arrays, strings and structures and manipulate them through a program
			CO7	Declare pointers of different types and use them in defining self referential structures.

			CO8	Create, read and write to and from simple text files.
	9BC01	9BC01: ENGINEERING GRAPHICS	CO1	use the instruments to solve engineering problem and draw various type of curves used in engineering
			CO2	explain Orthographic projections and draw projections of simple drawing entities such as points Lines.
			CO3	Draw projections of different types of regular Planes, solids in various positions wrt principal planes of projection.
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views.
			CO6	Convert Isometric to orthographic views and understand basic sketching using computer aided design (CAD) software.
I-II & A22	9HC04	9HC04: ENGINEERING CHEMISTRY	CO1	analyze microscopic chemistry in terms of atomic orbital's, molecularorbital's and intermolecular forces.
			CO2	Identify and differentiate polymers, thermoplastic, thermosetting plastics and variouslubricants.
			CO3	Recognize and select the domestic and industrial problems caused by hard water andalso learn about the municipal water treatment using various methods.
			CO4	interpret the important fundamental concepts of electrochemistry andsolve the problems related to batteries.
			CO5	Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques
			CO6	explainsynthesis of drug molecules and analytical

				techniques like electronic, vibrational and rotational spectroscopy
	9EC01	9EC01 - DATA STRUCTURES	CO1	Design the programs using structures, unions and enum
			CO2	Demonstrate the concepts of Abstract data type and also applications of stacks and queues
			CO3	Implement basic operations on single, double and circular linked list
			CO4	Solve problems involving Binary Search trees and AVL trees
			CO5	Articulate the concepts of graphs, heaps and hashing
			CO6	Develop algorithms for various searching and sorting techniques and analyze their performance
	9HC12	9HC12: ADVANCED CALCULUS	CO1	Find the limits and test for the continuity and differentiability of a function
			CO2	Solve the problems on multiple integrals
			CO3	Solve linear and nonlinear first order partial differential equations
			CO4	Find Series expansion a function defined over the intervals
			CO5	Find directional derivative, gradient, divergence and curl of a function
			CO6	Solve problems of line, surface and volume integrals
	9K201	9K201: Engineering Mechanics (For Civil Engineering)	CO1	analyse the system of forces and draw free body diagrams to solve problems dealing with a system of forces in a plane
			CO2	explain various types of friction and analyze and solve real world problems related to friction
			CO3	explain the concepts and compute Center of gravity for various shapes
			CO4	explain the concepts and compute mass moment of Inertia for various regular and composite shapes and bodies to evaluate the strength of the body

			CO5	predict the geometry of motion of a particle and explain work energy, impulse momentum, virtual energy principles
			CO6	distringuish different motions of a rigid body in a plane and predict geometry of rigid body motion and compute forces in the body
	9HC64	9HC64: ENGINEERING CHEMISTRY LAB	CO1	Prepare Inorganic compounds
			CO2	Determine surface tension of a liquid, viscosity of lubricant, and acid value of an oil
			CO3	Estimate hardness of water and Analyze the amount of chloride content
			CO4	Determine cell constant and conductance of solutions, redox potential and emf of solutions, the rate constant of acid
			CO5	Synthesize a polymer (Thiakol rubber / Urea-Farmaldehyde resin), a drug- Aspirin
	9EC61	9EC61 - DATA STRUCTURES USING C LAB	CO1	Write programs on structures and unions
			CO2	Implement Stacks, Queues and circular queues using arrays
			CO3	Write programs to implement basic operations on various types of linked list
			CO4	Implement insertion and traversal operations on binary search tree
			CO5	Develop programs on various searching, sorting algorithms
	9HC62	9HC62- ORAL Communication LAB-II	CO1	demostrate the nuances of striking a great conversation in formal and informal situations
			CO2	face an audience and speak in public
			CO3	Design a winning presentation and present it with ease
	9BC61	WORKSHOP/MANUFACTURING PROCESSES LAB	CO1	Use various types of conventional manufacturing Processes
			CO2	Manufacture components from wood, MS flat, GI Sheet etc
			CO3	manufacture components such as shafts, holes, and threaded holes by machining and surface finishing

			CO4	Produce small devices / products /appliances by assembling different components
II-I & A22	9HC15	8HC15 - Complex analysis, Probability, and Statistics	CO1	Solve problems on analyticity and conformal mapping
			CO2	Evaluate Series expansions of a function using Taylor's and Laurent's series and also evaluation of definite integrals and improper integrals
			CO3	Solve problems on probability and will able to solve problems on discrete and continuous probability distributions
			CO4	Describe basic concepts of sampling distribution and solve problems on estimation
			CO5	Solve problems on quality control
			CO6	define the test of hypothesis and solve problems based on the concept
	9K301	8K301 - Solid Mechanics	CO1	evaluate the strength of concept of the stress and strain for different materials
			CO2	evaluate the behavior of different beams for Shear Force and Bending Moment diagrams
			CO3	valuate the behavior and strength of flexural stress, direct and bending stresses
			CO4	evaluate the deflection of beams subjected to various loads
			CO5	determine the Principal Stresses and Strains in the members subjected to stresses
			CO6	evaluate the Shear Stresses and Theories of Failure
	9K302	8K302 - Surveying and Geomatics	CO1	Calculate angles, distances using chain and tape
			CO2,CO3	Identify data collection methods using a compass and enhance knowledge of the various field applications of levelling Apply the concepts of Trigonometric levelling
			CO4	Set out curves on the field and overcome obstructions in curve ranging

			CO5	apply the concepts of Remote sensing and GIS/GPS to Civil Engineering problems
			CO6	Read Aerial maps and perform necessary calculations
	9K303	8K303 - Building Materials and Planning	CO1	Identify different building materials and differentiate use them appropriately
			CO2	Test the various properties of cement and to use the appropriate admixtures
			CO3	Identify the various mortars and check for its suitability in various jobs
			CO4, CO5	To effectively use new building materials and appropriate paints for the various works undertaken Appropriately suggest the different roof and floor types for different construction practices
			CO6	Plan construction activities in adherence with the bye-laws
	9HC74	Soft Skills	CO1	demonstrate the importance of certain soft skills like time management, goal setting and etiquette so that they can make their mark in their career and life in general
			CO2	sharpen their verbal ability to handle the competitive exams
			CO3	enhance their team skills and design thinking capabilities for effective problem solving and decision making
			CO4	know their emotional information which guides their thinking, behavior and helps them manage stress efficiently
			CO5	equip themselves with the prerequisites, and the relevant techniques to effectively tackle the corporate interview process in vogue
	9ZC02	Open elective - I: 8ZC02 – BASICS OF ENTREPRENEURSHIP	CO1	show basic knowledge on Skills of Entrepreneurship
			CO2	demonstrate the techniques of selecting the customers through the process of customer

				segmentation and Targeting
			CO3	compare business Models and their validity
			CO4	explain the basic cost structure, Revenue Streams and the pricing strategies
			CO5	illustrate project management and its techniques
			CO6	choose marketing strategies and business regulations for Start ups
	9FC22	Open elective - I: 8FC22 Python Programming and Computer Algorithms	CO1	list Python versions and their specifications and build programs
			CO2	Write applications that include functions, modules, packages along with respective exceptional handling mechanism
			CO3	Write applications using OO features of Python and applications using Files
			CO4	interpret NumPy/Tkinter/Plotpy modules
			CO5	Analyze worst-case running times of algorithms using asymptotic analysis
			CO6	Describe the dynamic-programming paradigm and the greedy paradigm and explain when an algorithmic design situation calls for it
	9HC03	Universal Human Values	CO1	make self-assessment
			CO2	explain the importance of certain soft skills like time management, goal setting and etiquette and how they make a mark in their career and life in general
			CO3	assess their emotional strengths which guides their thinking, behavior and helps them manage stress efficiently
			CO4	identify the prerequisites, and the relevant techniques in order to tackle corporate interview process in vogue
	9K371	MECHANICS OF SOLIDS LAB	CO1,CO2	Conduct compression tests on spring, wood and concrete Conduct flexural and torsion test to determine elastic constants
			CO3	Determine hardness of metals
	9K372	SURVEYING LABORATORY	CO1	Stake out/Lay out different types of curves in the field
			CO2	Use modern instruments such as Total Station and GPS for locating

				and plotting any/all ground features
				Course Outcomes of All the Subjects (AY 0-)
	9K373	COMPUTER AIDED DRAFTING OF BUILDINGS LAB	CO1	Make use of AutoCAD commands for drawing D building drawings
			CO2	Create plans and sections for simple buildings
			CO3	Present drawings in required format according to user requirements
	9K384	TECHNICAL SEMINAR –III	CO1	Demonstrate public speaking with the aid of Power Point Presentations
			CO2,CO3	Identify current general and specific technological topics of interest and prepare and present the content cogently Demonstrate communication skills and interview performance skills
	9K394	Comprehensive Test and Viva Voce – III	CO1,CO2	recall the concepts in the core and elective courses Exhibit technical knowledge to face interviews
			CO3	Exhibit lifelong Learning skills for higher education and to pursue Professional practice
II-II & A22	9ZC01	Economics, Accountancy, and Management Science	CO1	recall basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular
			CO2	define cost concept, Revenues and Market structure
			CO3	list various basic concepts of Accounting, Double entry system and Book keeping
			CO4	explain the concepts of Capital expenditure, Revenue expenditure and Final accounts
			CO5	outline the basics of Management, its principles and various functions performed in organization
			CO6	explain various personality traits, perception, attitudes of individuals

				working in organization
	9K404	Mechanics of Materials	CO1	evaluate the deformation of structures
			CO2	Describe the stability of structures under certain loading conditions
			CO3,CO4	assess the deformation for structures under load actions evaluate the force-stress equilibrium relationship in Multiaxial load condition
			CO5	evaluate the displacement-strain relationship in Multiaxial load condition
			CO6	solve the stress behavior pattern in thin cylinder and sphere
	9K405	Fluid Mechanics	CO1	Explain the properties of fluids and determine shear force on the surfaces applying newton's law of viscosity
			CO2	Compute hydrostatic forces on immersed and floating bodies and predict stability of floating bodies
			CO3	Apply laws of kinematics to fluid flow and arrive at D, D, D continuity equations
			CO4	Workout Eulers and Bernoullis equations for average flow along a streamline and apply these laws to measure fluid flow; understand principles of dimensional analysis to arrive at non dimensional quantities
			CO5	Workout equation for friction loss for flow through conduits and predict flow behaviour in pipe networks
			CO6	Apply the concept of boundary layer to fluid flow over solid bodies and assess its effects on these bodies
	9K406	Hydrology and Water resources engineering	CO1	quantify precipitation;
			CO2	estimate various abstractions of precipitation;
			CO3	estimate runoffs from given data;
			CO4	apply the knowledge of various water withdrawals and uses to practical problems;
			CO5	design basic water distribution systems;
			CO6	arrive at hydrologic design of spillways
	9K408	ENGINEERING GEOLOGY	CO1	Describe different concepts and terms used in Engineering

				Geology
			CO2	Identify and explain various types of minerals and rocks
			CO3	Apply the various concepts of Engineering Geology to civil engineering field
			CO4,CO5	Examine and select the sites related to dams, roads, tunnels and slopes Identify the hazards prior and able to take the necessary precautions
			CO6	list geological hazards
	9EC42	Open Elective - II: 8EC42- PROGRAMMING IN JAVA	CO1	explain the concept of OOP with the need of constructing objects, and classes Write programs using classes, objects, members of a class and the relationships among them needed for a specific problem
			CO2	Identify the purpose and usage of principles of inheritance and polymorphism Implement concepts of polymorphism, encapsulation and method overloading
			CO3	Create Java application programs using sound OOP practices (eg, interfaces and APIs) and proper program structuring (eg, by using access control identifiers, automatic documentation through comments)
			CO4	implement error exception handling and multi-threading
			CO5	create GUI for the specific applications
			CO6	Write programs for event-handling using various user interface components on applets
	9ZC23	Open Elective – II 8ZC23- Advanced Entrepreneurship	CO1	explain the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup
			CO2	classify various business models and critically evaluate the effectiveness of the business models and products

			CO3	define the method of business traction, create roles and build their A- team
			CO4	list various channels of revenue building and exploration of new revenue avenues
			CO5	dissect the need of sales planning, people planning, and financial modeling
			CO6	explain legal implications affecting the company's prospects and identifying right mentors and advisors to support startups
	9HC05	Environmental Science and Ecology	CO1	demonstrate ecosystem and energy flow among the organisms
			CO2	name resources available, and explain overexploitation of the resources in the nature
			CO3	summarize the value and use of biodiversity
			CO4	list the causes and effect of pollution and implement measures in control of pollution
			CO5	explain the sustainable development and implement green technology for sustainable development
			CO6	implement policy to protect the environment
	9K471	FLUID MECHANICS LAB	CO1	Determine coefficient of discharge for orifice and mouthpiece
			CO2	Calibrate notches, venturimeter, orifice meters
			CO3	Determine major and miner losses in pipes
	9K472	ENGINEERING GEOLOGY LABORATORY	CO1	Identify the various rocks and minerals depending on geological classifications
	9K473	MATLAB	CO1	operate in the MATLAB environment using programming fundamentals
			CO2	write basic matlab programs using commands and functions
			CO3	write MATLAB programs for solving problems encountered in Civil Engineering
	9K485	TECHNICAL	CO1	Demonstrate public speaking with

		SEMINAR – IV		the aid of Power Point Presentations
			CO2,CO3	Identify current general and specific technological topics of interest and prepare and present the content cogently Demonstrate communication skills and interview performance skills
	9K495	COMPREHENSIVE VIVA VOCE – IV	CO1,CO2	Comprehend the concepts in the core and elective courses Exhibit technical knowledge to face interviews
			CO3	Exhibit lifelong Learning skills for higher education and to pursue Professional practice
III-I & A20	8K510	HYDRAULICS AND HYDRAULIC MACHINERY	CO1	Analyse uniform flows through open channels and work out resistance to the flow and most economical sections
			CO2	Analyse gradually varied flows through open channels and able to classify different profiles and compute profile lengths
			CO3	Workout sequent depths and energy dissipation of hydraulic jumps in open channels
			CO4	Arrive at the force generated on vanes and work done by vanes due to impact of jet on the vanes
			CO5	Compute work done by the turbines and able to arrive at hydraulic design of the turbines
			CO6	Compute work done by centrifugal and reciprocating pumps and able to prevent cavitation conditions in the pumps
	8K511	SOIL MECHANICS	CO1	depict the various phases and fabric of soil
			CO2	determine the index properties and classify the soil
			CO3	apply the concepts of water flow through soil in the context of design and construction of embankments, canals etc apply stress distribution and effective stress in soil for

				designing the foundation
			CO4	compute the compressibility of different types of soil
			CO5	draw the Mohr's circle and find out shear strength parameters of soil
	8K615	CONCRETE TECHNOLOGY	CO1	test cement and know cement applications
			CO2	assess aggregates and its properties
			CO3	assess fresh concrete and its behaviour on using admixtures
			CO4	evaluate and analyse behaviour of hardened concrete and testing of hardened concrete
			CO5	arrive at proportions for different mix-design of concrete using IS code books
			CO6	assess different types of concrete and its behaviour and applications
	8KC51	(PROFESSIONAL ELECTIVE – I) 8KC51: REINFORCED CONCRETE DESIGN	CO1	explain basic requirements of concrete structures and fundamentals of different design philosophies
			CO2	interpret various specifications of relevant standards, to field problems and professional practices
			CO3,CO4,CO5	design singly reinforced, doubly reinforced rectangular and flanged beams design slabs with different conditions and different supports design for uni-axial and biaxial bending of columns and design isolated square, rectangular and circular footings
			CO6	Interpret and communicate the design and detailing of rc beams, slabs, columns, stair cases and footings, through appropriate structural drawings
	8EC44	(Open elective-III) 8EC44: DATA BASE SYSTEMS CONCEPTS	CO1	Explain Abstract data type, stack and Queues with their applications
			CO2	Write programs on Singly linked lists, Doubly linked lists, Circular list and explain their operations
			CO3	Explain concepts of Trees, AVL

				Trees and Graphs with examples and applications
			CO4	Describe and solve problems of searching and sorting and evaluate the time complexity of each algorithm
			CO5	Explain concepts of OOPs and implement programs using objects, classes, constructors and destructors
			CO6	Explain and apply concepts of oops , write programs implementing functions, operator overloading and inheritance
	8ZC24	(Open elective – III) 8ZC24 - PRODUCT AND SERVICES	CO1	identify the basic concepts of a product
			CO2	distinguish the process of new product development and stages in the process
			CO3	illustrate the concept of product testing, product planning and the preparatory groundwork for launching a new product
			CO4	describe the nature of services, its differences with the goods and the application of marketing principles for services
			CO5	explain the attributes of a good service design and the tools for producing and distributing the services
			CO6	recognize the importance of quality of services and apply measurement scales to evaluate the service quality
	8FC24	CYBER SECURITY (Mandatory course)	CO1	Interpret cyber-attacks, and outline types of cybercrimes
			CO2	explain cyber laws
			CO3	demonstrate how to protect themselves and ultimately the entire Internet community from cyber attacks
	8K571	HYDRAULICS AND HYDRAULIC MACHINERY LAB	CO1	compute Mannigs coefficient, 'n' for uniform flow in the open channel
			CO2	determine work done by fluid jet on vane, compute work done and draw performance characteristic curves for turbines and centrifugal pumps

			CO3	perform hydraulic jump and verify sequent depths ration and energy loss
	8K572	SOIL MECHANICS LAB	CO1,CO2	determine basic engineering properties of soil classify the soil with the help of Atterberg's limits and Classification of soil
			CO3	determine the cohesion and friction using direct shear test and tri-axial tests
	8K573	CONCRTE TECHNOLOGY LAB	CO1	Test Fineness, Specific Gravity, Setting Time, Soundness and Compressive Strength of Cement
			CO2	Test Specific Gravity of Coarse Aggregate and Fine Aggregate, Bulking of Fine Aggregate
			CO3	Design Concrete Mix Proportioning by Using Indian Standard Method
			CO4	Test Workability of Fresh Concrete and Compressive strength, Split Tensile Strength of Hardened Concrete
	8K577	GROUP PROJECT-I	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects
			CO2	Exhibit the interest in learning the modern tools and technologies
			CO3	demonstrate enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs to the marked and society as a whole
			CO4	exhibit communication skills and team work skills
			CO5	Work as in individual and in a team
	8K596	COMPREHENSIVE VIVA VOCE-V	CO1	recall the concepts in the core and elective courses
			CO2	Exhibit technical knowledge to face interviews
			CO3	Exhibit lifelong Learning skills for higher education and to pursue Professional practice

III-II & A20	8AC48	ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING	CO1	explain the fundamentals of electrical engineering and DC machines
			CO2	define the principles of AC circuits
			CO3	explain the principle and operation of three phase induction motor and measuring instruments
			CO4	summarize the principle and operation of diode
			CO5	recall the principle and operation of transistor
			CO6	summarize the principles of digital electronics
	8K613	GEOGRAPHIC INFORMATION SYSTEM	CO1	recall the basic definition of GIS
			CO2	generate various model from raw data
			CO3,CO4,CO5	edit and rectify the topography data analyze and interpret the data generated apply GIS in Projects
			CO6	list out various spheres of application for Civil Engineers
	7K614	ENVIRONMENTAL ENGINEERING	CO1	design the treatment units based on the population estimation
			CO2	analyse a water supply network
			CO3,CO4,CO5	describe collection of sewage and treatment of sewage water distinguish basic phenomenon/ units involved in the treatment plants explain the basic treatment processes involved in treating water
			CO6	explain solid waste management and low cost treatment technologies
	8K717	Disaster Mitigation and Management	CO1	analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at local, national and international levels
			CO2	choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
			CO3	explain various mechanisms and consequences of natural and human

				induced disasters for the participatory role of engineers in disaster management
			CO4	Develop an awareness regarding the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans
			CO5	list various participatory approaches/strategies and their applications in disaster management
			CO6	explain the concepts of remote sensing and geographical information systems for their effective application in disaster management
	8KC61	DESIGN OF STEEL STRUCTURES (PROFESSIONAL ELECTIVE – II)	CO1	design various Steel Structures and connections and interpret the specifications of relevant codes
			CO2	apply the design principles to field problems
			CO3	apply design principles to field problems of tension members
			CO4	draw, understand and interpret the detailing aspects of steel structural drawings
			CO5	Is able to investigate into the critical issues of steel structures, compare various options and chose the best solution for the problems in the area of steel structures
			CO6	design the end bearing Stiffness and intermediate stiffness
	8EC45	ARTIFICIAL ENGINEERING	CO1	contrast Python versions and their specifications
			CO2	Build programs using primitive data types
			CO3	Write applications that include functions, modules, packages along with respective exceptional handling mechanism
			CO4,CO5	Write applications using OO features of Python Write applications using Files
			CO6	develop NumPy/Tkinter/Plotpy modules

	8K671	GEOGRAPHICAL INFORMATION SYSTEMS LAB	CO1,CO2,CO3	extract various details from the topography survey map The student shall be able to convert the raw data into vector and raster forms The student shall be able to generate maps with various geographic features
	8K672	ENVIRONMENTAL ENGINEERING LABORATORY	CO1,CO2	establish water and wastewater quality, and know which tests are appropriate for given environmental problems? Statistically analyse and interpret laboratory results
			CO3	use the water and wastewater sampling procedures and sample preservations
			CO4	Obtain the necessary background for subsequent courses in environmental engineering
	8AC95	ELECTRICAL & ELECTRONICS ENGINEERING LAB	CO1,CO2	Use Excel sheets for Civil Engineering applications Write computer programs for structures with various loading and support conditions using Civil Engineering related software such as STAAD Pro
	8K678	GROUP PROJECT-II	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing small conceptual projects
			CO2	Exhibit interest in learning the modern tools and technologies
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs to the marked and society as a whole
			CO4	Improve their communication skills and team work skills
			CO5	Work as in individual and in a team
	8K697	COMPREHENSIVE VIVA VOCE –VI	CO1	recall the concepts in the core and elective courses
			CO2	Exhibit technical knowledge to face interviews
			CO3	Exhibit lifelong Learning skills

				for higher education and to pursue Professional practice
IV-I & A20	8K717	Finite Element Method for Civil Engineers	CO1	apply potential energy method to structural engineering problems
			CO2	generate and solve the governing FE equations for one-dimensional problems
			CO3	generate and solve the governing FE equations for two-dimensional problems
			CO4	formulate FE equations using four nodded iso-parametric element
			CO5	solve FEM equation using the Gauss quadrature
			CO6	analyze basic structural elements using ANSYS software
	8K718	Design and Detailing of Hydraulic Structures	CO1	design and detail Surplus weir;
			CO2	design and detail Direct sluice ;
			CO3,CO4,CO5	design and detail Glacis type canal drop; design and detail Cross regulator; Design of super passage
			CO6	design and detail and understand design concepts of syphon
	8K719	Estimation and Valuation	CO1	prepare detailed estimates for different buildings
			CO2	do the rate analysis for different items of works of buildings
			CO3	prepare the rate analysis for different items of works
			CO4,CO5	prepare the schedules for shuttering and bar bending work out different types of contracts, prepare tenders, to suit the present day practices of tendering
			CO6	valuate buildings as per norms
	8KC74	Professional Elective_III(7KC74: Ground Improvement Techniques)	CO1	explain the necessity of ground improvement and the factors which decide the method of ground improvement
			CO2	contrast mechanical modification of the ground by compaction and various methods of compaction
			CO3	outline hydraulic modification of the ground by lowering of water table and other methods
			CO4	Understand the necessity of

				drainage of slopes, vertical drains sand drains etc,
			CO5	Understand chemical modifications of the ground by lime stabilization and other methods
			CO6	Understand the method of grouting and other advanced methods
	8DC55	Open elective_III (7DC55) Internet of Things	CO1	Identify the implementation layers of an IoT application system
			CO2	Summarize the characteristics and challenges of designing SDN and NFV
			CO3	Describe the management of an IoT system using necessary protocols
			CO4	Design, Develop and Illustrate IoT applications using Raspberry PI platform and Python Scripting
			CO5	Implement web based services on IoT devices
			CO6	Design new projects using Raspberry PI
	8ZC24	Open elective_III (7ZC24) Innovation and Design thinking	CO1	The students gain the knowledge on the inputs required for innovation and also gain familiarity on Entrepreneurship
			CO2	The students will get exposure on creative methods of ideation and the importance of protecting the ideas
			CO3	The students gain knowledge on design thinking and types of thinking
			CO4	The students gain familiarity on emerging technologies like Internet of things (IOT)
			CO5	The students understand the process of building the startup
			CO6	The students gain knowledge on various startup funding and also to branding building for the startup
	8K771	Concrete Technology Lab	CO1	Test Fineness, Specific Gravity, Setting Time, Soundness and Compressive Strength of Cement
			CO2	Test Specific Gravity of Coarse Aggregate and Fine Aggregate, Bulking of Fine Aggregate
			CO3	Design Concrete Mix Proportioning by Using Indian

				Standard Method Test Workability of Fresh Concrete and Compressive strength, Split Tensile Strength of Hardened
			CO4	Concrete
	8K772	Revit Lab	CO1	Develop the architectural design for the structure based on the requirement of end user
			CO2	Develop the design and documentation for the various structures using REVIT software
	8K773	Estimation & Quantity Surveying Laboratory	CO1	Use Excel sheets for Civil Engineering applications
			CO2	Develop the documentation for material quantities and rate analysis for different structures
		Project - I	CO1	review and outline various civil engineering problems that can be taken up as project work
			CO2	Work in a team to select a problem for project work
			CO3	Review and evaluate the available literature on the chosen problem
			CO4	formulate, with the help of faculty advisor, a methodology to solve the identified problem
			CO5	Apply the principles, tools and techniques to solve the problem
			CO6	Prepare and present project report
		Artificial Intelligence - Mandatory course	CO1	explain significance of AI list out different types of AI agents and AI search algorithms infer fundamentals of knowledge representation build simple knowledge-based systems
IV-II & A20	8KC81	Professional Elective_IV(7KC81: Structural Engineering) - studied in III-I	CO2,CO3	Differentiate between statically determinate and indeterminate structures
				Sketch the SF and BM diagrams for determinate and indeterminate beams
				Calculate the deflections in beams and frames
			CO4	draw the SFD and BMD for structures with and without sway
			CO5	Aanalyse the indeterminate structure for various types of loads

			CO6	analyze the truss and also able to determine the Plastic moment capacity of a structure
	8KC86	Professional Elective_V(7KC86: Foundation Analysis and Design - studied in III-II)	CO1	recall soil exploration methods
			CO2	calculate earth pressures on foundations and retaining structures
			CO3	Analyse shallow foundations
			CO4	determine bearing capacity of soils and foundation settlements
			CO5	Design the Pile foundation
			CO6	illustrate the concept of well foundation
		Project - II	CO1	review and outline various civil engineering problems that can be taken up as project work
			CO2	Work in a team to select a problem for project work
			CO3,CO4	Review and evaluate the available literature on the chosen problem formulate, with the help of faculty advisor, a methodology to solve the identified problem
			CO5	Apply the principles, tools and techniques to solve the problem
			CO6	Prepare and present project report

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Course Outcomes of EEE Department

Department of Electrical & Electronics Engineering
COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC07	Engineering Physics	CO1	Explain semiconductor behavior, types and their applications
			CO2	Differentiate the wave and particle, and its application for a particle in one dimension box
			CO3	Explain about emission, its types, laser principle and applications of optical fibers (sensors and medical endoscopy)
			CO4	Reveals about the magnetism-its origin and types and its applications
			CO5	Explain the basic concepts of dielectric materials, polarization and its types, their applications (piezo, ferro and Pyro electricity).
			CO6	Summarize nano& bulk concepts, surface to volume ratio and its applications.
	9FC01	Problem Solving using C	CO1	Explain basic fundamentals of Computer Systems, computing environments, Computer Languages – Machine Languages.
			CO2	Describe C language Programs, Structure of a C Program
			CO3	Describe write programs using control structures such as Pre-test and post-test loops, while, do while, for, break
			CO4	Write programs implementing application on arrays
			CO5	Write programs using Pointers and string handling functions
			CO6	Write programs using Enumerated, Structure, Union types and files.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	Basic operation of matrices and about the linear system and some analytical methods for solution.
			CO2	Concept of Eigen value and Eigen vector and their properties and applications.
			CO3	Quadratic form and its properties.
			CO4	Mean value theorems and their applications to the given functions, series expansions of a function.
			CO5	Various analytical methods to solve first order first degree and also the equations not of first degree ordinary differential equations.
			CO6	Methods to solve higher order ordinary differential equations.
	9HC01	Essential English	CO1	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.

		Language Skills (EELS)	CO2	State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	Identify the differences of each tense and use the tenses accurately.
			CO4	Identify specialized reading strategies for specific types of texts
			CO5	Produce written work that is substantive, organized, and grammatically accurate.
	9BC01	Engineering Graphics	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			CO3	Draw projections of different types of regular solids in various positions wrt principal planes of projection
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software
	9HC61	Oral Communication Lab-I	CO1	Describe people, objects and situations using simple sentences.
			CO2	Use appropriate tenses and expressions in different contexts of conversations.
			CO3	Identify major areas of concern in their oral communication and address them.
			CO4	Create a SMART plan to enhance their communication skills in English
	9HC66	Engineering Physics Lab	CO1	Demonstrate the wave length of monochromatic source of light by using Newton's Rings
			CO2	Analyze refractive index of a material prism and Dispersive power of a glass Prism by using spectrometer
			CO3	Determine the wave length of spectral light and laser Source of light by using Diffraction Grating
			CO4	Design and Analyze RC Circuits
			CO5	Analyze RLC Series circuit and parallel circuit
			CO6	Investigate magnetic Circuits
	9FC61		CO1	To formulate the algorithms for simple problems

		Problem Solving using C Lab	CO2	To translate given algorithms to a working and correct program
			CO3	To be able to correct syntax errors as reported by the compilers
			CO4	To be able to identify and correct logical errors encountered at run time
			CO5	To be able to write iterative as well as recursive programs
			CO6	To be able to represent data in arrays, strings and structures and manipulate them through a program
I-II & A22	9HC04	ENGINEERING CHEMISTRY	CO1	To understand microscopic chemistry in terms of atomic and molecular orbitals
			CO2	To learn the preparation and applications of commercial polymers and lubricant materials
			CO3	To learn the industrial problems caused by water and municipal water treatment
			CO4	To acquire knowledge about different types of batteries and their working mechanism
			CO5	To develop the concepts and types of corrosion and the factors influence corrosion
			CO6	To understand the control methods and protective coatings for metals and other surfaces
	9A201	**ELECTRICAL CIRCUITS AND NETWORKS – I**	CO1	Apply Kirchhoff's laws for solving electrical circuits.(L3)
			CO2	Construct the network graph and solve the problems of electrical networks. (L3)
			CO3	Solve the problems of composite magnetic circuits and electrical networks using network theorems. (L3)
			CO4	Explain the basic concepts of single phase AC circuits and solve the problems related to steady state analysis. (L2)
			CO5	Evaluate various parameters such as Q factor and bandwidth for resonance circuits. (L5)
	9EC01	DATA STRUCTURES	CO1	Design the programs using structures, unions and enum.
			CO2	Demonstrate the concepts of Abstract data type and also applications of stacks and queues.
			CO3	Implement basic operations on single, double and circular linked list.
			CO4	Solve problems involving Binary Search trees and AVL trees.
			CO5	Articulate the concepts of graphs, heaps and hashing.
			CO6	Develop algorithms for various searching and sorting techniques and analyze their performance.
	9HC12	ADVANCED CALCULUS	CO1	Basic concepts of multivariable differential calculus.

			CO2	Evaluation of double and triple integrals.
			CO3	Solutions of first order linear and non-linear partial differential equations.
			CO4	Series expansion of a given function in terms of sine and cosine terms.
			CO5	Basic Concepts of vector differential calculus.
			CO6	Concepts of vector integral calculus,
	9HC62	Oral Communication Lab-II	CO1	Understand the nuances of striking a great conversation in formal and informal situations.
			CO2	Gain experience of facing an audience and speaking in public.
			CO3	Design a winning presentation and present it with ease.
	9HC64	Engineering Chemistry Lab	CO1	Describe the principle and theory in determination of Hardness of a water sample.
			CO2	Experiment the method of preparation for organic compounds.
	9EC61	Data Structures Using C Lab	CO1	Write programs on structures and unions.
			CO2	Implement Stacks, Queues and circular queues using arrays.
			CO3	Write programs to implement basic operations on various types of linked list.
			CO4	Implement insertion and traversal operations on binary search tree
			CO5 CO6	Develop programs on various searching, sorting algorithms.
	9BC61	Workshop/Manufacturing Processes Lab	CO1	Use various types of conventional manufacturing Processes
			CO2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
			CO3	Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			CO4	Produce small devices / products /appliances by assembling different components
II- I A-22	9HC14	TRANSFORM TECHNIQUES AND NUMERICAL METHODS	CO1	Use the Laplace transforms techniques for solving ODE's
			CO2	Use the Z-Tranforms technique for solving Difference equations
			CO3	Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations.
			CO4	Find the root of a given equation.
			CO5	Estimate the value for the given data using interpolation

			CO6	Find the numerical solutions for a given ODE's
	9CC02	**DIGITAL LOGIC DESIGN**	CO1	An ability to understand number systems and apply the rules of Boolean algebra and K-maps to simplify Boolean expressions.
			CO2	An ability to design MSI combinational circuits such as full adders, multiplexers, decoders, encoders, Code converters.
			CO3	An ability to design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers
			CO4	An ability to design digital design using PLD's such as ROM's, PLA's, PALs and digital controllers using Algorithmic State Machine Charts.
	9CC01	**ELECTRONIC DEVICES AND CIRCUITS**	CO1	Demonstrate the concepts of pn Diode, Zener Diode, Bipolar Junction Transistor, Field Effect Transistor and their characteristics.
			CO2	Design and Analyze the Amplifier circuit's using BJT and FET.
			CO3	Classify and characterize the Feed Back amplifiers and design various Oscillator circuits.
			CO4	Understand the Basic regulator circuits and voltage multipliers.
	9A302	**ELECTRO MAGNETIC FIELDS**	CO1	Understand the Principle of electrostatics.
			CO2	Understand the principle of dipole and field due to dipole.
			CO3	Understand the Fundamentals of dielectrics and calculation of capacitance.
			CO4	Understand the Fundamentals of Ampere circuital law and force in magnetic field.
			CO5	Understand the magnetic dipole and magnetic potential.
			CO6	Understand the self and mutual inductance and time varying fields.
	9A303	**ELECTRICAL MACHINES – I**	CO1	Understand the Electromechanical Energy conversion.
			CO2	Understand the constructional features & Principle of operation of DC machine.
			CO3	Understand the characteristic features of DC machines.
			CO4	Understand the starting & speed control techniques of various types of DC motors.
			CO5	Analyze the various testing procedures of DC machines.
			CO6	Understand the various applications of DC machines.
	9A304	**ELECTRICAL CIRCUITS and NETWORKS- II**	CO1	Understand the three phase circuits.
			CO2	Understand the DC and AC transients.
			CO3	Understand the network functions.
			CO4	Analyze the network parameters.

			CO5	Understand the different types of filters.
			CO6	Understand the Fourier analysis of AC circuits.
	9EC42	**PROGRAMMING IN JAVA**	CO1	Understand the concept of OOP with the need of constructing objects, and classes. Write programs using classes, objects, members of a class and the relationships among them needed for a specific problem.
			CO2	Identify the purpose and usage of principles of inheritance and polymorphism. Implement concepts of polymorphism, encapsulation and method overloading.
			CO3	Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifiers, automatic documentation through comments)
			CO4	Students understand and implement error exception handling and multi- threading.
			CO5	Students learn to create GUI for the specific applications.
			CO6	Write programs for event-handling using various user interface components on applets.
	9HC05	**ENVIRONMENTAL SCIENCE AND ECOLOGY**	CO1	To understand structure and function of ecosystem
			CO2	To learn classification and uses of natural resources
			CO3	To learn about Understanding the impacts of developmental activities and mitigation measures.
			CO4	To know the source, causes and preventive methods of pollution
			CO5	To understand the importance of ecological balance for sustainable development.
			CO6	To understand the environmental policies and regulations
	9CC71	**ELECTRONIC DEVICES & CIRCUITS LAB**	CO1	Understand color coding, operations on Diode, BJT, FET and other electronic components.
			CO2	Correlate theoretical concepts with practical implementation.
			CO3	Apply the knowledge of Diodes, Capacitors and Transistors for the realization of rectifiers, regulators, amplifiers and Oscillator circuits.
			CO4	Adapt effective Communication, presentation and report writing skills.
	9A371	**ELECTRICAL CIRCUITS AND NETWORKS ANALYSIS LAB**	CO1	Perform the test for verification of various network theorems
			CO2	Measure the frequency for a RLC series/parallel circuits under resonance.
			CO3	Conduct an experiment for determination of self & mutual inductance and coefficient of coupling

			CO4	Construct current locus diagram by performing a test on single phase parallel circuits
			CO5	Simulate for analysis of electrical circuits.
			CO6	Determine the parameters of the coil
	9A393	**TECHNICAL SEMINAR – III**	CO1	Deliver lecture on emerging technologies.
			CO2	Explain domain knowledge to resolve real time technical issues
			CO3	Demonstrate ability to lead and explain concepts and innovative ideas.
			CO4	Demonstrate team leading qualities.
			CO5	Demonstrate public speaking skills.
			CO6	Exchange new information that would not have been available otherwise.
	9A383	**COMPREHENSIVE TEST AND VIVA VOCE – III**	CO1	Comprehend the concepts in the Core Courses 1st year and 2nd year 1st Semester.
			CO2	Assess technical knowledge to face interviews.
			CO3	Exhibit lifelong learning skills to pursue higher studies or professional practice.
II- II A-22	9HC16	**PROBABILITY & STATISTICS**	CO1	Solve the random variable problems and probability distributions.
			CO2	Estimate the parameters and solve the problems using central limit theorem.
			CO3	Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	Solve the problems on measures of central tendency, Correlation and regression models
	9A405	**ELECTRICAL MACHINES-II**	CO1	Learn basic concepts of single phase transformer.
			CO2	Study about testing of single phase transformer and auto transformer.
			CO3	Study about poly phase transformer.
			CO4	Study about poly phase induction motors.
			CO5	Study about torque speed characteristics and circle diagram of induction motor.
			CO6	Study about different starting methods of induction motor.
	9A406	**POWER SYSTEMS - I**	CO1	Learn basic concepts of hydro electric and thermal power plants.
			CO2	Study about gas and nuclear power plants.
			CO3	Study about transmission line parameters and efficiency.
			CO4	Study about performance of transmission lines.
			CO5	Learn basic about over head insulators and mechanical design.
			CO6	Learn fundamentals of underground cables.

	9AC07	**LINEAR CONTROL SYSTEMS**	CO1	Learn basic concepts of control systems.
			CO2	Study about time response analysis.
			CO3	Learn basic concepts of stability and root locus method.
			CO4	Study about frequency response analysis.
			CO5	Learn basic concepts stability analysis in frequency domain.
			CO6	Learn fundamentals of state space analysis.
	9CC05	**ANALOG CIRCUITS**	CO1	Distinguish between small and large signal amplifier and able to compare the conversion efficiency levels
			CO2	Analyze and Design tuned RF amplifiers and different types of sweep generators
			CO3	Understand linear and non-linear wave shaping methods and able to Analyze various types of Logic gates and Sampling gates.
			CO4	Understand and design various types of multivibrators and applications
	9EC44	**DATABASE SYSTEMS CONCEPTS**	CO1	Students will learn basics of databases and understand the architecture of database management systems.
			CO2	Students will learn about good database design techniques and database theories behind.
			CO3	Understand conceptual database designs, and functional dependencies and normalization.
			CO4	Students will understand the Mathematical foundation for relational databases.
			CO5	Student will be able to understand concept of Constraints, Views and will be able to create dynamic databases.
			CO6	Learn transaction management, concurrency controls.
	9HC17	**UNIVERSAL HUMAN VALUES (UHV)**	CO1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
			CO2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
			CO3	Strengthening of self-reflection.
			CO4	Development of commitment and courage to act.
	9HC03	**SOFT SKILLS**	CO1	Assess them using SWOT analysis.
			CO2	Appraise the importance of certain soft skills like time management and goal setting.
			CO3	Improve their verbal ability to handle the competitive exams.
			CO4	Enhance their team skills and design thinking capabilities for effective problem solving and decision making.
			CO5	Know their emotional quotient which guides their thinking, behavior and helps them

				manage stress efficiently.
			CO6	Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews.
	9A473	**ELECTRICAL MACHINES LAB – I**	CO1	Understand the principles of DC electrical machines.
			CO2	Understand the load characristics.
			CO3	Understand the principle and operation of DC machine speed control methods.
			CO4	Understand the calculation of losses in DC machines.
	9CC74	**Analog Circuits Lab**	CO1	To understand the design and working of various linear and non-linear wave shaping circuits.
			CO2	To demonstrate the working principle of various multivibrators and functionalities of various logic gates.
			CO3	To perform and verify the working of oscillators, feedback amplifiers and voltage regulators.
			CO4	To perform laboratory experiment to verify the conversion efficiency of various power amplifiers.
	9A494	**TECHNICAL SEMINAR - IV**	CO1	Deliver lecture on emerging technologies.
			CO2	Explain domain knowledge to resolve real time technical issues
			CO3	Demonstrate ability to lead and explain concepts and innovative ideas.
			CO4	Demonstrate team leading qualities.
			CO5	Demonstrate public speaking and lifelong learning skills for higher studies and to pursue professional practice.
			CO6	Exchange new information that would not have been available otherwise.
	9A484	**COMPREHENSIVE VIVA TEST – IV**	CO1	Comprehend the concepts in the Core Courses 1st year and 2nd year.
			CO2	Assess technical knowledge to face interviews.
			CO3	Exhibit lifelong learning skills to pursue higher studies or professional practice.
III-I & A20	**8CC07**	**IC APPLICATIONS**	CO1	Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics.
			CO2	Design the basic circuits using IC 741 op-amp.
			CO3	Explore, design and analyze active filters, timers, oscillators, voltage controlled oscillator DACs and ADCs, and IC regulators.
			CO4	Classify and characterize the TTL/ECL/CMOS Logic Families and design of various logic gates using them.
	8A508	**ELECTRICAL**	CO1	Explain the constructional details and

		MACHINES - III		generation of EMF.
			CO2	Explain the causes for harmonics and its suppression and also armature reaction.
			CO3	Evaluate the performance of alternator by different methods.
			CO4	Explain how to operate the alternators in parallel for load sharing and how to control the reactive power.
			CO5	Analyze and explain applications of synchronous motor.
			CO6	Explain the various applications of single phase induction motor and special purpose motors.
	8A509	**POWER ELECTRONICS**	CO1	Understand the construction and operation of various power semiconductor devices and analyze about the series and parallel operation of SCRs.
			CO2	Analyze the operation of different configurations of single phase converters for different loads.
			CO3	Analyze the operation of different configurations of three phase converters for different loads.
			CO4	Explain the operation of different type's choppers.
			CO5	Explain the operation of inverter and applications of inverters.
			CO6	Explain the working of an AC voltage controller and Cyclo-Converters for different configurations.
	8A510	**POWER SYSTEMS-II**	CO1	Understand the importance of power factor and analyze the different methods of power factor and voltage control.
			CO2	Analyze the factors affecting the economic aspects of power generation and tariff, different methods of tariff.
			CO3	Learn about components of substation and different methods of grounding.
			CO4	Learn about per unit system and symmetrical fault analysis.
			CO5	Learn about symmetrical components, sequence impedances and unsymmetrical fault analysis.
			CO6	Analyze different types of distribution systems.
	8EC76	**OPERATING SYSTEMS CONCEPTS (OPEN ELECTIVE-I)**	CO1	Describe the basic functionalities and structure of the Operating System
			CO2	Explain the concepts and implementations of: Processes, Process Scheduling. Describe, contrast and compare various types of Operating systems like Windows and Linux.
			CO3	Comprehend the concepts of Synchronization and Deadlocks in the Operating System

			CO4	Discuss the concepts of Memory Management (Physical and Virtual memory)
			CO5	Explain the concepts of File System with regard to directory and disk management algorithms.
			CO6	Students understand the concepts of I/O systems, protection and security in a case study given
	8ZC01	**ECONOMICS, ACCOUNTACY, AND MANAGEMENT SCIENCE (EAMS)**	CO1	To understand the basics of Managerial Economics at Micro level
			CO2	To understand cost concept
			CO3	To understand and identify various basic concepts of Accounting
			CO4	To understand the concepts of Capital expenditure
			CO5	To make student understand the basics of Management
			CO6	To make student learn about various personality traits
	8FC24	**CYBER SECURITY**	CO1	The students will be able to understand cyber-attacks, types of cybercrimes.
			CO2	Realize the importance of cyber security and various forms of cyber attacks and countermeasures.
			CO3	Get familiar of cyber forensics.
			CO4	Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.
			CO5	Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
			CO6	Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.
	8CC76	**IC APPLICATIONS LAB**	CO1	An ability to explore the applications of IC 741 OP-AMP.
			CO2	An ability to design Active filters and its applications
			CO3	An ability to understand and implement generate square and Triangular waveforms using 555 Timers
			CO4	An ability to design D to A converters and its applications
	8A575	**LINEAR CONTROL SYSTEMS AND SIMULATION LAB**	CO1	To explore the applications of control systems.
			CO2	To explore the concepts of control systems.
	8A586	**SUMMER INDUSTRY INTERNSHIP – I**	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern

				tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
III-II & A20	**8DC05**	**MICROPROCESSOR AND MICROCONTROLLERS**	CO1	Understanding the concepts of 8086 Architecture
			CO2	Understanding the concepts of Instruction set & developing skills in writing assembly language programs.
			CO3	Ability to interface keyboard, stepper motor ADC, DAC to 8086 using 8255
			CO4	Understanding the concepts of 8051 Architecture
			CO5	Exploring the concepts of instruction set of 8051
			CO6	Ability to interface LED, LCD, Keyboard DAC, ADC with 8051
	8A611	**SWITCH GEAR AND PROTECTION**	CO1	Understand about power system transients and its effects.
			CO2	Learn about protection against over voltages.
			CO3	Learn about different types of circuit breakers and its importance.
			CO4	Learn about different types of electromagnet relays.
			CO5	Learn about different types of static relays.
			CO6	Learn about generator, transformer and feeder protection.
	8A612	**MEASUREMENTS & INSTRUMENTATION**	CO1	Understand the principle of operation of different types of instruments viz., PMMC, moving iron type of instruments, the required characteristics of an instrument in general. The student demonstrates the ability to compensate for the errors in the instruments and to extend the range of the instruments.
			CO2	Demonstrates the knowledge of Potential and Current transformers; the errors in them and the effect of having an open/short in the secondary circuits; Understand the principle of operation of Dynamometer and Moving-iron type of Power factor meters.
			CO3	Comprehends the principle of operation of dynamometer type of Wattmeter and Induction type of Energy meter; use the wattmeter to measure the Active and Reactive power and demonstrates the ability to extend the range of them.

			CO4	Identify and use different techniques of measurement of Resistance, Inductance and Capacitance values.
			CO5	Understand the principle of operation of Different type of digital voltmeters, wave analyzers, spectrum analyzers and Cathode ray Oscilloscope.
			CO6	Demonstrates the ability in characterizing the different types of transducers and uses them to measure Strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque and Temperature.
	8BC04	**ELEMENTS of MECHANICAL ENGINEERING**	CO1	To acquire the knowledge of basic concepts of thermodynamics and analyze the p-v & t-s diagrams of the different cycles.
			CO2	To acquire the knowledge two and four stroke engines, the function of components used in the steam power plant
			CO3	To identify & understand the function of components used in VCR & VAR system, & about the working of hydraulic pumps & hydraulic turbines.
			CO4	To identify & understand *properties of material and engineering application*
			CO5	To acquire the knowledge *of various types of power transmission systems*
			CO6	To acquire the knowledge the different NC and CNC machine.
	8FC22	**PYTHON PROGRAMMING CONCEPTS**	CO1	Gains exposure towards Python versions and their specifications.
			CO2	Build programs using primitive data types.
			CO3	Write applications that include functions, modules, and packages along with respective exceptional handling mechanism.
			CO4	Writes applications using OO features of Python
			CO5	Write applications using Files.
			CO6	Hands on exposure on NumPy/Tkinter/Plotpy modules.
	8ZC23	**ADVANCED ENTREPRENEURSHIP (OPEN ELECTIVE – II)**	CO1	The Students' gain knowledge on the stages of Start-up and the turbulence environment it undergoes and the stages related to growth of the Start-up.
			CO2	The Students are exposed to the various business models and critically evaluating the effectiveness of the business models and products
			CO3	The students understand the method of business traction, create roles and build their A- team
			CO4	The students understand the various channels of revenue building and exploration of new

				revenue avenues.
			CO5	The students understand the need of sales planning and people plan and also financial modeling.
			CO6	The students are exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support start-ups
	8E654	**ARTIFICIAL INTELLIGENCE**	CO1	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			CO3	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, and heuristic search together with the time and space complexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
			CO6	Analyze Supervised Learning Vs. Learning Decision Trees
	8A678	**POWER ELECTRONICS AND SIMULATION LAB**	CO1	**Correlate theoretical and practical analysis of AC-AC**
			CO2	Also analyze the characteristics of MOSFET.
	8A677	**ELECTRICAL MACHINES LAB – II**	CO1	Understand the concepts studied in theory subject.
			CO2	Understand the applications of the concepts.
	8A696	**GROUP PROJECT**	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.
	8A686	**COMPREHENSIVE**	CO1	Assess the relevant courses they have

		VIVA- VOCE		undergone till the completion of that academic year.
			CO2	Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills.
IV- I A-20	**8A714**	**POWER SYSTEM ANALYSIS AND CONTROL**	CO1	Understand about importance of network matrices and usefulness in power system analysis.
			CO2	Analyze the power system under different types of faults.
			CO3	Analyze the power system under steady state condition for voltage and power flow calculations.
			CO4	Analyze the power system for maintain constant frequency in single area.
			CO5	Analyze the power system for maintain constant frequency in two area.
			CO6	Analyze the power system for maintaining steady state and transient stability.
	8A716	**UTILIZATION OF ELECTRICAL ENERGY (PROFESSIONAL ELECTIVE – I)**	CO1	Know the importance of different type of electric drives, selection of motor based on starting and running characteristics, required speed control, tolerance of temperature rise, Particular applications of electric drives, and understands different types of industrial loads, Continuous, Intermittent and variable loads etc
			CO2	Know the importance of advantages and methods of electric heating, and applications of resistance heating induction heating and dielectric heating.
			CO3	Identify the core areas of illumination, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, and their applications & sources of light.
			CO4	Differentiate Discharge lamps of MV and SV lamps, tungsten filament lamps and fluorescent tubes, understands basic principles of light control, Types and design of lighting and flood lighting.
			CO5	Understands System of electric traction and track electrification.
			CO6	Understand and Calculations of tractive effort, power, specific energy consumption for a given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.
	8A715	**RENEWABLE ENERGY SOURCES (PROFESSIONAL ELECTIVE – II)**	CO1	Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms

				describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
			CO2	Demonstrates the knowledge of different techniques of solar collection and storage.
			CO3	The student becomes familiar with the different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
			CO4	Aware of the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
			CO5	Aware of the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
			CO6	Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.
	8A713	**POWER SEMI CONDUCTOR DRIVES (PROFESSIONAL ELECTIVE – III)**	CO1	Identify the necessity of drive; understand the operation of different converters connected to D.C separately excited motors and series motors derive the Speed.
			CO2	Understand four Quadrant operations of dc drives and analyze electric braking.
			CO3	Understand four Quadrant operations of Chopper fed dc drives.
			CO4	Describe the operation of Induction motor with its equivalent circuit, speed control of Induction motor with V/ F control and its speed torque Characteristics
			CO5	Explain the concept of slip power and deduce an expression for speed variation with slip power
			CO6	Analyze the working of different Synchronous Motor drives.
	8FC23	**Data Base Systems (Open Elective – III)**	CO1	Students will learn basics of databases and understand the architecture of database management systems.
			CO2	Students will learn about good database design techniques and database theories behind.
			CO3	Understand conceptual database designs, and functional dependencies and normalization.
			CO4	Students will understand the Mathematical foundation for relational databases.
			CO5	Student will be able to understand concept of

				Constraints, Views and will be able to create dynamic databases.
			CO6	Learn transaction management, concurrency controls.
	8A779	**PROJECT - I**	CO1	Develop plans with relevant people to achieve the project's goals
			CO2	Break work down into tasks and determine handover procedures
			CO3	Identify links and dependencies, and schedule to achieve deliverables
			CO4	Estimate the human and physical resources required, and make plans to obtain the necessary resources
			CO5	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO6	Design and develop the software or prototype to meet societal needs.
	8A787	**SUMMER INDUSTRY INTERNSHIP – II**	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team
			CO6	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
IV- II & A-20	**8A835**	ELECTRICAL AND HYBRID VEHICLES **(PROFESSIONAL ELECTIVE-IV)**	CO1	Understand working of Electric Vehicles and recent trends
			CO2	Analyze different power converter topology used for electric vehicle application
			CO3	Develop the electric propulsion unit and its control for application of electric vehicles.
	8A820	**ELECTRICAL DISTRIBUTION SYSTEMS (PROFESSIONAL ELECTIVE – V)**	CO1	Know the importance of terms used in distribution system such as load factor, loss factor etc and how these are interred related.
			CO2	Know the importance of different voltages in primary & secondary distribution systems and types of feeders in our country.
			CO3	Identify the importance of location of optimal sub –station through theoretical methods.
			CO4	Calculate power loss and voltage drop in balanced lines and derivations connected with

				these.
			CO5	Understand various types of protective devices and where and how these are used and the general procedure to coordinate protective devices.
			CO6	Understand the importance of power factor voltage control and how to improve it with various types of correction equipments and best location for them in a system so as to give optimum results.
	8A883	**PROJECT - II**	CO1	Develop plans with relevant people to achieve the project's goals
			CO2	Break work down into tasks and determine handover procedures
			CO3	Identify links and dependencies, and schedule to achieve deliverables
			CO4	Estimate the human and physical resources required, and make plans to obtain the necessary resources
			CO5	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO6	Design and develop the software or prototype to meet societal needs

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Course Outcomes of Mechanical Department

Department of Mechanical Engineering
COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	**9HC07**	Engineering Physics	CO1	Explain semiconductor behavior, types and their applications
			CO2	Differentiate the wave and particle, and its application for a particle in one dimension box
			CO3	Explain about emission, its types, laser principle and applications of optical fibers (sensors and medical endoscopy)
			CO4	Reveals about the magnetism-its origin and types and its applications
			CO5	Explain the basic concepts of dielectric materials, polarization and its types, their applications (piezo, ferro and Pyro electricity).
			CO6	Summarize nano& bulk concepts, surface to volume ratio and its applications.
	9FC01	Problem Solving using C	CO1	Explain basic fundamentals of Computer Systems , computing environments , Computer Languages – Machine Languages
			CO2	Describe C language Programs, Structure of a C Program
			CO3	Describe write programs using control structures such as Pre-test and post-test loops, while, do while, for, break
			CO4	Write programs implementing application on arrays
			CO5	Write programs using Pointers and string handling functions
			CO6	Write programs using Enumerated, Structure, Union types and files.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	Check the consistency or inconsistency of a linear system and can solve the problems.
			CO2	Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
			CO3	Find the nature, index and signature of the quadratic form.
			CO4	Verify the applicability of mean value theorems and also can express the givenstandardfunction in series form using Taylor's and Maclaurin series.
			CO5	Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.

			CO6	Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	Essential English Language Skills (EELS)	CO1	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
			CO2	State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	Identify the differences of each tense and use the tenses accurately.
			CO4	Identify specialized reading strategies for specific types of texts
			CO5	Produce written work that is substantive, organized, and grammatically accurate.
			CO6	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
	9BC01	Engineering Graphics	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			CO3	Draw projections of different types of regular solids in various positions wrt principal planes of projection
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software
	9HC61	Oral Communication Lab-I	CO1	Describe people, objects and situations using simple sentences.
			CO2	Use appropriate tenses and expressions in different contexts of conversations.
			CO3	Identify major areas of concern in their oral communication and address them.
			CO4	Create a SMART plan to enhance their communication skills in English
	9HC65	Applied Physics Lab	CO1	Demonstrate the wave length of monochromatic source of light by using Newton's Rings
			CO2	Analyze refractive index of a material prism and Dispersive power of a glass Prism by using spectrometer
			CO3	Determine the wave length of spectral light and laser Source of light by using Diffraction Grating
			CO4	Design and Analyze RC Circuits

			CO5	Analyze RLC Series circuit and parallel circuit
			CO6	Investigate magnetic Circuits
	9FC61	Problem Solving using C Lab	CO1	To formulate the algorithms for simple problems
			CO2	To translate given algorithms to a working and correct program
			CO3	To be able to correct syntax errors as reported by the compilers
			CO4	To be able to identify and correct logical errors encountered at run time
			CO5	To be able to write iterative as well as recursive programs
			CO6	To be able to represent data in arrays, strings and structures and manipulate them through a program
			CO7	To be able to declare pointers of different types and use them in defining self referential structures.
			CO8	To be able to create, read and write to and from simple text files.
I-II & A22	**9HC04**	ENGINEERING CHEMISTRY	CO1	To understand microscopic chemistry in terms of atomic and molecular orbitals
			CO2	To learn the preparation and applications of commercial polymers and lubricant materials
			CO3	To learn the industrial problems caused by water and municipal water treatment
			CO4	To acquire knowledge about different types of batteries and their working mechanism
			CO5	To develop the concepts and types of corrosion and the factors influence corrosion
			CO6	To understand the control methods and protective coatings for metals and other surfaces
	9EC01	DATA STRUCTURES	CO1	*Design the programs using structures, unions and enum.*
			CO2	Demonstrate the concepts of Abstract data type and also applications of stacks and queues.
			CO3	Implement basic operations on single, double and circular linked list.
			CO4	Solve problems involving Binary Search trees and AVL trees.
			CO5	Articulate the concepts of graphs, heaps and hashing.
			CO6	Develop algorithms for various searching and sorting techniques and analyze their performance.

	9HC12	ADVANCED CALCULUS	CO1	Find the limits and test for the continuity and differentiability of a function.
			CO2	Solve the problems on multiple integrals.
			CO3	Solve linear and nonlinear first order partial differential equations.
			CO4	Find Series expansion a function defined over the intervals.
			CO5	Find directional derivative, gradient, divergence and curl of a function.
			CO6	Solve problems of line, surface and volume integrals.
	9BC02	Engineering Mechanics	CO1	1. to analyse the system of forces, free body diagrams to solve problems dealing with forces in a plane.
			CO2	2. to analyse plane frame and solving using different methods like method of joints and method of sections friction concept and applications like wedge friction.
			CO3	3. to understand the properties of surfaces and volumes and roll played by centroid and centre of gravity in different applications.
			CO4	4. to understand second moment of area and mass moment of inertia and its application strength of materials in evaluating strength.
			CO5	5. to understand analysis of rigid body rotation and kinematics and kinetics of particle & rigid body.
			CO6	6. To analyse Application of work energy method and impulse momentum method to rigid bodies
	9HC62	Oral Communication Lab-II	CO1	Understand the nuances of striking a great conversation in formal and informal situations.
			CO2	Gain experience of facing an audience and speaking in public.
			CO3	Design a winning presentation and present it with ease.
	9HC64	Engineering Chemistry Lab	CO1	Preparation of Inorganic compounds
			CO2	Determination surface tension of a liquid
			CO3	Determination viscosity of lubricant
			CO4	Determination acid value of an oil
			CO5	Estimation hardness of water
			CO6	Analysis the amount of chloride content
			CO7	Determination of cell constant and conductance of solutions

			CO8	Determination of redox potential and emf of solutions
			CO9	Determination of the rate constant of acid
	9EC61	Data Structures Using C Lab	CO1	Write programs on structures and unions.
			CO2	Implement Stacks, Queues and circular queues using arrays.
			CO3	Write programs to implement basic operations on various types of linked list.
			CO4	Implement insertion and traversal operations on binary search tree
			CO5	Develop programs on various searching, sorting algorithms.
	9BC61	Workshop/Manufacturing Processes Lab	CO1	Use various types of conventional manufacturing Processes
			CO2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
			CO3	Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			CO4	Produce small devices / products /appliances by assembling different components
II-I A-22	9HC15	Complex Analysis, Probability And Statistics	CO1	Basic concepts of Complex Analysis and conformal mapping and their properties.
			CO2	Series expansion of a function using Taylor's and Laurent's series. Evaluation of definite integrals and improper integrals.
			CO3	Concepts of probability and will able to solve problems on discrete and continuous probability distributions.
			CO4	Learn basic concepts of sampling distribution and able solve problems on estimation.
			CO5	Concepts of Control Charts
			CO6	Testing the hypothesis concerning to large size and small size samples also goodness of fit and independence of attributes using chi-square distribution.
	9FC21	Python programming and Algorithms	CO1	Gains exposure towards Python versions and their specifications.
			CO2	Build programs using primitive data types.
			CO3	Write applications that include functions, modules, packages along with respective exceptional handling mechanism.
			CO4	Writes applications using OO features of Python
			CO5	Write applications using Files.
			CO6	Hands on exposure on NumPy/Tkinter/Plotpy modules.
	9HC05	Environmental Science and Ecology	CO1	Understand about ecosystem and energy flow among the organisms.

			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity.
			CO4	Understand the causes and effect of pollution and implement measures in control of pollution.
			CO5	Understand the sustainable development and implement green technology for sustainable development..
			CO6	Learn and implement policy to protect the environment.
	9ZC01	Economics, Accountancy and Management Science	CO1	Outlines the significance of management, defines the basic concepts and applicability of management principles in changing paradigms.
			CO2	Helps in understanding organization behavior, personality determinants and other key aspects
			CO3	Infers the need to understand the importance of Strategic management and Business environment in particular
			CO4	Enrich students with basic concepts of Financial Accounting.
			CO5	Understand basic concepts of Depreciation and need for preparing trial balance.
			CO6	Helps in preparation of Financial Statements (final accounts).
	9B306	Thermodynamics	CO1	The students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
			CO2	Students can evaluate changes in thermodynamic properties of substances
			CO3	The students will be able to evaluate the performance of energy conversion devices
			CO4	The students will be able to differentiate between high grade and low grade energies.
			CO5	The students will be able to use property table and Mollier charts to evaluate properties of steam at different states.
			CO6	The students will be able to analyze and evaluate the performance of basic thermodynamics cycles
	9B307	Materials Science and Metallurgy	CO1	identify crystal structures for various materials including metals and alloys and understand the impact of defects in such structures at atomic scale.
			CO2	understand fracture modes in failure of the industrial components during their service and failure under fatigue conditions.
			CO3	acquire the knowledge of finding number and amounts of phases, by using Lever Rule, draw and analyze the phase diagram for different binary alloys; concept of nucleation, growth of crystals and application of some cast and wrought non-ferrous metals/alloys used in industry.

			CO4	acquire the knowledge of industrially important Fe-Fe_3C phase diagram, various cast irons, steels and their applications in industry
			CO5	acquire the knowledge of different industrial heat treatment processes for steels; Surface hardening processes, how mechanical properties could be altered by implementing various heat treatment processes.
	9B308	Machine Drawing and Computer aided Drawing Practice	CO1	Understand the principles and requirements of the machine drawings.
			CO2	Understand the various symbols used in machine drawing.
			CO3	Understand the principles and requirements of various Assembly drawings.
			CO4	Drawing of different machine components
			CO5	Imagine and drawing the assembly by seeing the components given.
			CO6	Ability to understand the existing geometric modeling and develop a geometric modeling for a new component in design process
	9B363	Metallurgy Lab & Mechanics of Solids Lab	CO1	acquire the knowledge of preparation of samples for metallurgical study.
			CO2	acquire the knowledge of preparation of sample for metallurgical study of a plain carbon steel, cast iron, alloy steel, heat treated steel and their interpretation.
			CO3	acquire the knowledge of preparation of sample for metallurgical study of nonferrous metal/alloy and interpretation
	9B364	Fuels and Lubricants Lab	CO1	To determine the flash and fire point using Abels Apparatus
			CO2	To determine the flash and fire point using Pensky Martens Apparatus
			CO3	To determine the Viscosity using Saybolt Viscometer
			CO4	To determine the Calorific value using Bomb Calorimeter
			CO5	To determine viscosity using red wood viscometer
			CO6	To detremine Calorific value using Junkers Calorimeter
	9B393	Comprehensive test and Viva-voce-III	CO1	Comprehend the concepts in the core and elective courses.
			CO2	Exhibit technical knowlegde to face interviews.
			CO3	Exhibit life long Learning skills for higher education and to persue Professional practice.
	9B387	Technical Seminar III	CO1	Deliver lecture on emerging technologies.
			CO2	Explain domain knowledge to resolve real time technical issues
			CO3	Demonstrate ability to lead and explain concepts and innovative ideas.
			CO4	Demonstrate team leading qualities.
			CO5	Demonstrate public speaking skills.

			CO6	Exchange new information that would not have been available otherwise.
II-II-A-22	9AC48	Elements of Electrical & Electronics Engineering	CO1	Understand the fundamentals of electrical engineering and DC machines.
			CO2	Understand the principles of AC circuits.
			CO3	Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	Understand the principle and operation of diode.
			CO5	Understand the principle and operation of transistor.
			CO6	Understand the principles of digital electronics
	9EC41	Java Programming	CO1	Understand the concept of OOP with the need of constructing objects, and classes. Write programs using classes, objects, members of a class and the relationships among them needed for a specific problem.
			CO2	Identify the purpose and usage of principles of inheritance and polymorphism. Implement concepts of polymorphism, encapsulation and methodoverloading
			CO3	Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifiers, automatic documentation through comments)
			CO4	Students understand and implement error exception handling andmulti-threading.
			CO5	Students learn to create GUI for the specificapplications.
			CO6	Write programs for event-handling using various user interface components on applets.
	9HC17	Universal Human Values	CO1	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values.
			CO2	Understanding Harmony is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.
	9B409	Manufacturing Processes	CO1	Select moulding material, pattern and calculate pattern allowances used in casting and design the gating system and Design a suitable riser for the casting and decide specific casting type for a defect free product
			CO2	Distinguish between different forming processes and Analyze the forces and power consumed in rolling operation
			CO3	Decide the specific forging/ extrusion process for making a part and identify the specific defects if any in the process
			CO4	Suggest the sheet metal process for making a part and decide the processing technology for a particular type of plastic.

			CO5	Propose the type of welding joint and specific welding process for an application and estimate the effect of process variables on arc welding
			CO6	Choose appropriate technique for making discrete parts and opt the specific plastic processing method based on type of plastic.
	9B410	Kinematics of Machinery	CO1	understand the basic concepts of mechanism, types of mechanisms and inversions difference between machine mechanism and structure.
			CO2	understand velocity and acceleration diagram in order to evaluate the inertia forces in mechanism and machines.
			CO3	understand concept of steering gear mechanism, types and Hooke's joint with respect to an automobile.
			CO4	In order to understand and design complex motions possible out of comes and followers.
			CO5	understand the concept pf toothed gears and selection different types of gear trains in order obtain required velocity ratios.
			CO6	understand transmission power by various means like belts, rope and chains and their advantages and limitations.
	9B411	Fluid Mechanics and Hydraulic Machinery	CO1	understand the fluid properties and measurement of pressure with monometers.
			CO2	Understand the classification of fluid, Bernoulli's equation, momentum equation and their applications
			CO3	understand Reynolds's experiment, major losses, minor losses
			CO4	understand velocity triangle, work done calculations, elements of Hydroelectric power plant, pump storage plant.
			CO5	Understand the classifications of turbines working principles of turbines, draft tube theory, performance of turbine.
			CO6	Understand various types of pumps working principle of reciprocating pump, centrifugal pump, performance characteristics of centrifugal pump.
	9HC03	Soft Skills	CO1	enhance oral communication skills
			CO2	develop the skill of speaking extemporaneously
			CO3	enrich their vocabulary and subsequently hone their verbal aptitude
			CO4	learn to make formal presentations both online and offline.
			CO5	learn to listen and comprehend well
			CO6	learn the nuances of the art of group discussion
	9HC63	Soft Skills Lab	CO1	enhance oral communication skills
			CO2	develop the skill of speaking extemporaneously
			CO3	enrich their vocabulary and subsequently hone their verbal aptitude

			CO4	learn to make formal presentations both online and offline.
			CO5	learn to listen and comprehend well
			CO6	learn the nuances of the art of group discussion
	9AC95	Electrical & Electronics Engineering lab	CO1	Understand the fundamentals of electrical engineering and DC machines.
			CO2	Understand the principles of AC circuits.
			CO3	Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	Understand the principle and operation of diode.
			CO5	Understand the principle and operation of transistor.
			CO6	Understand the principles of digital electronics
	9B465	Manufacturing Processes Lab	CO1	Make a pattern preparation of sand mould and cast the part
			CO2	Perform welding operation under different conditions and test the quality of the weld
			CO3	Make use of plasma technique for accurately cutting metals and also perform brazing operation
			CO4	Identify the various press working operations and various parts of hydraulic press and perform operations
			CO5	Choose the appropriate plastic molding method to manufacture a plastic product
	9B466	Fluid Mechanics and Hydraulic Machinery Lab	CO1	compute the performance of pelton wheel under working conditions
			CO2	compute the performance of francis turbine under working conditions
			CO3	compute performance of reciprocating pump under working conditions
			CO4	compute the Performance of centrifugal pump under working conditions
			CO5	compute the Performance of multistage pump under working conditions
			CO6	compute the coefficient of discharge of venturimeter of orifice meter under working conditions
	9B494	Comprehensive test and Viva-voce-IV	1	Comprehend the concepts in the core and elective courses.
			2	Exhibit technical knowledge to face interviews.
			3	Exhibit lifelong Learning skills for higher education and to persue Professional practice

III-I-A-20	9FC24	Cyber Security (Grade Award)	CO1	The students will be able to understand cyber-attacks, types of cybercrimes.
			CO2	Realize the importance of cyber security and various forms of cyber attacks and countermeasures.
			CO3	Get familiar of cyber forensics.
			CO4	Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.
			CO5	Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
			CO6	Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.
	8B512	Applied Thermodynamics-I	CO1	*Compare the air standard, actual and the fuel-air cycles of Internal Combustion Engines.*
			CO2	*Classify IC Engines, understand the working principles of 2-stroke and 4-stroke cycles, draw valve and port timing diagrams and explain different engine subsystems.*
			CO3	*Understand the combustion process in S.I and C.I Engines, the phenomenon of knocking, factors affecting knocking, and different types of combustion chambers for S.I and C.I Engines,*
			CO4	*Understand the performance parameters, methods of measurement of brake and friction power and Draw the heat balance diagram.*
			CO5	*Understand the working principles of Roots blower, vaned blower, reciprocating compressor-single stage and multi-stage compression with inter cooling.*
			CO6	*Understand the working principles of centrifugal and axial compressors and draw the velocity diagram and calculate the Compressor Power input and efficiency.*
	8B513	Dynamics of Machinery	CO1	*Understand the phenomenon of friction and in developing different applications like, brakes, clutches and dynamometers etc. [CO1]*
			CO2	*Understand the effect of precession motion on the stability of moving vehicles. [CO2]*
			CO3	*Understand and development of speed controlling devices like flywheel. [CO3]*
			CO4	*Understand how to control speed in engines or turbines by governors. [CO4]*
			CO5	*Understand how to balance different systems, machines and engines. [CO5]*
			CO6	*Understand how to do analysis of different vibrating systems. [CO6]*

	8B514	Metal Cutting and Machine Tools	CO1	Understand the basic metal cutting process and parameters, Forces in metal cutting , various chips, tool materials, basic relations in metal cutting [CO1]
			CO2	Understand the thermal aspects of metal cutting, tool wear, tool life, various cutting tool materials and economic analysis of machining [CO2]
			CO3	Understand the principle and working of lathe, shaping, planning, slotting machines and Drilling machines and estimate the machining time [CO3]
			CO4	Understand the principle and working of Milling machine and Broaching machine [CO4]
			CO5	Understand the principle and working of Grinding machine, Lapping and Honing machine [CO5]
			CO6	Understand the principle of Jigs & Fixtures and the principles of advanced machining processes[CO6]
	8B515	Design of Machine Members -I	CO1	· Use different theories of failure for designing machine members subjected to steady loads and fatigue loads.[CO1]
			CO2	· Use different criteria of failure for designing machine members subjected to fatigue loads.[CO2]
			CO3	· Develop ability to analyze, design and select shafts, keys, couplings, cotter and knuckle joints.[CO3]
			CO4	· Able to analyze and design the helical coiled and leaf springs.[CO4]
			CO5	· Identify the applications where Temporary (threaded and bolted) joint and permanent (riveted) joints are used for various applications - with attention to design requirements.[CO5]
			CO6	· able to design and analyze various Welded joints [CO6]
	8B516	Fluid Power System(FPS) (Professional Elective-I)	CO1	Co1: Understand the types of Fluid Power Systems
			CO2	Co2: Understandthegain knowledge of Hydraulic System
			CO3	Co3: Demonstrate varies control valves of Fluid Power Systems
			CO4	Co4:Demonstrate Fluid Power Circuits
			CO5	Co5: Understand the pneumatic Systems
			CO6	Co6: Understandthe typical Hydro-pneumatic Circuits for Industrial Applications
	8B517	Power Plant Engineering(PPE)	CO1	Co1: Acquire the basics of sources of Energy and combustion processes
			CO2	Co2: Evaluate the details of Internal combustion engine Plants

			CO3	Co3: Demonstrate hydro Electric Power Plant
			CO4	Co4: Realize the significance of Non Conventional Energy plants
			CO5	Co5: Understand the working o nuclear power plant
			CO6	Co6: Explain the economics and environmental issues of various power plants
	8B518	Operation Research((OR) (Professional Elective-I)	CO1	CO1: Learns various OR methods and modeling of Job allocation with Linear program
			CO2	CO2: Analyze the transportation and Assignment models
			CO3	CO3: Lear sequencing and Replacement models
			CO4	CO4: Understand theory of gaming and inventory model
			CO5	CO5: Demonstrate various waiting models and their limitations
			CO6	CO6: Understand the basics of dynamic programming
	8B519	Automotive Chassis (Professional Elective-I)	CO1	CO-1: Understand the vehicle lay-out and body types
			CO2	CO-2: Comprehend the working of Clutch and gearing system
			CO3	CO-3: Acquire the knowledge of Automatic transmission
			CO4	CO-4: Comprehend the working of driveline system
			CO5	CO-5: learn principles and types of steering and suspension system
			CO6	CO-6: Demonstrate the construction and working of brake, wheel and tyre assembly
	8ZC22	Basics of Entrepreneurship (Open Elective-I)	CO1	1. The students' will acquire basic knowledge on Skills of Entrepreneurship.
			CO2	2. The students' will understand the techniques of selecting the customers through the process of customer segmentation and Targeting
			CO3	3. Business Models and their validity are understood by the students'.
			CO4	4. The basic cost structure, Revenue Streams and the pricing strategies are understood by the students'.
			CO5	5. The students' will acquire knowledge about the project management and its techniques.
			CO6	6. The students' get exposure on marketing strategies and business regulations for the Start up.
	8ZC25	Basics of Indian Economy (Open Elective-I)	CO1	1. Gain knowledge relating to Economics, various sectors and its growth
			CO2	2. Will gain knowledge relating to various concepts of National income and related aggregates
			CO3	3. Students will learn about Indian Industrial policy and benefits of LPG to India
			CO4	4. Comprehend knowledge relating to Fiscal policy & Taxation system in India

			CO5	5. Learn about inflation & business cycles.
			CO6	6. Know about the BoP and its influence on economy.
	8ZC08	Design literacy and Design Thinking(Open Elective-I)	CO1	1. The students gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
			CO2	2. The students learn the techniques of idea generation
			CO3	3. The students gain knowledge on different phases of design thinking
			CO4	4. The students realize the product design process.
			CO5	5. The students gain familiarity on design thinking for service design.
			CO6	6. The students gain knowledge on various cases related to design thinking.
	8ZC05	Banking Operations, Insurance and Risk Management(Open Elective-I)	CO1	1. Describe the new dimensions and products served by the banking system in INDIA.
			CO2	2. Explain the credit control system and create awareness on NPA's
			CO3	3. Apply the knowledge of Insurance concepts in real life scenarios
			CO4	4. Recognize the importance of regulatory and legal frame work of IRDA
			CO5	5. Identify the risk management process and methods.
			CO6	6. Calculate the diversity of risk and return
	8DC42	Fundamental of Digital Circuits and Microprocessors(Open Elective-I)	CO1	1. To understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps.
			CO2	2. To design combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters etc.
			CO3	3. To design basic memory units (latches and flip-flops) and sequential circuits
			CO4	4. To understand Architecture of 8086 and analyzing in single mode and in multi processor mode.
			CO5	5. To understand instructions of 8086 and to write Assembly Language Programs
			CO6	6. To interface I/0 devices with 8086.
	8EC74	Database systems Concepts(Open Elective-I)	CO1	1. Students will learn basics of databases and understand the architecture of database management systems.
			CO2	2. Students will learn about good database design techniques and database theories behind.
			CO3	3. Understand conceptual database designs, and functional dependencies and normalization.
			CO4	4. Students will understand the Mathematical foundation for relational databases.

			CO5	5. Student will be able to understand concept of Constraints, Views and will be able to create dynamic databases.
			CO6	6. Learn transaction management, concurrency controls.
	8AC46	Control System Engineering(Open Elective-I)	CO1	1. Learn basic concepts of control systems.
			CO2	2. Study about time response analysis.
			CO3	3. Learn basic concepts of stability and root locus method.
			CO4	4. Study about frequency response analysis.
			CO5	5. Learn basic concepts stability analysis in frequency domain.
			CO6	6. Learn fundamentals of state space analysis.
	8B568	Applied Thermodynamics Lab	CO1	1. Performance test on air compressor will make the student to analyze the performance of the compressor(CO1)
			CO2	2. Disassembly and assembly of I.C engine and Valve timing diagram will make the student understand the internal components and their functionality and study of boilers(CO2)
			CO3	3. Heat balance test and performance of four stroke single cylinder diesel engine and will make the student understand have the energy supplied to the engine (CO3)
			CO4	4. Vapour compression Refrigeration system and Air conditioning system will make the student understand the components and working of a refrigeration cycle(CO4)
			CO5	5. computerized IC engine and variable compression ratio engine performance will make the student understand have the energy supplied to the engine in distributed in a cycle.(CO5)
			CO6	6. Performance of four stroke petrol engine and Morse test will make the student understand have the energy supplied to the engine.(CO6)
	8B569	Machine Tools Lab	CO1	:Make simple products using lathe and covering various machining operations as per drawing
			CO2	Produce jobs as per drawing using shaper, PlanerandSlotter machines
			CO3	Understand the principle and working of Drilling machine and conduct various machining operations as per drawing
			CO4	Work on Tool & Cutter Grinding, Milling machine and conduct various machining operations as per drawing
			CO5	:Perform surface grinding operation and conduct alignment test on lathe and drilling machines
	8B570	KOM & DOM Lab	CO1	1) Understand the concept of vibrations, able to calculate the acceleration due to gravity and stiffness

			CO2	Understand concept of radius of gyration
			CO3	Draw the displacement diagram of cam and follower and study the characteristics of governor
			CO4	Understand the tensional vibrations
			CO5	Understand the gyroscopic effects and balancing of rotating masses
			CO6	Understand the pressure distribution in a journal bearing and critical speeds of shafts.
III-II-A-20	8EC75	Artificial Intelligence(Grade Award)	CO1	Understand the concepts of state space representation and calculate time and space complexities of exhaustive search and heuristic search together.
			CO2	Apply AI techniques to solve problems of advanced searching techniques.
			CO3	Distinguish different knowledge representation techniques.
			CO4	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
			CO5	Analyze different learning techniques and decision trees.
			CO6	Use techniques to represent domain knowledge of the expert systems.
	8B62	Applied Thermodynamics-II	CO1	Understand steam power plants and the Rankine cycle on p-v, T-S and h-s diagrams
			CO2	Understand the working principles and basic design parameters of different types boilers.
			CO3	Understand the function of steam nozzle, Wilson line
			CO4	Understand the difference between impulse and reaction turbines, draw velocity diagrams and understand the Principle of operation of reaction turbine, features of Parsons reaction turbine and to draw the velocity diagrams for the same
			CO5	Understand the working principles of different condensers and understand the gas turbine power plants
			CO6	Understand the working principle of jet propulsion and rocket engines
	8B621	CAD/CAM	CO1	To apply geometric transformation techniques in CAD.

			CO2	2.Develop mathematical models to represent curves and surfaces and model engineering components using solid modelling techniques.
			CO3	3.Develop programs for CNC to manufacture industrial components.
			CO4	4. Learn group technologies concepts
			CO5	5. Demonstrate the FMS and computer quality control
			CO6	6. Address CIM and computer Aided manufacturing Resources Plans
	8B622	Design of Machine Members -II	CO1	Design bearings and select appropriate bearings using bearing catalogs.[CO1]
			CO2	design parts of internal combustion engine[CO2]
			CO3	derive design expression for spur and bevel gears [CO3]
			CO4	design helical and worm gears [CO4]
			CO5	gain skills to design various pressure vessels.[CO5]
			CO6	Learn the application of statistical mathematics for machine design subject.[CO6]
	8B623	Heat Transfer	CO1	1. To demonstrate basic knowledge of heat transfer by understanding: differences between conduction, convection and radiation; Students shall be able to formulate basic differential equations for heat transfer; Students must able to understand the importance of thermal conductivity of materials.
			CO2	2. To deal with problems like conduction through walls and composite walls; critical radius of insulation; heat transfer in fins; Transient heat transfer.
			CO3	3. To Calculate of heat transfer coefficient; overall heat transfer coefficient; log-mean temperature differences.
			CO4	4. To differentiate forced and natural convection problems correlations; and demonstrate the use of Biot, Nusselt, Reynolds, Grashof, Rayleigh and Prandtl numbers; basic radiative heat transfer, basic principles of mass transfer.
			CO5	5. To make the students capable of employing the heat transfer principles during phase change processes in heat exchangers; To bring in confidence to apply the principles in industrial appliances and machinery like Power Plants, Heat Exchangers, coolers etc
			CO6	6. To understand basic principles of radiation heat transfer and radiation heat exchange between surfaces.
	8B624	Mechanical Vibrations(MV) (Professional Elective-II)	CO1	1.Understand the causes and effects of vibration in mechanical systems & single degree freedom vibrations.
			CO2	2. learn methods to implement on SDF Vibrations
			CO3	3.Develop schematic models for physical systems and formulate governing equations of motion for two degree freedom system

			CO4	4.Understand the role of multi degree in mechanical systems
			CO5	5. Analyze and design continuous vibration system
			CO6	6.Analyze rotating and reciprocating systems and compute critical speeds.
	8B625	RAC(Refrigeration & Air Conditioning) (Professional Elective-II)	CO1	CO1: Understand the Principle and applications of Air Refrigeration system
			CO2	CO2: Demonstrate working of vapour compression Refrigeration System
			CO3	CO3: Understand the various components of Refrigeration system
			CO4	CO4: Illustrate the vapour Absorption system
			CO5	CO5: Learn Principle and methods of basic Air conditioning system
			CO6	CO6: Gain knowledge Air conditioning Equipment's
	8B626	Unconventional Machining(UM) (Professional Elective-II)	CO1	Student will identify the problem faced in traditional metal cutting and come to an understanding of theneed for the development of Unconventional machining processes
			CO2	. Gain the knowledge of basic mechanism of various Unconventional machine processes namely UM and AJM related equipment, variables, advantages, limitations, applications.Given a set of physical, electrical and other parameters. Student can identify a suitable Unconventionalmachining process.
			CO3	Understand the learn various Thermal material Removing processes
			CO4	4. Understand the Acquire Knowledge in chemical Remaining processes
			CO5	5. Understand the demonstrate working of chemical material remaining process
			CO6	6. Understand the significance of micro machine
	8B627	Automotive Engines (Professional Elective-II)	CO1	CO-1: Understand the constructional details and combustion in automotive engines
			CO2	CO-2: Describe the principle and functions of an automotive fuel engine systems
			CO3	CO-3: Understand the role of senses and Activations inAutomotives
			CO4	CO-4: Analyze engine measurements and performance characteristics for Engines with cooling and vibration
			CO5	CO-5: Discuss the concepts and working of charging
			CO6	CO-6: learns types and working of unconventional Engines

	8ZC23	Advanced Entrepreneurship (Open Elective-II)	CO1	The Students' gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
			CO2	The Students are exposed to the various business models and critically evaluating the effectiveness of the business models and products
			CO3	The students understand the method of business traction, create roles and build their A- team
			CO4	The students understand the various channels of revenue building and exploration of new revenue avenues.
			CO5	The students understand the need of sales planning and people plan and also financial modeling
			CO6	The students are exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support start ups
	8ZC26	Basics of Polity (Open Elective-II)	CO1	1. Gain knowledge relating to the Indian Constitution and the Preamble to the Constitution.
			CO2	2. Gain knowledge relating to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
			CO3	3. Students will learn about the federal structure and judiciary of India.
	8ZC09	Co-Creation and Product Design (Open Elective-II)	CO1	1. The students gain the knowledge on the inputs required for human centric design thinking the students learn the techniques of idea generation.
			CO2	2. The students gain knowledge on exploring the different phases of Ideation process.
			CO3	3. The students grasp the awareness on emerging technologies and understand 3d printing in manufacturing.
			CO4	4. The students gain familiarity on development of prototypes.
			CO5	5. The students understand reverse engineering methods in product development.
			CO6	6. The students have access to information on IPR, and patent application.
	8ZC19	Entrepreneurship Project Management and Structured Finance (Open Elective-II)	CO1	1. Students will understand the nature of Entrepreneurship andits importance
			CO2	2. Will gain knowledge regarding project, its life cycle and organization
			CO3	3. Will gain knowledge relating to project formulation and implementation
			CO4	4. Comprehend the components of structured finance
			CO5	5. Establish a framework of CMBS
			CO6	6. Students will gain knowledge relating to the CRE Servicing

	8DC43	Introduction to VLSI Design (Open Elective-II)	CO1	i. *Design and verify basic logic gates*
			CO2	ii. *Draw layouts for a digital circuit for a specified technology and verify design rules and validate them.*
			CO3	iii. *Design schematics for the digital sub systems.*
	8EC76	Operating Systems Concepts (Open Elective-II)	CO1	1. Describe the basic functionalities and structure of the OperatingSystem
			CO2	2. Explain the concepts and implementations of: Processes, Process Scheduling. Describe, contrast and compare various types of Operating systems like Windows and Linux.
			CO3	3. Comprehend the concepts of Synchronization and Deadlocks in the Operating System
			CO4	4. Discuss the concepts of Memory Management (Physical and Virtualmemory)
			CO5	5. Explain the concepts of File System with regard to directory and disk management algorithms.
			CO6	6. Students understand the concepts of I/O systems, protection and security in a case study
	8AC36	Special Machine s (Open Elective-II)	CO1	1. To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors.
			CO2	2. To impart knowledge on the Construction, principle of operation, control and performance of stepping motors.
			CO3	3. To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors.
			CO4	4. To impart knowledge on the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
			CO5	5. To impart knowledge on the Construction, principle of operation and performance of permanent magnet synchronous motors.
	8B671	CAD/CAM Lab	CO1	Draw computer Aided 2D drawings to solve design and manufacturing problems using CAD CAM principles.
			CO2	2. Acquire skills of developing geometric modelingof 3D components
			CO3	3. Developing assemblies different machine elements and import and export CAD models one software to anther software
			CO4	4. Learn skills of writing CNC part programming.
			CO5	5. Understand how to machine simple components on CNC lathe and CNC mill
			CO6	Understand how to simulate the articulated robot and Fabricate simple components on 3D printing machine

	8B672	Heat Transfer Lab	CO1	1. Compute the thermal conductivity of a given material rod and composite wall understand the physical significance of the thermal conductivity of the given material.(CO1)
			CO2	2. To calculate thermal conductivity of lagged pipe and insulating powder under given conditions.(CO2)
			CO3	3. To Understand the forced ad free convection heat transfer coefficients under given conditions from fundamentals.(CO3)
			CO4	4. Understand the LMTD for parallel flow and counter flow heat exchangers and overall heat transfer coefficient.and pinfin apparatus. (CO4)
			CO5	Understand theemissivity of a given surface and to calculate Stefan-Boltzmann's constant experimentally.(CO5)
			CO6	Understand the phenomena of pool boiling and to draw the boiling curve by showing different phases of boiling.and study the heat pipe (CO6)
	8B673	Group Project	CO1	· Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects.
			CO2	· Enables to apply modern tools and technologies for project works
			CO3	· Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society.
			CO4	· Enhances communicative skills and team work
			CO5	· The students learn the ability to work as an individual with multidisciplinary approach
			CO6	
	8B695	Comprehensive Viva-voce-II	CO1	1. Perform well in Technical interviews
			CO2	2. Apply knowledge in building their career in particular fields.
			CO3	3. Enhance their communication skills and interactive-ness.
IV-I-A-20	**8B722**	**ROBOTICS**	CO1	Student demonstrate the basic knowledge in robotic systems their classification and application areas
			CO2	Student demonstrate the Robotic Kinematic Models and its importance
			CO3	Student demonstrate the Robotic dynamically models
			CO4	Student demonstrate the ability to plan trajectories in the presence/absence of obstacles
			CO5	Student learn the control system concepts and their application in robotics through linear and nonlinear control schemes

			CO6	Student understand commonly used sensory and vision systems used in robotics
	8B723	**ADDITIVE MANUFACTURING PROCESSES**	CO1	Understand the Additive manufacturing processes and their relationship with subtractive manufacturing
			CO2	Demonstrate comprehensive knowledge of the broad range of liquid based rapid proto type processes, devices, capabilities and materials that are available
			CO3	Demonstrate comprehensive knowledge of the broad range of liquid based rapid proto type processes, devices, capabilities and materials that are available
			CO4	apply the principles of casting in Additive manufacturing systems
			CO5	Articulate the various tradeoffs of Additive manufacturing softwares / data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements
			CO6	Learn various applications of additive manufacturing, such as in architecture, art, health care direct part production and mass customization
	8B724	**MECHATRONICS(Professional Elective-I)**	CO1	able to understands the significance of integration of mechanical, electronics, control and computer engineering and also focuses the role of sensors
			CO2	able to learn the complete theory of various sensors
			CO3	be able to get skill to select appropriate actuators for different applications
			CO4	become proficient in building linear models of mechatronics
			CO5	become proficient in the programming of microcontrollers
			CO6	able to demonstrate PLCprogramming
	8B725	**DESIGN AND ANALYSIS OF EXPERIMENTS(Professional Elective-I)**	CO1	Demonstrate history, role, principle and steps of experimentation
			CO2	Apply concepts of Probability and statistics in design of experiments
			CO3	learn various DOE techniques
			CO4	Develops experiment design based on Taguchi method
			CO5	Analyses the experimental data of various experiments
			CO6	Solve multi response problems using DOE approaches
	8B726	**OPERATIONS RESEARCH (Professional Elective-I)**	CO1	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
			CO2	Recognize and solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations

			CO3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
			CO4	Design and analyze different optimal strategies to win the game, justify the games using minimax or maximin principle to compute the value of the game using various rules.
			CO5	Analyze the performance measures of Queuing system and calculate the EOQ for minimizing the total inventory cost
			CO6	Apply simulation techniques for solving various types of problems and general idea development about Markov chains
	8B727	**THERMAL TURBO MACHINERY(Professional Elective-I)**	CO1	Explain the compressible flow phenomena in turbomachine components
			CO2	Understand the steady and unsteady flow phenomena in tucts
			CO3	Perform simple aerodynamic designs using eulers equations etc..
			CO4	Explain the working steam turbines
			CO5	Understand gas turbine combustor principles and challenges
			CO6	Discuss jet propulsion technologies
	8B728	**NANOTECHNOLOGY(Professional Elective-I)**	CO1	Know the different approaches of synthesis of nanomaterials, gain in depth of knowledge which will be helpful to them in their career to go forward successfully in the field of nano science and nanotechnology
			CO2	Learn about different physical and chemical methods for synthesis of nanomaterials
			CO3	Characterization of nanomaterials by using SEM, TEM, AFM, STM
			CO4	Characterization of nanomaterials by using XRD, FTIR, UV visible spectroscopy, Rama spectroscopy.
			CO5	Applications of carbon based nanomaterials
			CO6	Applications of nanomaterials in electronics, medicine, mechanical engineering.
	8B729	**Artificial Intelligences (AI) for Mechanical Engineering (Professional Elective-II)**	CO1	to understand the history of AI and uninformed search Method
			CO2	to demonstrate informed search graphs, rule and pruning & Evaluation methods
			CO3	to demonstrate KR and KR&R through propositional logics and FOL
			CO4	To learn how to use BN, BNN , MDN in decision making
			CO5	Learn various techniques for planning and sequential decision problem
			CO6	brief out the basics of ML, SL,RL and CNN

	8B730	**POWER PLANT ENGINEERING (Professional Elective-IV)**	CO1	**Understand** and **describe** the various available sources of energy, and the basic Steam power plant layout including the coal and ash handling equipments.
			CO2	**Discuss** and **classify** the types of coals, coal feeding stokers and other accessories.
			CO3	**Define** and **elaborate** the understanding of the previously learn concepts to basics of Diesel Power Plant, Gas turbine plant and their auxiliaries.
			CO4	**Gain** the **knowledge** regarding Equipment, Plant layout, working principle of Hydroelectric Power plants, and able to **draw** hydrological cycle, Hydrographs etc.
			CO5	**Familiarize** withtheConcepts of various nuclear reactors**.**
			CO6	**Apply** the established models of Economics in Power plant engineering.
	8B731	**Production Planning and Control (Professional Elective-II)**	CO1	Understand production systems and their characteristics to evaluate MRP and JIT systems against traditional inventory control systems
			CO2	Analyze aggregate planning strategies
			CO3	Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems
			CO4	Understand production systems and their characteristics to evaluate MRP and JIT systems against traditional inventory control systems
			CO5	Analyze aggregate planning strategies
			CO6	Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems
	8B732	**ADVANCED MATERIALS AND PROCESSING(Professional Elective-II)**	CO1	Classify manufacturing processes
			CO2	Understand principles of casting and solidification
			CO3	Understand manufacturing of porous powder metallurgical products
			CO4	Utilize forming and processing technologies to shape metals and ceramics
			CO5	Understand the role of ceramics and composites in industrial applications
			CO6	Analyse the processing and defects of ceramics and polymers
	8B733	**NON-DESTRUCTIVE TESTING OF MATERIALS (Professional Elective-III)**	CO1	Classify Non-Destructive Testing (NDT) methods
			CO2	Understand principles of various NDT methods
			CO3	Understand TECHNIQUES OF ULTROSONIC and thermography
			CO4	Gain knowledge in radiography
			CO5	Demonstrate the Acoustic methods

			CO6	Learn how to interpret the various techniques used in various case studies
	8B734	**QUALITY AND RELIABILTY ENGINEERING (Professional Elective-III)**	CO1	Attain the basic techniques of quality assessment , fundamental knowledge of statistics and probability and Use control charts
			CO2	learn principles of DOQ design for quality
			CO3	Use reliability concepts to analyze for improving the process quality
			CO4	Describe various methods to asses reliability determination
			CO5	Acquire basic knowledge of reliability management
			CO6	Understand the concepts of risk management
	8B735	**RENEWABLE ENERGY AND ENERGY MANAGEMENT (Professional Elective-III)**	CO1	Understand of solar energy, working principle of various solar energy and hybrid wind energy systems.
			CO2	Apply the concept of bio-energy, develop different types of biofuels, biochemical.
			CO3	Design and develop different types of Biogas Plants and its applications.
			CO4	Estimate wind energy and wind energy conversion system.
			CO5	Demonstrate different renewable energy sources like Geothermal, Tide and Wave Energy.
			CO6	Illustrate the knowledge on production and application of Hydrogen Energy and fuel cell.
	8B736	**PRODUCT DESIGN (Professional Elective-III)**	CO1	Apply structural approach to concept generation, selection and testing
			CO2	Understand various aspects of design such as industrial design, design for manufacture
			CO3	Economic analysis and product architecture
			CO4	Apply structural approach to concept generation, selection and testing
			CO5	Understand various aspects of design such as industrial design, design for manufacture
			CO6	Economic analysis and product architecture
	8B776	**PRODUCTION DRAWING PRACTICES LAB**	CO1	Identify the national and international standards pertaining to machine drawing
			CO2	Apply limits and tolerances to assemblies and choose appropriate fits
			CO3	Recognize machining and surface finish symbols.
			CO4	llustrate various machine components through drawings.
			CO5	Examine assembly drawing by seeing the components given
	8B777	**INSTRUMENTATION LAB**	CO1	Experimentation on the pressure gauge and analyzing the performance of the pressure gauge
			CO2	Examining the working of the transducer for temperature measurement.

			CO3	Evaluate the LVDT transducer for displacement measurement and Assess displacement
			CO4	Examining the temperature by the strain gauge method.
			CO5	Testing the capacitive transducer for angular measurement.
			CO6	Evaluating the performance of loadcell and comparing experimental& theoretical values
	8B778	**CAE LAB**	CO1	***Apply*** finite element method to *solve* static and dynamic analysis problems
			CO2	of 1D,2D trusses, beams with different boundary conditions
			CO3	***Develop*** finite element method to ***solve*** plane stress, axi-symmetric solids three dimensional problems with different boundary in solid mechanics.
			CO4	***Generate*** finite element method to ***solve*** steady state heat transfer analysis of a composite wall and a Fin with different boundary conditions.
	8B779	**PROJECT-I**	CO1	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects
			CO2	Enables to apply modern tools and technologies for project works
			CO3	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society
			CO4	Enhances communicative skills and team work
			CO5	The students learn the ability to work as an individual with multidisciplinary approach
IV-II A-20	**8B837**	**Mechanics Manufacturing Methods of Composite Materials (Professional Elective-IV)**	CO1	Understand the concepts and applications of composite materials
			CO2	Analyze micro mechanical behaviour of a lamina
			CO3	Learn matrix tranformation for stress and strain in composites
			CO4	Analyze Elastic behavior of composites
			CO5	Develop governing equations for bending strength evaluation in laminated plates
			CO6	Gains knowledge of manufacture of composites
	8B838	**DESIGN AND ANALYSIS OF ENGINEERING MATERIALS (Professional Elective-IV)**	CO1	Understand the principles of materials selection and design
			CO2	Design components using appropriate attribute limits and material indices
			CO3	Establish the criteria for material qualification and acceptance.
			CO4	Apply design principles for manufacturing of different engineering components
	8B839	**AUTOMOBILE**	CO1	dentify front wheel drive, rear wheel drive and four wheel drive

		ENGINEERING (Professional Elective-IV)	CO2	Outline the fuel systems like petrol injection system and diesel injection system
			CO3	Classify the thermo, water, forced circulation system and Understand the ignition system
			CO4	Understand the various emission standards and Outline various Electrical starting systems
			CO5	Understand about clutches and Distinguish single plate clutch, multi plate clutch, wheels , tyres and differential gear box
			CO6	Know the steering geometry – Ackerman steering mechanism and Davis steering mechanism toe-in, and to know the objects of suspension system
	8B840	**Advanced Manufacturing Processes (Professional Elective-IV)**	CO1	Understand abrasive and electrical discharge machining processes
			CO2	list the advances in casting
			CO3	learn principles and applications of electron beam, ion beam and laser hybrid welding processes
			CO4	apply advanced forming processes to manufacture mechanical products
			CO5	Understand the advantageous of micro fabrication
			CO6	realize the importance of nano fabrication
	8B841	**FLEXIBLE MANUFACTURING SYSTEMS & MACHINE VISION (Professional Elective-V)**	CO1	Understand Evaluation and applications of FMS
			CO2	Understand Machining centers and FMS layouts
			CO3	Design and analyze FMS material handling systems
			CO4	Understand tool management and scheduling tools in FMS
			CO5	Identify the role of computers in FMS and machine vision and evaluate the performance of FMS
			CO6	Analyze case studies a typical FMS
	8B842	**DESIGN OPTIMIZATION (Professional Elective-V)**	CO1	Basics of optimization, considerations relevant to mechanical / structural systems
			CO2	Concepts and methods for single-variable unconstrained and constrained optimisation
			CO3	Concepts and methods for multi-variable unconstrained and constrained optimization
			CO4	Techniques for nonlinear optimization
			CO5	Advanced optimization techniques
			CO6	Optimisation of complex mechanical elements
	8B843	**JET PROPULSION and ROCKET ENGINEERING (Professional Elective-V)**	CO1	Derive the thermal efficiency of gas turbine cycle and working of gas turbine plant.
			CO2	Determine the performance evaluation, thrust augmentation Of turbo jet engines.
			CO3	DISCUSS the plant layout of Ramjet , principle of operation
			CO4	understand liquid propellant Rocket engines, compassion of propulsion systems.

			CO5	Describe the flight mechanics and applications of trust profiles, analyze the rocket heat transfer and ablative to cooling
			CO6	APPLY the concepts in criogenics, advanced propulsion systems, elementary treatment of Electrical Nuclear and Plasma Arc propulsion
	8B844	**COMPUTATIONAL FLUID DYANAMICS (Professional Elective-V)**	CO1	gain knowledge on using numerical techniques
			CO2	Understand various applied numerical methods to solve fluid flow problems
			CO3	understand and apply finite volume method to solve heat transfer problems
			CO4	know application of finite volume method and fundamentals of fluid flow modeling
			CO5	right fluid flow governing equations, momentum and energy equations apply to fluid flow problems
			CO6	gain knowledge about different algorithms
	8B845	**CARBON BASED NANOSTRUCTURES AND THEIR APPLICATIONS (Professional Elective-V)**	CO1	To investigate and formulate method to use carbon nanotubes as active components in organic electronic devices
			CO2	To explore methods of synthesis to obtain SWNT with desired characteristics
			CO3	To understand the dependence of the performance of the nanotubes based transistors on the nanotube bundle geometry
			CO4	Apply the knowledge acquired for synthesis of CNTs by various methods.
			CO5	Carry out research in the areas of lithium, hydrogen adsorption and energy storage
			CO6	Pursue research on nano-chip, applications leading to communications and aerospace
	8B881	**PROJECT -II**	CO1	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects
			CO2	Enables to apply modern tools and technologies for project works
			CO3	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society
			CO4	Enhances communicative skills and team work
			CO5	The students learn the ability to work as an individual with multidisciplinary approach

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Course Outcomes of ECE Department

Department of Electrical & Communication Engineering
COs for A22-1st Year and 2nd Year, A20-3rd year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC07	Engineering Physics	CO1	Explain semiconductor behavior, types and their applications
			CO2	Differentiate the wave and particle, and its application for a particle in one dimension box
			CO3	Explain about emission, its types, laser principle and applications of optical fibers (sensors and medical endoscopy)
			CO4	Reveals about the magnetism-its origin and types and its applications
			CO5	Explain the basic concepts of dielectric materials, polarization and its types, their applications (piezo, ferro and Pyro electricity).
			CO6	Summarize nano& bulk concepts, surface to volume ratio and its applications.
	9FC01	Problem Solving using C	CO1	Explain basic fundamentals of Computer Systems , computing environments , Computer Languages – Machine Languages
			CO2	Describe C language Programs, Structure of a C Program
			CO3	Describe write programs using control structures such as Pre-test and post-test loops, while, do while, for, break
			CO4	Write programs implementing application on arrays
			CO5	Write programs using Pointers and string handling functions
			CO6	Write programs using Enumerated, Structure, Union types and files.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	Check the consistency or inconsistency of a linear system and can solve the problems.
			CO2	Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
			CO3	Find the nature, index and signature of the quadratic form.
			CO4	Verify the applicability of mean value theorems and also can express the given standard function in series form using Taylor's and Maclaurin series.
			CO5	Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
			CO6	Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	Essential English Language Skills (EELS)	CO1	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
			CO2	State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	Identify the differences of each tense and use the tenses accurately.
			CO4	Identify specialized reading strategies for specific types of texts
			CO5	Produce written work that is substantive, organized, and grammatically accurate.
			CO6	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
	9BC01	Engineering	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			CO3	Draw projections of different types of regular solids in various positions wrt principal planes of projection

		Graphics	CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software
	9HC61	Oral Communication Lab-I	CO1	Describe people, objects and situations using simple sentences.
			CO2	Use appropriate tenses and expressions in different contexts of conversations.
			CO3	Identify major areas of concern in their oral communication and address them.
			CO4	Create a SMART plan to enhance their communication skills in English
	9HC66	Engineering Physics Lab	CO1	Demonstrate the wave length of monochromatic source of light by using Newton's Rings
			CO2	Analyze refractive index of a material prism and Dispersive power of a glass Prism by using spectrometer
			CO3	Determine the wave length of spectral light and laser Source of light by using Diffraction Grating
			CO4	Design and Analyze RC Circuits
			CO5	Analyze RLC Series circuit and parallel circuit
			CO6	Investigate magnetic Circuits
	9FC61	Problem Solving using C Lab	CO1	To formulate the algorithms for simple problems
			CO2	To translate given algorithms to a working and correct program
			CO3	To be able to correct syntax errors as reported by the compilers
			CO4	To be able to identify and correct logical errors encountered at run time
			CO5	To be able to write iterative as well as recursive programs
			CO6	To be able to represent data in arrays, strings and structures and manipulate them through a program
			CO7	To be able to declare pointers of different types and use them in defining self referential structures.
			CO8	To be able to create, read and write to and from simple text files.
I-II& A22	**9HC04**	ENGINEERING CHEMISTRY	CO1	To understand microscopic chemistry in terms of atomic and molecular orbitals
			CO2	To learn the preparation and applications of commercial polymers and lubricant materials
			CO3	To learn the industrial problems caused by water and municipal water treatment
			CO4	To acquire knowledge about different types of batteries and their working mechanism
			CO5	To develop the concepts and types of corrosion and the factors influence corrosion
			CO6	To understand the control methods and protective coatings for metals and other surfaces
	9EC01	DATA STRUCTURES	CO1	*Design the programs using structures, unions and enum.*
			CO2	Demonstrate the concepts of Abstract data type and also applications of stacks and queues.
			CO3	Implement basic operations on single, double and circular linked list.

			CO4	Solve problems involving Binary Search trees and AVL trees.
			CO5	Articulate the concepts of graphs, heaps and hashing.
			CO6	Develop algorithms for various searching and sorting techniques and analyze their performance.
	9HC12	ADVANCED CALCULUS	CO1	Find the limits and test for the continuity and differentiability of a function.
			CO2	Solve the problems on multiple integrals.
			CO3	Solve linear and nonlinear first order partial differential equations.
			CO4	Find Series expansion a function defined over the intervals.
			CO5	Find directional derivative, gradient, divergence and curl of a function.
			CO6	Solve problems of line, surface and volume integrals.
	9AC42	Electrical Circuits & Networks Analysis	CO1	Understand the principle of different methods of electrical circuit reduction.
			CO2	Understand the principle of single phase A.C circuits
			CO3	Understand the principle of magnetic circuits
			CO4	Understand the principles of network theorems along with its applications
			CO5	Understand the principle two port networks along with its applications
			CO6	Understand the principle of transients with both DC and AC excitation
	9HC62	Oral Communication Lab-II	CO1	Understand the nuances of striking a great conversation in formal and informal situations.
			CO2	Gain experience of facing an audience and speaking in public.
			CO3	Design a winning presentation and present it with ease.
	9HC64	Engineering Chemistry Lab	CO1	Preparation of Inorganic compounds
			CO2	Determination surface tension of a liquid
			CO3	Determination viscosity of lubricant
			CO4	Determination acid value of an oil
			CO5	Estimation hardness of water
			CO6	Analysis the amount of chloride content
			CO7	Determination of cell constant and conductance of solutions
			CO8	Determination of redox potential and emf of solutions
			CO9	Determination of the rate constant of acid
	9EC61	Data Structures Using C Lab	CO1	Write programs on structures and unions.
			CO2	Implement Stacks, Queues and circular queues using arrays.
			CO3	Write programs to implement basic operations on various types of linked list.
			CO4	Implement insertion and traversal operations on binary search tree
			CO5	Develop programs on various searching, sorting algorithms.
	9BC61	Workshop/Manufacturing Processes Lab	CO1	Use various types of conventional manufacturing Processes
			CO2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
			CO3	Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			CO4	Produce small devices / products /appliances by assembling different components

II-I & A22	**9CC01**	Electronic Devices and Circuits	CO1	Understand the operation of semiconductor diode
			CO2	Understand the Fundamentals of BJT operation,
			CO3	Understand the Fundamentals of SCR, JFET operation
			CO4	Understand the Analysis and design of Amplifier and Oscillators
			CO5	Understand the Basic regulator circuits and voltage multipliers.
			CO6	Explore the various number systems
	9CC02	Digital Logic Design	CO1	An ability to understand number systems and apply the rules of Boolean algebra
			CO2	An ability to simplify of Boolean expressions using K-map
			CO3	An ability to design MSI combinational circuits
			CO4	An ability to design basic memory units
			CO5	An ability to design digital design using PLD's such as ROM's, PLA' s, PAL s.
			CO6	An ability to design digital controllers using Algorithmic State Machine Charts.
	9CC03	Signals and Systems	CO1	Understand the concepts of signals, comparison of signals
			CO2	Apply the orthogonality properties to understand Fouries series and Fourier Transforms.
			CO3	Understand the concepts of systems, their characterization in the Time as well as Transformed domains
			CO4	Understand and apply the mathematical tools
			CO5	the sampling frequency for any low pass and band pass signals applying the sampling theorem.
			CO6	Distinguish between continuous and Discrete time signals and systems. .
	9C304	Probability Theory and Stochastic Process	CO1	Understand the concepts of Probability, Understand concepts of multiple random variables.
			CO2	Understand concepts of Discrete Random Variables
			CO3	Understand concepts of multiple random variables
			CO4	Understand concepts ofthe.Mean. Auto-correlation, Auto-covariance and Auto-correlation
			CO5	Understand the concepts of Power Spectral Density Function of Random Process,
			CO6	Understand the concepts of Random Signal Response of Linear Systems
	9HC14	Transform Techniques and Numerical Methods	CO1	Use the Laplace transforms techniques for solving ODE's
			CO2	Use the Z- Tranforms technique for solving Difference equations
			CO3	Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations
			CO4	Find the root of a given equation
			CO5	Estimate the value for the given data using interpolation
			CO6	Find the numerical solutions for a given ODE's
	9HC17	Universal Human Values	**CO1**	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values.
			CO2	Understanding Harmony is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.
	9HC03	Soft Skills	CO1	Assess themselves using SWOT analysis
			CO2	Appraise the importance of certain soft skills like time management and goal setting
			CO3	Improve their verbal ability to handle the competitive exams.
			CO4	Enhance their team skills and design thinking capabilities for effective problem solving and decision making
			CO5	Know their emotional quotient which guides their thinking, behavior and helps them manage stress efficiently.
			CO6	Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews
	9CC71		CO1	Identify, Specify and test R, L, C Components (Colour Codes),

		Electronic Devices and Circuits Lab		Potentiometers, Switches, Coils, Relays
			CO2	Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs, MOSFETs.
			CO3	Describe operation of Multimeters, Function Generator and Regulated Power Supplies
			CO4	Explain and use CRO for experiments
			CO5	Explain and demonstrate working of PN Junction diode characteristics
			CO6	Explain and demonstrate working Half and Full wave Rectifier with and without filters
	9CC72	Basic Simulation Lab	CO1	Perform basic operations on Matrices, 1D signals and sequences
			CO2	Understand convolution correlation of signals and sequences in time and frequency domains
			CO3	compute the response of LTI system for unit impulse and step
			CO4	verify the sampling theorem and Gibbs Phenomenon
	9CC73	Digital Logic Design Lab	CO1	Verify the operations of digital circuits using IC s
	9C364	Comprehensive Test and Viva –Voce – III	CO1	Assess the relevant courses they have undergone till the completion of that academic year. Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. Assessment is done in the relevant courses they have undergone till the completion of that academic year.
	9C365	Technical Seminar – III	CO1	Identify current General, political and technology related topics
			CO2	Arrange and present seminar in a effective manner.
			CO3	Collect, survey and organize content in presentable manner.
			CO4	Demonstrate oratory skills with the aid of Power Point Presentations and also submit the report of the Technical seminar
			CO5	Exhibit interview facing skills and team leading qualities
II-II &A22	**9CC05**	Analog Circuits	CO1	Distinguish between small and large signal amplifiers.
			CO2	Analyze and Design tuned and RF amplifiers
			CO3	Understand linear and non-linear wave shapingmethods
			CO4	Understand analyze and design various types of multivibrators, their analysis, designing and applications
			CO5	Explain different sweep generators and their applications
			C06	Analyze various types of Logic gates and Sampling gates
	9CC06	Analog & Digital Communications	CO1	Analyze and design of various continuous wave and angle modulation and demodulation techniques
			CO2	Understand the effect of noise present in continuous wave and angle modulation techniques.
			CO3	Attain the knowledge about AM , FM Transmitters and Receivers
			CO4	Analyze and design the various Pulse Modulation Techniques
			CO5	Understand the concepts of Digital Modulation Techniques and Baseband transmission, source coding and channel coding
	9CC07	IC Applications	CO1	Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics.
			CO2	Design the basic circuits using Operational Amplifiers.
			CO3	Explore, design and analyze Filters, Timers, Voltage Controlled Oscillator and Phase Locked Loop.
			CO4	Demonstrate the design and analyze Oscillators, D/A Converters and A/D Converters.

			CO5	Classify and characterize the various Logic Families.
			CO6	Explore the design of various logic gates using CMOS logic
	9C408	Electromagnetic Waves and Transmission Lines	CO1	Apply the Maxwell's equations in propagation of EM waves
			CO2	Demonstrate the behavior of EM waves in different media
			CO3	Understand the property of EM energy at different boundary conditions
			CO4	Understand the impossibility of TEM waves in rectangular wave guides
			CO5	Design different transmission lines
			C06	Understand the concepts of high frequency dissipation less and open& short-circuited lines
	9ZC01	Economics, Accountancy and Management Science	CO1	To understand the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular.
			CO2	To understand cost concept, Revenues and Market structure
			CO3	To understand and identify various basic concepts of Accounting, Double entry system and Book keeping.
			CO4	To understand the concepts of Capital expenditure, Revenue expenditure and Final accounts.
			CO5	To make student understand the basics of Management, its principles and various functions performed in organization.
			C06	To make student learn about various personality traits, perception, attitudes of individuals working in organization.
	9FC27	Python Programming concepts	CO1	Gains exposure towards Python versions and their specifications and build programs using primitive data types
			CO2	Write applications that include functions, modules, packages along with respective exceptional handling mechanism.
			CO3	Writes applications using features of Python and applications using Files
			CO4	Hands on exposure on NumPy/Tkinter/Plotpy modules
			CO5	Analyze worst-case running times of algorithms using asymptotic analysis. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide and-conquer algorithms
			C06	Describe the dynamic-programming paradigm and the greedy paradigm and explain when an algorithmic design situation calls for it. Synthesize dynamic programming and greedy algorithms and analyze them
	9HC05	Environmental Science and Ecology	CO1	Understand about ecosystem and energy flow among the organisms
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity
			CO4	Understand the causes and effect of pollution and implement measures in control of pollution.
			CO5	Understand the sustainable development and implement green technology for sustainable development
			C06	Learn and implement policy to protect the environment
	9CC74	Analog Circuits Lab	CO1	To understand the design and working of various linear and non-linear wave shaping circuits.
			CO2	To demonstrate the working principle of various multivibrators and functionalities of various logic gates
			CO3	To perform and verify the working of oscillators, feedback amplifiers and voltage regulators.
			CO4	To perform laboratory experiment to verify the conversion efficiency of various power amplifiers.
	9CC75	Analog & Digital Communication Lab	CO1	Demonstrate the modulation and demodulation of few analog and digital modulation techniques.
			CO2	Verifying the spectral components of AM and FM&the concepts of frequencyand time division multiplexing techniques
			CO3	Demonstrate the modulation and demodulation of few pulse analog, and pulse digital modulation techniques &Verifying sampling

				theorem
			CO4	Demonstrate the modulation and demodulation of digital modulation technique&Generation of line coding techniques.
	9CC76	IC Applications Lab	CO1	To explore the operating modesof IC 741 OP-AMP
			CO2	To design applications using 741Op-Amp
			CO3	To understand and implement applications using 555 Timers
			CO4	To design D to A converters and IC voltage regulators
	9C466	Comprehensive Test and Viva –Voce – IV	CO1	Assess the relevant courses they have undergone till the completion of that academic year. Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. Assessment is done in the relevant courses they have undergone till the completion of that academic year.
	9C467	Technical Seminar - IV	CO1	Identifycurrentgeneral, political and technologyrelated topics.
			CO2	Arrange and presentseminar in a effective manner
			CO3	Collect, survey and organize content in presentablemanner
			C04	Demonstrateoratoryskillswith the aid of Power Point resentations and also submit the report of the Technical seminar
			CO5	Exhibit interview facingskills and team leadingqualities
		Summer Break - Internship–I	CO1	Select the real-time problem in the industry.
			CO2	Analyze the requirements with respect to the problem statement
			CO3	Design the optimal solution for the problem.
			CO4	Implement the solution using the apropriate modern tools
			CO5	Present and submit the report
III-I &A20	**8CC09**	**Digital Signal Processing**	CO1	Distinguish between CT and DT signals and systems and understand the growing need of DSP and study the concepts of discrete time signals and systems.
			CO2	Represent periodic DT signals as a Fourier series; non-periodic DT signals as a Fourier Transform and use a powerful mathematical tool called DFT
			CO3	Compute the Fourier Transform of DT signals using the FFT algorithms.
			CO4	Realize a digital filter in several forms and structures for a given transfer function H(z).
			CO5	Distinguish IIR and FIR filters; Design each type by several methods once the desired specifications are given.
			CO6	Understand the need and implement the multirate sampling techniques.
	8C510	**VLSI Technology and Design**	CO1	Understand the existing device technologies and IC fabrication process
			CO2	Explore and analyze the electrical properties of the devices of CMMOS device.
			CO3	Design basic logic gates, combinational and sequential circuits using CMOS logic.
			CO4	Analyze the effects of parasitic on IC power and performance.
			CO5	Design memory cells and basic data path units.

			CO6	Explore the need for testing and design verification of VLSI circuits.
	8DC05	**Microprocessors and Microcontrollers**	CO1	Understands the Architecture of 8086.
			C02	Understand instructions of 8086 and to write Assembly Language Programs
			CO3	Interface I/0 devices with 8086
			CO4	Understand Architecture of 8051 microcontroller
			CO5	Understand instructions of 8051 and to Interface I/0 devices with 8051
			C06	Understand the need of advanced processors
	8C511	**Cellular and Mobile Communication**	CO1	Understand the working principle and limitations/advancements of conventional mobile telephone systems, cellular mobile systems and Advanced generations of cellular wireless systems
			CO2	Analyze Frequency reuse concept and avoidance of Co-channel interference.
			CO3	Explore the concepts of adjacent channel interference, its effects and avoidance mechanism.
			CO4	Analyze signal reflections, path loss, propagation delay/loss, near and long distance propagation loss under different conditions, Merits of Lee model
			CO5	Analyze frequency allocation of cellular systems
			CO6	Demonstrate the concept of handoff mechanism and dropped calls.
	8C512	**Antennas and Wave Propagations**	CO1	Learning the radiation mechanism of antenna and antenna parameters
			CO2	Design and analyze wire antennas and antenna arrays
			CO3	Evaluate knowledge on Horn, Parabolic and Lens antennas.
			CO4	Analysis of Horizontal Polarized antennas, Helical antennas , Patch antennas etc.
			CO5	Understand the propagation mechanisms of ground wave, sky wave and space wave concepts.
			CO6	Analyzetheconcepts of sky wave propagation .
	8C517	**Digital Design Through Verilog**	CO1	Understand levels of design description, concurrency, simulation and synthesis.
			CO2	Apply language constructs, data types, operators available in verilog HDL.
			CO3	Design combinational logic and sequential logic in gate level modeling.
			CO4	Explain Gate and Switch level modeling.
			CO5	Use system tasks, functions and UDPs.
			CO6	Demonstrate SM charts and realize digital design using SM charts.
	8CC18	**Advanced Computer Architecture**	CO1	To analyze the internal architecture of the computer
			CO2	Understand the different data types and instruction set, of the computer
			CO3	Understand the memory structure of the computer and learn CISC & RISC
			CO4	Understand processor structure and function and know the input output interfacings
	8C519	**Digital Image &**	CO1	Gets the knowledge of the basic step in image processing system, Discrete cosine transforms and discrete wave let transforms.

		Video Processing	CO2	Differentiate image enhancement methods, different types of spatial domain and frequency domain methods.
			CO3	Get the knowledge of point, line and edge detection, thresholding, Region based segmentation.
			CO4	Differentiate different types of redundancies, lossy and lossy less image compression, different types of coding techniques.
			CO5	Know the difference between analog video and digital video, different types of image formation and sampling of video signals
			CO6	Study the different types of motion estimation techniques and application of motion estimation in video coding.
	8C520	**Information Theory and Coding Techniques**	CO1	Explain different kind of networking models
			CO2	Define different addressing schemes for networks.
			CO3	Detailed idea of data link layer protocol and medium access protocol
			CO4	Gain the knowledge of router configuration and network layer protocols and their working.
			CO5	Differentiate the IPv4 and IPv6 addressing schemes for different networks.
			CO6	Gain the knowledge of application layer protocols like DHCP, DNS.
	8C521	**Digital Image Processing**	CO1	Describe basic concepts of image processing system.
			CO2	Summarize and compare various digital image transform techniques.
			CO3	Demonstrate and survey digital image enhancement in practical applications.
			CO4	Analyze the case study related to various techniques of image restoration.
			CO5	Apply compression techniques on digital image.
	8DC71	**Microprocessors and Microcontrollers Lab**	CO1	Explore to write the Assembly Language Programs using Arithmetic instructions of 8086
			CO2	Explore to write the Assembly Language Programs using String instructions of 8086
			CO3	Explore to write the Assembly Language Programs for I/O interface with 8086
			CO4	Explore to write the Assembly Language Programs using Arithmetic instructions of 8051
			CO5	Explore to write the Assembly Language Programs using Timers and interrupts of 8051
	8C577	**VLSI Technology and Design Lab**	CO1	An ability to use VLSI CAD Tools (NGSPICE, Xilinx, and Cadence).
			CO2	An ability to understand and implement digital logic gates and circuits using SPICE and Verilog HDL.
			CO3	An ability to perform physical design- layouts using Cadence EDA Tool.
			CO4	An ability to implement combinatorial and sequential designs on FPGA boards (SPARTAN 3) using Xilinx tools.
			CO5	An ability to use VLSI CAD Tools (NGSPICE, Xilinx, and Cadence).

	8FC72	**Python Programming Lab**	CO1	Apply knowledge for computer assembling and software installation and ability to solve the trouble shooting problems
			CO2	Apply the tools for preparation of PPT, Documentation and budget sheet etc
			CO3	Install and run the Python interpreter, Create and execute Python programs
			CO4	Apply the best features of mathematics, engineering and natural sciences to program real life problems
			CO5	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python, Express different Decision Making statements and Functions, Interpret Object oriented programming in Python
			CO6	Understand and summarize different File handling operations, explain how to design GUI Applications in Python
	8C591	**Summer Industry Internship-I**	CO1	Select the real-time problem in the industry.
			CO2	Analyze the requirements with respect to the problem statement
			CO3	Design the optimal solution for the problem.
			CO4	Implement the solution using the apropriate modern tools
			CO5	Present and submit the report
	8FC24	**Cyber Security**	CO1	The students will be able to understand cyber-attacks, types of cybercrimes.
			CO2	Realize the importance of cyber security and various forms of cyber attacks and countermeasures
			CO3	Get familiar of cyber forensics
			CO4	Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet
			CO5	Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks
			CO6	Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008
III-II & A20	**8EC47**	**Computer Networks**	CO1	Classify network topologies and apply the same to different networks with the knowledge acquired from the network reference models and fundamentals of computer networks
			CO2	Illustrate the design issues of data link layer and detect the transmission errors and flow control problems
			CO3	Categorize the Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN
			CO4	Distinguish the knowledge of the several routing algorithms and Internetworking concepts
			CO5	Obtain and use the skills of subnetting and routing mechanisms

			CO6	Distinguish the knowledge of the functions of transport and application layer
	8C613	**Microwave and Optical Communications**	CO1	Distinguish microwave frequencies and analyze Rectangular and circular wave guides.
			CO2	Formulate various passive components with the help of scattering matrix
			CO3	Explore different linear beam tubes
			CO4	Analyze Cross field tubes and slow wave structures.
			CO5	Analyze the propagation of light in optical fibers and to characterize various optical sources.
			CO6	Understand the principle of various Losses, Dispersion and to characterize various Optical Detectors.
	8EC45	**Artificial Intelligence**	CO1	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			CO3	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and spacecomplexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks
			CO6	Analyze Supervised Learning Vs. Learning DecisionTrees
	8AC07	**Linear Control system**	CO1	Learn basic concepts of control systems.
			CO2	Study about time response analysis.
			CO3	Learn basic concepts of stability and root locus method.
			CO4	Study about frequency response analysis.
			CO5	Learn basic concepts stability analysis in frequency domain.
			CO6	Learn fundamentals of state space analysis.
	8C623	**Analog and Mixed Signal Design (PE-II)**	CO1	Understand the concepts of Switched capacitors Circuits
			CO2	know the concepts of PLLS
			CO3	study concepts of Data Converter Fundamentals
			CO4	Explore the concepts of Nyquist Rate A/D Converters and develop its applications
			CO5	Understand concepts of the Oversampling Converters and Continuous-Time Filters
			CO6	Understand concepts of concepts of Continuous-Time Filters, CMOS Trans conductors
	8C624	**Embedded C**	CO1	Demonstrate the use of development software for a particular application and choosing appropriate OS.

		Programming (PE-II)	CO2	Understanding and building basic embedded system using 8051.Understanding its design
			CO3	Design of embedded systems and implementation of switch reading.
			CO4	Demonstrate the concepts of OOP's theory inheritance and functions in embedded C to support modular programming.
			CO5	Learning the need for realtime implementation in Embedded C..
			CO6	Case study of 'Intruder Alarm" toachihve real time hands on.
	8C625	**Transform Techniques (PE-II)**	CO1	Use the Laplace transforms techniques for solving ODE's
			CO2	Use the Z- Tranforms technique for solving Difference equations
			CO3	Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations
			CO4	Find the root of a given equation
			CO5	Estimate the value for the given data using interpolation
			CO6	Find the numerical solutions for a given ODE's
	8C626	**Software Defined Radio(PE-II)**	CO1	An ability to make system-level decisions for software-defined radio technology and products
			CO2	An ability to implement smart antenna algorithms
			CO3	Knowledge of digital hardware architectures and understanding of development methods
			CO4	An understanding of middleware in SDR
			CO5	Understanding of analog RF components
			CO6	Understand the basic principles of Cognitive Radio
	8C627	**Artificial Neural Networks (PE-II)**	CO1	Understand the concepts of Artificial Intelligence
			CO2	Illustrate the concepts of Artificial Neural system
			CO3	Illustrate computer vision
			CO4	Explain Probabilistic models and neural networks
			CO5	Illustrate concept Neural language
			CO6	Explain applications of Neural networks
	8C628	**Satellite Communications (PE-II)**	CO1	Demonstrate the orbital mechanics.
			CO2	Design the satellite subsystem.
			CO3	Estimate the C/N and able to measure the relevant values.
			CO4	Evaluate the satellite link.
			CO5	Recall Multiple access concepts and discuss earth station technology
			CO6	Apply the knowledge of GPS in real time applications.
	8CC51	**Electronics and Instrumentation(OE-I)**	CO1	Define the characteristics and analyze the errors of measurement systems
			CO2	Select the appropriate passive or active transducers for measurement of physical phenomenon
			CO3	Relate and apply the appropriate measuring techniques to real time applications

			CO4	Interpret the usage of DVM, Spectrum Analyzer and DSO instruments for appropriate measurements
			CO5	Develop an understanding of construction and working of different AC and DC bridges and their applications
	8CC56	**Fundamentals of digital circuits & Microprocessors**	CO1	To understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps.
			CO2	To design combinational circuits such as full adders, multiplexers, decoders, encoders. Code convertersetc
			CO3	To design basic memory units (latches and flip-flops) and sequential circuits
			CO4	To understand Architecture of 8086 and analyzing in single mode and in multi processor mode.
			CO5	To understand instructions of 8086 and to write Assembly Language Programs.
			CO6	To understand instructions of 8086 and to write Assembly Language Programs
	8C678	**Antenna Simulation Lab**	CO1	Understand the design of dipole antenna for various frequencies.
			CO2	Understand the design of monopole antenna for variation in radius of the wire
			CO3	Design of Microstrip patch antenna in different shapes
			CO4	Understand the design of standard horn antenna
			CO5	Analyze the characteristics of yagi-uda antenna
			CO6	Verify the radiation pattern of different types of antenna
	8EC65	**Computer Networks Lab**	CO1	Implement and analyze framing methods of data link layer
			CO2	Implement and analyze framing methods of data link layer.
			CO3	Illustrate and implement error detection & correction techniques
			CO4	Implement different Routing Algorithm
			CO5	Understand basic Network Commands
			CO6	Use of Wireshark and NS-2 tools
	8CC79	**Digital Signal Processing Lab**	CO1	To Understand the frequency response of a given systems
			CO2	Design of FIR & Butterworth and chebyshev approximations and converting them to IIR filters
			CO3	Transforming an analog filter to its digital equivalent
			CO4	Sampling rate conversion Interpolation and decimation
			CO5	An ability to use TMS320c6713 for different algorithms
			CO1	To Understand the frequency response of a given systems
	8C692	**Group Project**	CO1	Use the concepts, in conceptualizing, designing and executing the modules of the projects
			CO2	Exhibit the interest in learning the modern tools and technologies.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects
			CO4	Improve communicative skills and team working skills

	8C668	**Comprehensive Viva Voce**	CO1	Assess the relevant courses they have undergone till the completion of that academic year. Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. Assessment is done in the relevant courses they have undergone till the completion of that academic year.
IV-I & A20	**8EC05**	**Computer networks**	CO1	Classify network topologies and apply the same to different networks with the knowledge acquired from the network reference models and fundamentals of computer networks
			CO2	Illustrate the design issues of data link layer and detect the transmission errors and flow control problems
			CO3	Categorize the Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN.
			CO4	Distinguish the knowledge of the several routing algorithms and Internetworking concepts
			CO5	Obtain and use the skills of subnetting and routing mechanisms
			CO1	Distinguish the knowledge of the functions of transport and application layer
	8C714	**Microwave and Optical Communications**	CO1	Distinguish microwave frequencies and analyze Rectangular and circular wave guides.
			CO2	Formulate various passive components with the help of scattering matrix
			CO3	Explore different linear beam tubes
			CO4	Analyze Cross field tubes and slow wave structures.
			CO5	Analyze the propagation of light in optical fibers and to characterize various optical sources.
			CO6	Understand the principle of various Losses, Dispersion and to characterize various Optical Detectors.
	8ZC19	**Entrepreneur - ship, project management and structured finance**	CO1	Students will understand the nature of Entrepreneurship and its importance
			CO2	Will gain knowledge regarding project, its life cycle and organization
			CO3	Will gain knowledge relating to project formulation and implementation
			CO4	Comprehend the components of structured finance
			CO5	Establish a framework of CMBS
			CO6	Students will gain knowledge relating to the CRE Servicing
	8FC23	**Database systems**	CO1	Students will learn basics of databases and understand the architecture of database management systems.
			CO2	Students will learn about good database design techniques and database theories behind.
			CO3	Understand conceptual database designs, and functional dependencies and normalization.
			CO4	Students will understand the Mathematical foundation for relational databases.
			CO5	Student will be able to understand concept of Constraints, Views and will be able to create dynamic databases.
			CO6	Learn transaction management, concurrency controls.
	8ZC30	**Advanced**	CO1	The Students' gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to

		Entrepreneur - ship		growth of the Startup.
			CO2	The Students are exposed to the various business models and critically evaluating the effectiveness of the business models and products
			CO3	The students understand the method of business traction, create roles and build their A- team
			CO4	The students understand the various channels of revenue building and exploration of new revenue avenues.
			CO5	The students understand the need of sales planning and people plan and also financial modeling
			CO6	The students are exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support startups
	8ZC26	**Ecology and disaster management**	CO1	Comprehend knowledge relating to the conservation of the environment.
			CO2	Learn about bio-diversity and climatic changes occurring in the environment.
			CO3	Know about the international treaties, conventions and organizations active in the field of environmental protection.
			CO4	To provide students an exposure to disasters, their significance and types.
			CO5	To enhance awareness of institutional processes in the country
			CO6	To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
	8CC38	**Communications Theory**	CO1	Demonstrate the principle of converting analog signal to digital by using PCM, DM,ADM systems.
			CO2	Explore baseband transmission and optimal reception of digital signals using different filters and M-ary Error Probabilities.
			CO3	Design and compare ASK,PSK,FSK,DPSK,QPSK modulators and demodulators .
			CO4	Demonstrate the concepts of information theory , source coding techniques ,channel capacity and can find channel capacity and coding efficiency.
			CO5	Demonstrate encoding and decoding techniques of different channel coding techniques like ,block codes, cyclic codes, convolutional codes.
			CO6	Explore the knowledge on different types of spread sprectrum modulation techniques,DSSS,FHSS,CDMA and PN sequence.and OFDM
	8AC44	**Fundamentals of measurements& instrumentation**	CO1	Understand the principle of operation of different types of instruments viz., PMMC, moving iron type of instruments, the required characteristics of an instrument in general. The student demonstrates the ability to compensate for the errors in the instruments and to extend the range of the instruments.
			CO2	Demonstrates the knowledge of Potential and Current transformers; the errors in them and the effect of having an open/short in the secondary circuits; Understand the principle of operation of Dynamometer and Moving-iron type of Power factor meters.
			CO3	Comprehends the principle of operation of dynamometer type of Wattmeter and Induction type of Energy meter; use the wattmeter to measure the Active and Reactive power and demonstrates the ability to extend the range of them.
			CO4	Identify and use different techniques of measurement of Resistance, Inductance and Capacitance values.
			CO5	Understand the principle of operation of Different type of digital voltmeters, wave analyzers, spectrum analyzers and Cathode ray Oscilloscope.

			CO6	Demonstrates the ability in characterizing the different types of transducers and uses them to measure Strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque and Temperature.
	8BC53	**PRINCIPLES OF OPERATIONS RESEARCH**	CO1	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
			CO2	Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations
			CO3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
			CO4	Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost
			CO5	Apply simulation techniques for solving various types of problems and general idea development about Markov chains
	8BC52	**PRINCIPALS OF MANUFACTURING PROCESSES**	CO1	Ability to understand the need for manufacturing processes and various material properties
			CO2	Ability to understand the principle of casting, Patterns used, Pattern allowance and Gating systems used in casting, and various casting methods
			CO3	Ability to understand the basic principle of welding and distinguish between various welding types and their applications
			CO4	Ability to understand the principles of metal working, various types of metal working techniques, Knowledge of hot working and cold working, Ability to understand the bulk deformation processes of rolling,
			CO5	Ability to understand the bulk deformation processes of extrusion and forging, their applications and forces involved in these operations
			CO6	Ability to understand and distinguish the various press working operations with respect to their applications, advantages and disadvantages, understand the various types of plastics and their processing techniques
	8C719	CMOS Digital IC Design	CO1	Demonstrate advanced knowledge in the MOS Design
			CO2	Static and dynamic characteristics of CMOS to design and to develop the Digital Integrated Circuits for different Applications. • The concepts of Semiconductor Memories, Flash Memory, RAM array organization.
			CO3	Analyze complex engineering problems critically in the domain of CMOSDigital Integrated Circuits for conducting research.
			CO4	Solve engineering problems for feasible and optimal solutions in the corearea of CMOS Digital ICs.
			CO5	Apply the CMOS Digital IC concepts for usage of modern CAD tools andtheir Limitations.
			CO6	The student will be able to understand the MOS Design. • In this course, students can study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits. • Another main object of this course is to motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications.
	8C720	**Embedded Python Programming**	CO1	Gains exposure towards Python versions and their specifications.
			CO2	Build programs using primitive data types.
			CO3	Construct and use data structures for various applications
			CO4	Write applications that include functions, modules, packages along with respectiveexceptional handling mechanism.

			CO5	Write applications using Files – access and mnipulate
			CO6	Write applications using OO features of Python
	8C721	**DSP Processors and Architectures**	CO1	Understand the concepts of DFT,FFT digital filters
			CO2	Illustrate the concepts of Computational Accuracy in DSP Implementations
			CO3	Explain the Architectures for Programmable DSP Devices:
			CO4	Explain Programmable Digital Signal Processors
			CO5	Distinguish Analog Devices Family of DSP Devices .
			CO6	Illustrate Interfacing Memory and I/O Peripherals to Programmable DSP Devices
	8CC22	**Wireless Communications and Networks**	CO1	Explain wireless communication systems and Modern wireless communication systems with examples.
			CO2	Characterize Multiple Access Techniques for Wireless Communication and calculate capacity of cellular systems.
			CO3	Explain Traffic routing in wireless networks, Wireless data services, Common channel signaling.
			CO4	Describe about Mobile IP And Wireless Access Protocol
			CO5	Develop different Wireless LAN protocols
			CO6	Define About Fundamentals Of 3G Services, Its Protocols And Applications.
	8C723	**Digital Design and Verification with System Verilog**	CO1	Understand the UVM concepts
			CO2	Explore the class instances and functions
			CO3	Comprehend the UVM Configurations
			CO4	Analyzing UVM sequences and Modeling in UVM
			CO5	Developing Reusable Test benches using UVM
			CO6	Analyzing the Case studies of Layered test bench for SPI, APB and AXI.
	8C724	**Embedded System Design**	CO1	Understand the basic architecture of Embedded System and their classification.
			CO2	Explore the architecture of ARM processor.
			CO3	Understand the addressing modes and data processing instructions of ARM processor.
			CO4	Understand the ARM thumb instruction set and its capabilities.
			CO5	Use both assembly and C language based ARM programming.
			CO6	Explore the memory management techniques in ARM.
	8C725	Artificial Neural Networks	CO1	Understand the concepts of Artificial Intelligence
			CO2	Illustrate the concepts of Artificial Neural system
			CO3	Lustrate computer vision
			CO4	Explain Probabilistic models and neural networks
			CO5	Illustrate concept Neural language
			CO6	Explain applications of Neural networks
	8C726	**Software defined radio**	CO1	An ability to make system-level decisions for software-defined radio technology and products
			CO2	An ability to implement smart antenna algorithms
			CO3	Knowledge of digital hardware architectures and understanding of development methods
			CO4	An understanding of middleware in SDR
			CO5	Understanding of analog RF components
			CO6	Understand the basic principles of Cognitive Radio
	8EC75	**COMPUTER NETWORKS LAB**	CO1	Implement and analyse framing methods of data link layer.
			CO2	Implement and analyse framing methods of data link layer.
			CO3	Illustrate and implement error detection & correction techniques.
			CO4	implement different Routing Algorithm.
			CO5	Understand basic Network Commands.

			CO6	Use of Wireshark and NS-2 tools
	8C781	**ANTENNA SIMULATION LAB**	CO1	Understand the design of dipole antenna for various frequencies.
			CO2	Understand the design of monopole antenna for variation in radius of the wire
			CO3	Design of Microstrip patch antenna in different shapes
			CO4	Understand the design of standard horn antenna
			CO5	Analyze the characteristics of yagi-uda antenna
			CO6	Verify the radiation pattern of different types of antenna
	8C782	**Micro Wave and Optical Communications Lab**	CO1	Analyze the characteristics of RKO and GUNN diode
			CO2	Understand the principles governing attenuation and working of DC
			CO3	Measure the K, S, Z and f at microwave frequencies.
			CO4	Analyze the design principles of circulator and magic Tee
			CO5	Understand the basic characteristics of LED and LASER
			CO6	Measure the DR,NA and Losses for Digital and Analog Links
	8C764	**Project -I**	CO1	Students identify vast application areas for mobile / wireless communication / computing.
			CO2	They also understand the working principle of GSM technology.
			CO3	Students understand various media access control methods that are meant for wireless communication, each methods' pros and cons
			CO4	Understand the issues in the Network layer in the wireless communication and identifying suitable solutions for the same
			CO5	Understand the issues in the Transport layer in the wireless communication and identifying suitable solutions for the same
			CO6	Understand MANETs with an example like Bluetooth technology.
			CO7	Understand Security Issues related to mobile computing and various solutions to mitigate the security problems.
			CO8	Prepare for the Project Phase_II
	8C662	Summer Industry Internship – II	CO1	Select the real-time problem in the industry.
			CO2	Analyze the requirements with respect to the problem statement
			CO3	Design the optimal solution for the problem.
			CO4	Implement the solution using the appropriate modern tools.
			CO5	Present and submit the report
			CO6	Select the real-time problem in the industry.
	8EC20	**ARTIFICIAL INTELLIGENCE**	CO1	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			CO3	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
			CO6	Analyze Supervised Learning Vs. Learning DecisionTrees
IV-II & A20	**8ZC15**	**FINANCIAL INSTITUTIONS MARKETS AND SERVICES**	CO1	This unit enables the students to understand the financial structure and the financial sector reforms after 1991.
			CO2	The unit gives the exposure on the role of RBI and the Regulating and credit policies adopted by the RBI.
			CO3	The students get awareness on the role of Non-Banking financial institutions and the role of financial institutions in India.
			CO4	The unit educates the students to know the role of regulatory bodies like SEBI and also to know the capital and money market

				instruments
			CO5	The unit equips the students to understand about the asset fund based financial services
			CO6	The students will get exposure about the investment banking and merchant banking.
	8EC67	**OPERATING SYSTEMS CONCEPTS**	CO1	Describe the basic functionalities and structure of the Operating System
			CO2	Explain the concepts and implementations of: Processes, Process Scheduling. Describe, contrast and compare various types of Operating systems like Windows and Linux.
			CO3	Comprehend the concepts of Synchronization and Deadlocks in the Operating System
			CO4	Discuss the concepts of Memory Management(Physical and Virtual memory)
			CO5	Explain the concepts of File System with regard to directory and disk management algorithms.
			CO6	Students understand the concepts of I/O systems, protection and security in a case study given
	8ZC24	**INNOVATION & DESIGN THINKING**	CO1	The students gain the knowledge on the inputs required for innovation and also gain familiarity on Entrepreneurship.
			CO2	The students will get exposure on creative methods of ideation and the importance of protecting the ideas.
			CO3	The students gain knowledge on design thinking and types of thinking.
			CO4	The students gain familiarity on emerging technologies like Internet of things (IoT).
			CO5	The students understand the process of building the startup.
			CO6	The students gain knowledge on various startup funding and also to branding building for the startup.
	8CC39	**Introduction to VLSI and Embedded Systems**	CO1	Understand levels of design description, concurrency, simulation and synthesis.
			CO2	Apply language constructs, data types, operators available in verilog HDL.
			CO3	Design combinational logic and sequential logic in gate level modeling.
			CO4	Demonstrate the use of development software for a particular application and choosing appropriate OS.
			CO5	Understanding and building basic embedded system using 8051.Understanding its design
			CO6	Design of embedded systems and implementation of switch reading.
	8AC45	**Fundamentals of renewableenergy sources**	CO1	Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
			CO2	Demonstrates the knowledge of different techniques of solar collection and storage.
			CO3	The student becomes familiar with the different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
			CO4	Aware of the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
			CO5	Aware of the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.

			CO6	Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.
	8BC55	**PRINCIPALS OF AUTOMATION AND ROBOTICS**	CO1	Understand a production system, principles of automobile
			CO2	understand the methods of work part transfer mechanical buffer storage control functions
			CO3	understand the implementation of automated flow lines
			CO4	know the analysis and design of material handling systems, automated guided vehicle system
			CO5	understand adaptive control systems and Applications.
			CO6	understanding the business process Engineering. Concept of concurrent Engineering, techniques of rapid prototype.
	8C827	**Digital Design and Verification with Universal Verification Methodology**	CO1	Understand the UVM concepts
			CO2	Explore the class instances and functions
			CO3	Comprehend the UVM Configurations
			CO4	Analyzing UVM sequences and Modeling in UVM
			CO5	Developing Reusable Test benches using UVM
			CO6	Analyzing the Case studies of Layered test bench for SPI, APB and AXI.
	8C828	**EMBEDDED REAL TIME OPERATING SYSTEMS**	CO1	Understand the Basic concepts of UNIX operating Systems and files, commands usage.
			CO2	Understand the Real time Systems concepts and classification of Real time systems.
			CO3	Design concepts of scheduling algorithms and its applications.
			CO4	Understand the Interprocess communications and its applications in Real time systems.
			CO5	Understand the Exceptional handling andInterrupts and Timers
			CO6	Understand the case study of RTOS.
	8CC29	Artificial Intelligence	CO1	Demonstrate fundamental understanding of the history of artificial intelligence(AI) and its
			CO2	foundations
			CO3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
			CO4	Demonstrate awareness and a fundamental understanding of Expert Systems and its applications
			CO5	Demonstrate fundamental understanding of models of machine learning.
			CO6	Apply basic principles of Supervised learning
	8C830	Satellite Communications	CO1	Demonstrate the orbital mechanics.
			CO2	Design the satellite subsystem.
			CO3	Estimate the C/N and able to measure the relevant values.
			CO4	Evaluate the satellite link.
			CO5	Recall Multiple access concepts and discuss earth station technology
			CO6	Apply the knowledge of GPS in real time applications.
	8C831	Radar Communications	CO1	Recognise the basics of Radar systems and its applications and its frequencies (Understand)
			CO2	Differentiate the Radar parameters, how it affects the Range measurement. (Analyse)
			CO3	Recall the Doppler Effect, and draw backs of CW radars. (Remember)
			CO4	Discuss the basic concepts of Moving target indicators and evaluate the draw backs of MTI Radars.(Understand)
			CO5	Differentiate concept of scanning and tracking. (Analyse)
			CO6	Understand various types of displays and different phased arrays.

	8C832	Mixed Signal Design	CO1	Understand the concepts of Switched capacitors Circuits
			CO2	know the concepts of PLLS
			CO3	study concepts of Data Converter Fundamentals
			CO4	Explore the concepts of Nyquist Rate A/D Converters and develop its applications
			CO5	Understand concepts of the Oversampling Converters and Continuous-Time Filters
			CO6	Understand concepts of concepts of Continuous-Time Filters, CMOS Trans conductors
	8C833	System On-chip Architecture	CO1	Know basics of System Architecture
			CO2	Understand the various types of Processors like VLIW Processors, Superscalar Processors.
			CO3	Distinguish Cache memory and Multilevel Caches, SOC external memory.
			CO4	Know the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies.
			CO5	Know the concepts and issues related to Interconnect Configuration.
			CO6	Explore the SOC Design approach and develop its applications.
	8C834	Machine Learning	CO1	introduce basic concepts and techniques of Machine Learning
			CO2	have a thorough understanding of the Supervised and Unsupervised learning techniques
			CO3	study the various probability based learning techniques
			CO4	analyze the dimensionality reduction models
			CO5	Tunderstand graphical models of machine learning algorithms
			CO6	Apply analytical learning algorithms
	8C835	5G Communications	CO1	OFDM's transceiverarchitecture
			CO2	The problem of PAPR and how to reduce thePAPR.
			CO3	To understand how the OFDM receiver performssynchronization
			CO4	Channel modeling andpropagation
			CO5	MIMO Capacity, space-timecoding
			CO6	Massive MIMO and mmWave MIMO technologies for 5G
	8C865	**PROJECT –II**	CO1	Identify vast application areas for mobile / wireless communication / computing.
			CO2	They also understand the working principle of GSM technology.
			CO3	Students understand various media access control methods that are meant for wireless communication, each methods' pros and cons
			CO4	Understand the issues in the Network layer in the wireless communication and identifying suitable solutions for the same
			CO5	Understand the issues in the Transport layer in the wireless communication and identifying suitable solutions for the same
			CO6	Understand MANETs with an example like Bluetooth technology.
				Identify vast application areas for mobile / wireless communication / computing.

SREENIDHI EDUCATIONAL GROUP | SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY SNIST AUTONOMOUS

Course Outcomes of CSE Department

Department of Computer Science & Engineering

COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year Courses/subjects

Year and Regulation	Course Code	Course Name	Co's	
I-I & A22	9HC04	ENGINEERING CHEMISTRY	C01	Explain the fundamental aspects of atomic, molecular orbitals and metal complexes.
			C02	List general properties of polymers, lubricants and engineering materials.
			C03	Outline basic properties of water and its usage in domestic and industrial purposes.
			CO4	Summarize electrochemical procedures related to corrosion.
			CO5	Interpret potential applications of chemistry and practical utility of various organic reactions and drug molecules.
	9FC01	PROBLEM SOLVING USING C	C01	Explain the basic computer concepts and Illustrate programming principles of C language.
			C02	Develop C programs to solve simple mathematical and engineering problems using decision control, loop statements, arrays and strings.
			C03	Apply modular programming using functions to develop reusable code.
			CO4	Analyze memory oriented concepts using pointers to implement inter function, function communication, pointer arithmetic.
			CO5	Describe file handling concepts using C.
	9HC11	MATRIX ALGEBRA AND CALCULUS	C01	Solve the linear system of equations.
			C02	Determine the Eigen values and Eigenvectors of the matrix and apply Cayley Hamilton Theorem to obtain the higher powers of a matrix.
			C03	Identify the nature of the quadratic form and reduction of the quadratic form to its canonical form.
			CO4	Apply appropriate mean value theorems to obtain the mean values and find the power series expansion of a function.
			CO5	Solve the first order and higher order ordinary differential equations with constant coefficients.
	9HC01	ENGLISH	C01	Understand and demonstrate the use of diverse

		ESSENTIAL ENGLISH LANGUAGE SKILLS		forms of vocabulary in their communication.
			C02	Recognize different grammatical structures and use the appropriate ones in their communication.
			C03	Develop effective reading skills by applying strategies to comprehend different types of texts.
	9HC61	**ORAL COMMUNICATIONS LAB-1**	**C01**	Describe people, objects and situations using simple sentences with proper pronunciation.
			C02	Use apt expressions and narrate stories in simple sentences.
	9HC64	**ENGINEERING CHEMISTRY LAB**	**C01**	Estimate the hardness and chloride in water.
			C02	Determine strength of acid by potentiomeric and conductometric methods.
			C03	Demonstrate preparation of polymer, aspirin and inorganic compound.
	9FC61	**PROBLEM SOLVING USING C LAB**	**C01**	Develop programs to solve simple mathematical and engineering applications using C language.
			C02	Illustrate various operations on files to develop programs using C language.
	9BC61	**WORKSHOP/MANUFACTURING PROCESSES LAB**	**C01**	Demonstrate and make use of the workshop tools for Fitting, Carpentry, Welding, Casting, Smithy, Moulding, Glass cutting and Electric connections.
			C02	Design and Fabricate jobs with wood, MS flat, GI Sheet material.
I-II & A22	**9HC07**	**ENGINEERING PHYSICS**	**C01**	Interpret the concept of quantum mechanics, Schroedinger wave equation and its application for one dimensional potential box.
			C02	Explain the principle, construction and working of lasers and fiber optics along with their applications.
			C03	Summarize the phenomenon of magnetism and superconductivity.
			C04	Outline the concepts of dielectrics, polarization and apply the same for Piezo, Ferro and Pyro-electricity.
			C05	Identify the nature of semiconductors and demonstrate the semiconductor devices.
			C06	Characterize the nano and bulk materials for various applications.
	9EC01	**DATA STRUCTURES**	**C01**	Explain different data structure and select the appropriate data structure to develop applications.
			C02	Illustrate various Linear, Non Linear data

				structure in developing applications.
			C03	Demonstrate various hashing and collision resolution techniques for enhancing the performance of algorithms.
			C04	Asses the performance of various searching and sorting techniques.
	9HC12	**ADVANCED CALCULUS**	**C01**	Compute the Jacobian transformation, the extreme values of a multivariable function and solve the first order linear and nonlinear PDEs.
			C02	Evaluate double integrals using change of order of integration and change of variables, triple integrals.
			C03	Determine Fourier series expansion of a function over the interval.
			C04	Find directional derivative and solve the problems on line, surface and volume integrals.
	9AC48	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	**C01**	Apply the principles of electrical circuits and DC generation with basic equations.
			C02	Illustrate the working principles of DC and three phase AC motors.
			C03	Analyse the construction and working principles of diode, various transistors with applications.
			C04	Use numbering systems to solve Boolean expressions.
	9BC01	**ENGINEERING GRAPHICS**	**C01**	Outline the basics of the Engineering Graphics, Curves and Auto Cad.
			C02	Interpret the concepts of orthographic and isometric projections of lines, planes and solids.
			C03	Draw the sections of solids and development of surfaces.
			C04	Develop orthographic views from isometric views and vice versa.
	9HC62	**ORAL COMMUNICATION LAB – II**	**C01**	Use appropriate language in varied real-world scenarios Practice effectively the speaking skills with the apt body language.
			C02	Develop a winning presentation and present themselves with ease in various competitive situations.
	9HC66	**ENGINEERING PHYSICS LAB**	**C01**	Demonstrate the concepts of photo electric effect, total internal reflection, diffraction and dispersion of light.
			C02	Demonstrate the concepts of rigidity modulus, periodicity and oscillations.

			C03	Compare and contrast the Biot-Savart law with Oersted law and explain the concept of Magnetostriction.
			C04	Analyze the electrical resonance, time constant, band gap and forward resistance of a semiconductor diode.
	9EC61	**DATA STRUCTURES Lab Using C**	**C01**	Develop programs to illustrate various linear and nonlinear data structures using C language.
			CO2	Develop programs to assess the performance of various searching and sorting techniques using C language.
II-I & A22	**9AC41**	**BASIC ELECTRICAL ENGINEERING**	**CO1**	Understand and apply the principles of electrical engineering to solve basic equations.
			CO2	Apply the knowledge gained to explain the principles of single and three phase AC circuits.
			CO3	Apply the knowledge gained to explain the principle and operation of DC machine along with its applications.
			CO4	Use the principles of single phase transformer along with its applications and solve the equations.
			CO5	Realize the principle and operation of three phase induction motor with its applications.
			CO6	Understand the operation of different measuring instruments along with its applications.
	9CC54	**ANALOG ELECTRONIC CIRCUITS**	**CO1**	Understand the Fundamentals of diode & BJT operation, Characteristics, diode application as rectifiers.
			CO2	Comprehend different biasing circuits of BJT amplifiers.
			CO3	Analyze small signal model of BJT with h-parameters.
			CO4	Describe the working and construction of FETs and characteristics & biasing of FET and Analyze the small signal model of FET.
			CO5	Understand the fundamentals of JFET and its operation and characteristics.
			CO6	Determine the feedback and analysis of oscillators.
	9EC02	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA**	**CO1**	Comprehend the fundamentals of Java, Classes, Objects and design the java programs using constructors and String handling methods.
			CO2	Design the programs using inheritance, polymorphism and interface.
			CO3	Develop programs using Packages, I/O Streams and collections.
			CO4	Apply the concepts of Exception handling and

				Multithreading for various scenarios.
			CO5	Create programs using AWT, Swings and develop applications using event handling.
			CO6	Develop applications using Applets and client server programs using networking concepts.
	9F303	**DISCRETE MATHEMATICS**	**CO1**	Define the syntax and semantics of propositional logic.
			CO2	Translate statements from a natural language into its symbolic structures in logic.
			CO3	Prove elementary properties of modular arithmetic and explain their applications in Computer Science, for example, in cryptography and hashing algorithms.
			CO4	Apply the notion of relations on some finite structures, like strings and databases.
			CO5	Analyze algorithms using the concept of functions and function complexity.
			CO6	Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling.
	9DC12	**COMPUTER ORGANIZATION**	**CO1**	Perceive basic operational concept of computer and data processing.
			CO2	Use data types with instruction set of specified architecture.
			CO3	Justify different control unit design and algorithms for various operations.
			CO4	Elaborate basic architecture of 8086 processor.
			CO5	Write assembly language programming and debug to 8086.
			CO6	Interface devices to 8086 processor.
	9HC03	**SOFT SKILLS**	**CO1**	Assess themselves using SWOT analysis.
			CO2	Appraise the importance of certain soft skills like time management and goal setting.
			CO3	Improve their verbal ability to handle the competitive exams.
			CO4	Enhance their team skills and design thinking capabilities for effective problem solving and decision making.
			CO5	Know their emotional quotient which guides their thinking, behavior and helps them manage stress efficiently.
			CO6	Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews.

	9HC17	**UNIVERSAL HUMAN VALUES**	**CO1**	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values.
			CO2	Understanding Harmony is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.
	9EC62	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**	**CO1**	Evaluate programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
			CO2	Implement small application such as banking system.
			CO3	Compare programs on operator, function overloading and dynamic method dispatch.
			CO4	Evaluate programs to implement interface and packages.
			CO5	Explain and write programs to implement threads.
			CO6	Illustrate programs to implement applets and event handling.
			CO7	Illustrate an application to implement client and server scenario.
	9AC91	**BASIC ELECTRICAL ENGINEERING AND ANALOG ELECTRONICS CIRCUITS LAB**	**CO1**	Understand the working of single-phase transformer under different conditions, the performance of three phase induction motor, different speed control methods of DC motor with and without loading with its performance.
			CO2	Understand the applications of Thevenin's Theorem in circuit analysis.
			CO3	Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
			CO4	Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
			CO5	Explain and demonstrate working of PN Junction and Zener diode.
			CO6	Explain and demonstrate working Half and Full wave Rectifier without filters.
			CO7	Demonstrate working of CE characteristics and its application as an amplifier.
			CO1	Familiarize the architecture of 8086 processor, assembling language programming and interfacing

	9DC62	**COMPUTER ORGANIZATION LAB**		with various modules.
			CO2	Experiment with Arithmetic operations of binary number system.
			CO3	Simulate any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.
	9E378	**COMPREHENSIVE TEST AND VIVA-VOCE**	**CO1**	Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	9E386	**TECHNICAL SEMINAR - III**	**CO1**	Identify topics related to Computer Scienec and Engineering domain.
			CO2	Collect, survey and organize content in PPT form.
			CO3	Present seminar in an effective manner.
II-II & A22	**9HC16**	**PROBABILITY AND STATISTICS**	**CO1**	Solve the random variable problems and probability distributions.
			CO2	Estimate the parameters and solve the problems using central limit theorem.
			CO3	Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	Solve the problems on measures of central tendency, Correlation.
			CO6	Classify and differentiate various regression models.
	9CC55	**DIGITAL ELECTRONICS**	**CO1**	Apply the rules of Boolean algebra to simplify Boolean expressions.
			CO2	Simplify of Boolean expressions using K-map.
			CO3	Design MSI combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters.
			CO4	Design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers
			CO5	Create digital design using PLD’s such as ROM’s, PLA’s, PAL s.
			CO6	Design the digital controllers using Algorithmic State Machine Charts.
			CO1	Analyze worst-case running times of algorithms using asymptotic analysis.
			CO2	Synthesize divide and-conquer algorithms. Derive

				and solve recurrences describing the performance of divide-and-conquer algorithms.
	9FC05	**DESIGN AND ANALYSIS OF ALGORITHMS**	**CO3**	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
			CO4	Comprehend the concept of dynamic programming algorithms, their applications and analyze them.
			CO5	Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.
			CO6	Comprehend the concept of P and NP Problems and its usage in the applications.
	9EC03	***DATABASE MANAGEMENT SYSTEMS***	**CO1**	Analyze importance and significance of models, Database languages, architecture and design of Data Base Systems.
			CO2	Understand Relational Model – Integrity Constraints, Logic.
			CO3	Analyse data base Design and Views of databases, queries using Relational Algebra and Relational Calculus.
			CO4	Solve Queries with Comparison Operators, Aggregative Operators and nested queries. Queries with joins.
			CO5	Apply Schema refinement through all forms of Normalization to eliminate database redundancy.
			CO6	Apply ACID properties in transaction. Ensuring serializability in concurrent transactions. Concurrent control methods and recovery of transaction.
			CO7	Analyze External Storage Organization mechanisms and apply Indexing in databases for query optimization to enhance system performance.
	9F404	**SOFTWARE ENGINEERING AND OOAD**	**CO1**	Identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish lifecycles for developing software product.
			CO2	Describe the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO3	Define and design models for the requirements stated in the software project.
			CO4	Comprehend what and how to gather the requirements for a project.
			CO5	Design class, object and interactive diagrams and know their significance of an application.

			CO6	Design advanced behavioral and architectural modeling and work on case studies.
	9ZC01	**ECONOMICS, ACCOUNTANCY AND MANAGEMENT SCIENCE**	**CO1**	Acquire the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular.
			CO2	Expose on Cost concept, Revenues and Market structure and describe the concepts.
			CO3	Understand the basic concepts of Accounting, Double entry system and Bookkeeping.
			CO4	Interpret the concepts of Capital expenditure, Revenue expenditure and Final accounts ad their significance.
			CO5	Identify knowledge and elaborate the basics of Management, its principles and various functions performed in organization.
			CO6	Recognize various personality traits, perception, attitudes of individuals working in organization.
	9HC05	**ENVIRONMENTAL SCIENCE AND ECOLOGY**	**CO1**	Understand about ecosystem and energy flow among the organisms.
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity.
			CO4	Understand the causes and effect of pollution and implement measures in control of pollution.
			CO5	Understand the sustainable development and implement green technology for sustainable development.
			CO6	Learn and implement policy to protect the environment
	9EC63	**DATABASE MANAGEMENT SYSTEMS LAB**	**CO1**	Understand how to create tables for a database and apply Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
			CO2	Explore Queries using Aggregate functions such as [COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING], Conversion functions and use string functions for a given application.
			CO3	Learn and demonstrate write programs using PL/SQL programs using exceptions, COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block
			CO4	Gain knowledge in implementing programs using WHILE LOOPS, FOR LOOPS, nested loops using BUILT– IN Exceptions and Implement Procedures.
			CO5	Understand Programs for stored functions invoke functions in SQL Statement and Implement programs for packages specification.

			CO6	Know the significance and Implement programs using features of CURSORs and its variables and develop Programs implementing Triggers.
	9F463	**COMPUTER AIDED SOFTWARE ENGINEERING (CASE) TOOLS LAB**	**CO1**	Identify software process and software engineering practices to select and
			CO2	Justify approaches for a given project and its constraints and distinguish life cycles for developing software product.
			CO3	Understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO4	Define and design models for the requirements stated in the software project.
			CO5	Design class, object and interactive diagrams and know their significance.
			CO6	Design advanced behavioral and architectural modeling and work on case
	9FC64	**DESIGN AND ANALYSIS OF ALGORITHMS LAB**	**CO1**	Implement Merge sort algorithm for sorting a list of integers in ascending order, Dijkstra's algorithm for the single source shortest path problem.
			CO2	Implement Prim's algorithm to generate minimum cost spanning tree.
			CO3	Solve the job sequencing with deadlines problem using greedy algorithm.
			CO4	Design the solution for the 0/1 knapsack problem using implement Dynamic Programming and implement.
			CO5	Using Dynamic programming approach solve the Optimal Binary search Tree problem.
			CO6	Design and implement n-queens problem using backtracking approach.
	9E479	**COMPREHENSIVE TEST AND VIVA VOCE - IV**	**CO1**	Asses the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	9E487	**TECHNICAL SEMINAR – IV**	**CO1**	Identify topics related to Computer Scienec and Engineering domain or disruptive technologies.
			CO2	Collect, survey and organize content in PPT form.
			CO3	Present seminar in an effective manner.
	9E491	**SUMMER BREAK INTERNSHIP – I**		
			CO1	The students will acquire basic knowledge on Skills of Entrepreneurship.
			CO2	The students will understand the techniques of selecting the customers through the process of customer segmentation and Targeting.
			CO3	Business Models and their validity are understood

III-I & A20	**8ZC22**	**BASICS OF ENTREPRENEURSHIP**		by the students.
			CO4	The basic cost structure, Revenue Streams and the pricing strategies are understood by the students.
			CO5	The students will acquire knowledge about the project management and its techniques.
			CO6	The students get exposure on marketing strategies and business regulations for the Start up.
	8ZC25	**BASICS OF INDIAN ECONOMY**	**CO1**	Gain knowledge relating to Economics, various sectors and its growth.
			CO2	Will gain knowledge relating to various concepts of National income and related aggregates.
			CO3	Students will learn about Indian Industrial policy and benefits of LPG to India.
			CO4	Comprehend knowledge relating to Fiscal policy & Taxation system in India.
			CO5	Learn about inflation & business cycles.
			CO6	Know about the BoP and its influence on economy.
	8ZC05	**BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT**	**CO1**	Describe the new dimensions and products served by the banking system in INDIA.
			CO2	Explain the credit control system and create awareness on NPA's.
			CO3	Apply the knowledge of Insurance concepts in real life scenarios.
			CO4	Recognize the importance of regulatory and legal frame work of IRDA.
			CO5	Identify the risk management process and methods.
			CO6	Calculate the diversity of risk and return.
	8BC51	**INTRODUCTION TO ADDITIVE MANUFACTURING PROCESS**	**CO1**	Understand the Additive manufacturing processes and their relationship with subtractive manufacturing.
			CO2	Demonstrate comprehensive knowledge of the broad range of liquid based rapid prototype processes, devices, capabilities and materials that are available.
			CO3	Apply the principles of casting in Additive manufacturing processes.
			CO4	Articulate the various tradeoffs of Additive manufacturing software's/data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements.
			CO5	Learn various applications of additive manufacturing, such as in architecture art, health care direct part production and mass customization.
		CONTROL SYSTEM ENGINEERING	**CO1**	Understand basic concepts of control systems.
			CO2	Study about time response analysis.

	8AC46		**CO3**	Understand basic concepts of stability and root locus method.
			CO4	Study about frequency response analysis.
			CO5	Learn basic concepts stability analysis in frequency domain.
			CO6	Outline fundamentals of state space analysis.
	8DC42	**EMBEDDED SYSTEMS**	**CO1**	Classify embedded systems and their applications.
			CO2	Write ALP for 8051 architecture.
			CO3	Implement interfaces for Embedded System using various protocols and hardware modules.
			CO4	Understand the principles of Communication Interface, Wireless and Mobile Systems Protocols
			CO5	Design the interrupt routines for variois OS concepts and Memory Management techniques in an RTOS Environment.
			CO6	Recognize the issues and design of basic Real-Time Operating System principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations.
	8ZC08	**DESIGN LITERACY AND DESIGN THINKING**	**CO1**	Gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
			CO2	Understand the techniques of idea generation.
			CO3	Classify different phases of design thinking.
			CO4	Realize the product design process.
			CO5	Understand design thinking for service design.
			CO6	Gain knowledge on various cases related to design thinking.
	8EC11	**SEMANTIC WEB & SOCIAL NETWORKS**	**CO1**	Appraise the role of the Web, its need and Intelligence.
			CO2	Outline the concepts of Machine Intelligence Ontology, Inference engines, Software Agents, Berners-Lee www and Semantic Road Map.
			CO3	Conceptualize Knowledge Representation for the Semantic Web with Resource Description Framework (RDF) / RDF Schema, Ontology Web Language (OWL), UML and XML Schema.
			CO4	Apply Ontology Engineering using Ontology Development Tools/ Methods, Ontology Libraries, Ontology Mapping, Logic and Inference Engines.
			CO5	Illustrate Semantic Web Applications, Services and Technology.
			CO6	Apply Social Network Analysis, Semantic web networks analysis and describe Building of

				Semantic Web Applications with social network features.
	8FC12	**SOFTWARE ARCHITECTURE AND DESIGN PATTERNS**	**CO1**	Explain Architecture Business Cycle, Architectural patterns, reference models, reference architectures, and architecture structures.
			CO2	Describe architecture, Quality Attributes, styles, patterns and design of Architecture along with the Documentation of architecture.
			CO3	Discuss Software Architecture evaluation, Architecture design decision making, SAAM, ATAM and CBAM. And plan software architecture in future.
			CO4	Plan and use Creational patterns and Structural patterns application development.
			CO5	Solving problems using Induction learning, Decision Tree, Statistical learning methods, learning with hidden variables, EM algorithm, Instance based learning and Neural Networks.
			CO6	Explain Behavioral patterns using Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template method and Visitor.
	8EC16	**INTRODUCTION TO DATA SCIENCE**	**CO1**	Understand basic terms related to Big Data, Data Science and Analysis of Data. Learn Statistical Inference, Probability Distributions and Fitting a model.
			CO2	Implement Data analysis techniques for solving practical problems.
			CO3	Perform Data analysis on variety of data using R.
			CO4	Exercise appropriate manipulation techniques on lists and vectors using operators in R. Comprehend the significance and use the iterative programming and functions in R.
			CO5	Learn and describe the various Dimensionality Reduction techniques available.
			CO6	Apply the suitable visualization techniques to output analytical results.
	8FC17	**COMPUTER GRAPHICS**	**CO1**	Understand fundamental terms in Computer Graphics, various visible surface determination algorithms and midpoint and line segment analysis.
			CO2	Explore 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations.
			CO3	Apply functions 2D viewing and apply clipping algorithms.
			CO4	Understand the concepts and techniques used in 3D computer graphics, including viewing

				transformations, hierarchical modeling, color, lighting and texture mapping.
			CO5	Apply single and multiple 3-D viewing techniques like viewing coordinates etc and also back-face detection, depth-buffer, and scan-line methods.
			CO6	Analyze the animation production pipeline and Produce a short animation.
	8FC06	**INFORMATION SECURITY**	**CO1**	Understand the fundamental concepts of Security Attacks and security standards with the model for network Security.
			CO2	Review and analyze conventional cryptographic techniques and authentication.
			CO3	Review and analyze public cryptographic techniques and outline the concepts of Kerberos and email privacy.
			CO4	Recognize architecture, key management and header formats of IPSEC.
			CO5	Outline the various web security threats and protocols.
			CO6	Understand Intrusion Detection System and Design principles of Firewalls.
	8EC04	**DATA WAREHOUSING AND DATA MINING**	**CO1**	Understand the fundamentals of Data Mining and Identify the techniques used in data preprocessing.
			CO2	Understand the fundamentals of Data Warehousing and issues of mining with respect to architectures, technologies such as OLAP.
			CO3	Learn insights of Data Mining Primitives and Infer the significance of Concept Description.
			CO4	Apply the algorithms for mining association rules in large databases.
			CO5	Discuss and apply the models of classification and use those models for the prediction of the new samples.
			CO6	Apply various clustering techniques available for numerous applications. Identify the optimal clustering technique for a particular application.
	8EC05	**DATA COMMUNICATIONS AND NETWORKS**	**CO1**	Understand concepts of different networks, network models and transmission medias.
			CO2	Classify various data conversion techniques and Multiplexing, Demultiplexing techniques.
			CO3	Summarize the design issues of Datalink layer and solve problems on Error and Flow control.
			CO4	Infer MAC layer protocols, various connecting devices, IP addressing concepts and design a network (using subnetting and supernetting techniques).

			CO5	Analyze various routing algorithms and outline the concepts of Internet control protocols and congestion control techniques.
			CO6	Recognize services and protocols of transport layer, application layer along with network security issues.
	8EC64	**DATA WAREHOUSING AND DATA MINING LAB**	**CO1**	Work with the ETL and Mining tools.
			CO2	Demonstrate the classification, clustering techniques on the data sets.
			CO3	Comprehend the results obtained in the clustering, Association and Classification techniques applied on the data sets with varied input parameters.
			CO4	Ability to apply mining techniques for realistic data.
	8EC65	**COMPUTER NETWORKS LAB**	**CO1**	Implement and analyze framing methods of the data link layer.
			CO2	Implement and analyze framing methods of the data link layer.
			CO3	Illustrate and implement error detection & correction techniques.
			CO4	Implement different Routing Algorithms.
			CO5	Understand basic Network Commands.
			CO6	Use of Wireshark and NS-2 tools.
	8FC65	**INFORMATION SECURITY LAB**	**CO1**	Understanding of Symmetric Encryption Algorithms, Asymmetric Encryption Algorithms, Hash and Key Exchange, Digital Signature and Digital Envelope, Demonstration of NS3 Tool.
	8EC49	**INTELLECTUAL PROPERTY RIGHTS**	**CO1**	Demonstrate a breadth of knowledge in Intellectual property.
			CO2	Overview of Patents, Searching, filling and drafting of Patents.
			CO3	Overview of copyright & GI.
			CO4	Overview of Trade Mark & Trade Secret,
			CO5	Overview of Integrated Circuit and Industrial Design.
			CO6	Knowledge about different national and international: Conventions and Treaties Governing the IPRs.
			CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and

	8E491	**SUMMER INDUSTRY INTERNSHIP-I**		hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills.
III-II & A20	**8ZC23**	**ADVANCED ENTREPRENEURSHIP**	**CO1**	Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
			CO2	Exposed to the various business models and critically evaluating the effectiveness of the business models and products.
			CO3	Understand the method of business traction, create roles and build their A- team.
			CO4	Understand the various channels of revenue building and exploration of new revenue avenues.
			CO5	Understand the need of sales planning and people plan and also financial modeling.
			CO6	Exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support startups.
	8ZC26	**BASICS OF POLITY AND ECOLOGY**	**CO1**	Outline knowledge relating to the Indian Constitution and the Preamble to the Constitution.
			CO2	Relate to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
			CO3	Identify about the federal structure and judiciary of India.
			CO4	Understand knowledge relating to the conservation of the environment.
			CO5	Analyse about bio-diversity and climatic changes occurring in the environment.
			CO6	Discuss about the international treaties, conventions and organizations active in the field of environmental protection.
	8ZC19	**ENTREPRENEURSHIP PROJECT MANAGEMENTAND STRUCTURED FINANCE**	**CO1**	Students will understand the nature of Entrepreneurship and its importance.
			CO2	Will gain knowledge regarding project, its life cycle and organization.
			CO3	Will gain knowledge relating to project formulation and implementation.
			CO4	Comprehend the components of structured finance.
			CO5	Establish a framework of CMBS.
			CO6	Students will gain knowledge relating to the CRE Servicing.

	8BC52	**PRINCIPLES OF OPERATIONS RESEARCH**	**CO1**	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
			CO2	Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations.
			CO3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy.
			CO4	Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost.
			CO5	Apply simulation techniques for solving various types of problems and general idea development about Markov chains.
	8AC44	**FUNDAMENTALS OF MEASUREMENTS AND INSTRUMENTATION**	**CO1**	Understand the principle of operation of different types of instruments viz., PMMC, moving iron type of instruments, the required characteristics of an instrument in general. The student demonstrates the ability to compensate for the errors in the instruments and to extend the range of the instruments.
			CO2	Demonstrates the knowledge of Potential and Current transformers; the errors in them and the effect of having an open/short in the secondary circuits; Understand the principle of operation of Dynamometer and Moving-iron type of Power factor meters.
			CO3	Understand the principle of operation of dynamometer type of Wattmeter and Induction type of Energy meter; use the wattmeter to measure the Active and Reactive power and demonstrates the ability to extend the range of them.
			CO4	Identify and use different techniques of measurement of Resistance, Inductance and Capacitance values.
			CO5	Understand the principle of operation of Different type of digital voltmeters, wave analyzers, spectrum analyzers and Cathode ray Oscilloscope.
			CO6	Demonstrates the ability in characterizing the different types of transducers and uses them to measure Strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque and Temperature.

	8DC43	**INTRODUCTION TO VLSI DESIGN**	**CO1**	Identify the working principle of diffusion, ion implantation, metallization and other basic components.
			CO2	Comprehend basic electrical properties of various types of mos transistors.
			CO3	Identify the significance of cmos logic gates and design the multiplexers.
			CO4	Draw layouts for a cmos circuit and logic design and validate them.
			CO5	Differentiate the various types of memories and clocking strategies.
			CO6	Design various combinational and sequential circuits.
	8ZC09	**CO – CREATION AND PRODUCT DESIGN**	**CO1**	Understand the inputs required for human centric design thinking the students learn the techniques of idea generation.
			CO2	Explore the different phases of Ideation process.
			CO3	Outline emerging technologies and understand 3d printing in manufacturing.
			CO4	Indicate developments of prototypes.
			CO5	Understand reverse engineering methods in product development.
			CO6	Review the information on IPR, and patent application.
	8EC12	**ADVANCED COMPUTER NETWORKS**	**CO1**	Appraise networking and Internet concepts and be familiar with OSI Model and TCP/IP model.
			CO2	Detect networking errors learn correction techniques.
			CO3	Infer the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.
			CO4	Differentiate Internet addressing IPv4 and IPv6 and Internet protocols.
			CO5	Conceptualize wireless networking and to Develop new protocols in networking.
			CO6	Design new virtual private networks.
	8EC22	**DIGITAL FORENSICS**	**CO1**	Outline Forensic science and Digital Forensic concepts.
			CO2	Comprehend the technical concepts involved in understanding the digital forensics.
			CO3	Interpret the cyber pieces of evidence, Digital forensic process model.
			CO4	Familiarize the computer operating system concepts involved in digital forensics.
			CO5	Determine the legal aspects of Digital Forensics.
			CO6	Demonstrate various forensic tools to investigate

				the cyber crime and to identify the digital pieces of evidence.
	8FC13	**SOFTWARE PROJECT MANAGEMENT**	**CO1**	Explain primitives of Project Planning and evolution of software economics.
			CO2	Describe software economics; reduce Software product size, improvement in software processes, improving team effectiveness, improving automation, Achieving quality.
			CO3	Explain Life cycle phases and Artifacts of the process.
			CO4	Describe Model based software architectures and Work Flows.
			CO5	Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for a iterative process within cost and schedule. Describe Project Organizations and Responsibilities.
			CO6	Describe Automation and Project Control and Process instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management.
	8EC17	**MACHINE LEARNING**	**CO1**	Understand the fundamental concepts of ML and Designing a Learning System.
			CO2	Understand the basic concepts of MLP, RBF and SVM and their applications.
			CO3	Understand the Probability models namely supervised, unsupervised, basic statistics analyze their analysis of algorithms along with their applications.
			CO4	Understand various Dimensionality Reduction Techniques and Apply various Evolutionary Algorithms with models.
			CO5	Understand the Graphical models and their applications.
			CO6	Understanding Analytical Learning and Analyze KBANN Algorithm.
	8FC18	**IMAGE PROCESSING**	**CO1**	Analyze general terminology of image processing.
			CO2	Examine various types of images, intensity transformations and spatial filtering.
			CO3	Develop Fourier transform for image processing in frequency domain.
			CO4	Evaluate the methodologies for image segmentation, restoration etc.
			CO5	Implement image process and analysis algorithms.
			CO6	Apply image processing algorithms in practical

				applications.
	8FC26	**C# AND .NET FRAMEWORK**	**CO1**	Introducing .Net Architecture and learn basic programming in C# and the object oriented programming concepts.
			CO2	Explain advance features and enhance skills in writing windows applications, ADO.NET and ASP.NET.
			CO3	Discuss various class libraries for different applications and data manipulation functions.
			CO4	Understand the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
			CO5	Develop distributed applications using .NET Framework.
			CO6	Create mobile applications using .NET compact Framework.
	8FC07	**AUTOMATA THEORY AND COMPILER DESIGN**	**CO1**	Design the finite automata different Languages.
			CO2	Construct finite Automata for a given regular expressions, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
			CO3	Design the push down automata and Turing Machine for complex languages.
			CO4	Understand LEX tool and relate parsing techniques.
			CO5	Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
			CO6	Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.
	8EC06	**OPERATING SYSTEMS**	**CO1**	Understand the functional architecture of an Operating System with usage of system calls.
			CO2	Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems.
			CO3	Solve issues related to process synchronization and Deadlocks in the Operating System.
			CO4	Illustrate the concepts of Memory Management.
			CO5	Outline the directory structure & analyze disk scheduling algorithms.
			CO6	Summarize the aspects of Protection and Security, and understand the concepts of I/O systems.
			CO1	Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap.
			CO2	Develop dynamic programs using Javascript and

				Typescript.
			CO3	Develop scripts using XML and validate using parsers.
			CO4	Design a data-interchange format using JSON.
	8EC07	**WEB TECHNOLOGIES**	**CO5**	Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
			CO6	Design responsive web applications with Forms, Scope, Dependency Injection & Services, and Single Page Application (SPA) of Angular.
			CO7	Comprehend the uses of Web servers and design the server-side scripts using Servlets.
			CO8	Design and develop server-side scripts and components using PHP.
	8FC08	**CYBER SECURITY AND CYBER LAWS**	**CO1**	Familiarize the cryptographic procedures and Understand its primitives.
			CO2	Outline Security policy in Legislation and Comprehend E-Commerce. frame work, models and its associated threats.
			CO3	Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
			CO4	Categorize international cyber laws and cyber crimes.
			CO5	Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000.
			CO6	Classify and Outline the offences under the Cyberspace law and the Internet in India.
	8FC66	**COMPILER DESIGN LAB**	**CO1**	Implementation of DFA for a given Languages/ Regular Expression.
			CO2	Usage LEX of tool to implement lexical analyzer in compiler design and implementation of Top-Down Parser.
			CO3	Usage of YACC tools for implementing bottom up parser.
	8EC66	**OPERATING SYSTEMS LAB**	**CO1**	Implement scheduling algorithms, Deadlocks, File allocation and Memory management techniques.
	8FC19	**COMPUTER VISION**	**CO1**	Understand the basic fundamentals of computer vision and diversity of computer vision applications.
			CO2	Explore the various camera models, multi view geometry, structures and generate 3D model from images.
			CO3	Analyze and apply image preprocessing, continuous and discrete representation methods and feature extraction techniques.
			CO4	Apply regularization theory, optical

				communication, stereo vision, and motion estimation techniques to detect moving objects in a video.
			CO5	Illustrate different image shape representations and understand Fourier and wavelet descriptors and segmentation methods.
			CO6	Understand various object recognition methods, Hough transforms and illustrate shape matching.
	8EC67	**WEB TECHNOLOGIES LAB**	**CO1**	Demonstrate the use of HTML tags and be able to design web pages.Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.
			CO2	Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
			CO3	Implement Angular with Expressions, Filters, Directives, Controller, and Modules.
			CO4	Develop a Single Page Application with implementation of Scope and Form.
			CO5	Implement Java servlets using Apache Tomcat Server for User authentications.
			CO6	Develop an application in PHP with Database connectivity
	8E694	**GROUP PROJECT**	**CO1**	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.
	8E681	**COMPREHENSIVE VIVA VOCE**	**CO1**	Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	8E692	**SUMMER INDUSTRY INTERNSHIP-II**		
	8EC13	**DATABASE SECURITY**	**C01**	Comprehend the various access control rules available to assign privileges and protect data in

				databases.
			C02	Describe and compare the popular Security Models.
			C03	Categorize the security mechanisms and their functions.
			CO4	Identify the Security Software Design principles to protect data in databases.
			CO5	Classify and compare the Statistical Database Protection & Intrusion Detection Systems.
			CO6	Learn the new models of database systems and the models of protection.
IV-I & A20	**8FC11**	**SOFTWARE REQUIREMENTS AND ESTIMATION**	**C01**	Explain need, practices and Risk issues in Software requirements.
			C02	Describe Software Requirements Engineering elements such as review, quality and priorities.
			C03	Explain software Modeling and Requirements Management.
			CO4	Apply Estimation methods for size using Mark II FPA, Full Function Points, LOC Estimation.
			CO5	Apply Cost and Schedule estimation factors during software development.
			CO6	Apply tools for Requirements Management and Estimation.
	8EC18	**BIG DATA ANALYTICS**	**C01**	Discuss the importance of big data.
			C02	Interpret the challenges with big data; elaborate the knowledge about the technological developments in big data environment.
			C03	Assess about NOSQL data environment.
			CO4	Capability of understanding the usage of big data in context to cloud and other technologies.
			CO5	Justify about map reduce work flows.
			CO6	Implement Data Analysis with HADOOP and related tools.
	8FC16	BLOCK CHAIN TECHNOLOGIES	**C01**	Understand basic principles of HDFS and digital signature.
			C02	Learn about blockchain advantages, Simplified Payment Verification protocol and its life cycle.
			C03	Explain the Nakamoto consensus and List and describe differences between proof-of-work and proof-of-stake consensus.
			CO4	Understand Bitcoin and Ethereum.
			CO5	Learn about the legal issues of Blockchain through some applications.
			CO6	Discuss new trends in Blockchain technologies.
	8EC14		**C01**	Understand the Security Issues and Measures.
			C02	Know the KEY Elements and Logical Elements of

		INFORMATION SECURITY. MANAGEMENT AND STANDARDS		Networks.
			C03	Understand the Data Leakage, its Threats and Mitigation.
			CO4	Understand the Database Security.
			CO5	Understand the Policies, Guideline and Framework of Information Security.
			CO6	Understand the Ethics, Roles and Responsibilities of ISM.
	8FC12	**AGILE SOFTWARE DEVELOPMENT**	**C01**	To understand the essence of agile development methods.
			C02	To apply the principles and practices of extreme programming in real world problems.
			C03	To incorporate proper coding standards and guidelines in an agile process.
			CO4	To optimize an agile process by exploring the possible risks and threats in the software process.
			CO5	To improve the process by eliminating waste.
			CO6	To design an agile process for a business application and deal with appropriate tradeoff.
	8EC19	**BUSINESS INTELLIGENCE**	**C01**	Elaborate the fundamentals of business intelligence.
			C02	Link data mining with business intelligence.
			C03	Apply various modeling techniques.
			CO4	Perform the data analysis and knowledge delivery stages.
			CO5	Apply business intelligence methods to various situations.
			CO6	Decide on appropriate technique for the given model.
	8FC17	**AUGMENTED AND VIRTUAL REALITY**	**C01**	Understand the fundamentals of Virtual Reality.
			C02	Comprehend multiple Models of Input and Output Interface in Virtual Reality like Gloves, Video-based Input, 3D Menus & 3DScanner etc.
			C03	Describe the fundamentals or Advanced topics of Computer Graphics.
			CO4	Explain the Interactive Techniques on VR in respect of Body Track, Hand Gesture, 3D Manus, Object Grasp.
			CO5	Know about the developments Tools of VR and describe.
			CO6	Familiarize the Conceptual idea on Augmented Reality and relate the illustrations.
			C01	Describe concepts of Software testing.
			C02	Describe and apply the concepts Flow graphs, Path testing and Data Flow Testing.

	8F719	**SOFTWARE AUTOMATION AND TESTING**	**C03**	Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
			CO4	Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing.
			CO5	Demonstrate Software Testing Techniques such as JADs, Pareto Analysis ,Regression Testing, Structured walkthroughs, Thread testing , Performance testing and White box testing.
			CO6	Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP.
	8EC08	**INFORMATION SECURITY**	**C01**	Get familiarized with the fundamental concepts of security attacks, security services.
			C02	Implement the conventional cryptographic techniques.
			C03	Simulate the Public key cryptography techniques.
			CO4	Comprehend IP security Architecture and its role in security framework.
			CO5	Implement SSL and TLS for Web Security.
			CO6	Design Intrusion Detection Systems and Firewall.
	8F708	**LINUX PROGRAMMING**	**C01**	Describe the basic Linux commands.
			C02	Write Shell Scripts.
			C03	Enlist various System Calls in Linux.
			CO4	Classify various system calls to handle the processes and signal the process.
			CO5	Elaborate the working of IPC.
			CO6	Demonstrate the significance of Semaphores for Kernel support and simulate program using the same.
	8EC20	**ARTIFICIAL INTELLIGENCE**	**C01**	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			C02	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			C03	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, heuristic search

				together with the time and space complexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
			CO6	Analyze Supervised Learning Vs. Learning Decision Trees.
	8FC20	**CYBER SECURITY**	**C01**	Understand cyber-attacks, types of cybercrimes.
			C02	Realize the importance of cyber security and various forms of cyber attacks and counter measures.
			C03	Get familiarity of cyber forensics.
			CO4	Get familiar with obscenity and pornography in cyber space and understand the violation of right of privacy on Internet.
			CO5	Appraise Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
			CO6	Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.
	8F778	**SOFTWARE AUTOMATION AND TESTING LAB**	**C01**	Prepare Test Plan document and write Test Cases for Small scale Project (Like for their B.Tech IV Year Project or Post-Graduate Projects), they are learn how to Analyze SRS document in order to prepare Test Plan Document.
			C02	Demonstrate skills to use modern software testing tools (EX: UFT, TestLink, Bugzilla, Selenium, Test Director and Quality Center) and test application (web, Window application) by using the tools.
			C03	Demonstrate the ability to differentiate between different Testing tools present in the market (like functional testing tools, Test Management Tools, Bug Tracking Tools and Performance Testing Tools) and prepare Test Plan document and write Test Cases for Small scale Project (Like for their B.Tech IV Year Project or Post-Graduate Projects).
	8F777	**LINUX PROGRAMMING LAB**	**C01**	To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
			C02	To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
			C03	To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
			CO4	To gain knowledge in implementing processes

				aspects, mastering the process APIs.
			CO5	To understand how to implement pipes, FIFO, how to use for communication purpose in IPC.
			CO6	To understand the significance of Semaphores for Kernel support and simulate program using the same.
	8EC76	**INFORMATION SECURITY LAB**	**C01**	Design and Implement symmetric key encryption algorithms.
			C02	Simulate asymmetric key encryption algorithms.
			C03	Implement hashing and key exchange algorithms.
			CO4	Simulate and execute Digital Signature and Digital envelope.
			CO5	Install and execute various projects in NS3.
	8E784	**PROJECT - I**	**C01**	Develop plans with relevant people to achieve the project's goals.
			C02	Break work down into tasks and determine handover procedures.
			C03	Identify links and dependencies, and schedule to achieve deliverables.
			CO4	Estimate the human and physical resources required, and make plans to obtain the necessary resources.
			CO5	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO6	Design and develop the software or prototype to meet societal needs.
	8E682	**SUMMER INDUSTRY INTERNSHIP-II**	**C01**	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			C02	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			C03	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.
			C01	The students gain the knowledge on the inputs required for innovation and also gain familiarity on Entrepreneurship.
			C02	The students will get exposure on creative methods of ideation and the importance of protecting the ideas.

IV-II & A20	**8ZC24**	**INNOVATION AND DESIGN THINKING**	**C03**	The students gain knowledge on design thinking and types of thinking.
			CO4	The students gain familiarity on emerging technologies like Internet of things (IOT).
			CO5	The students understand the process of building the startup.
			CO6	The students gain knowledge on various startup funding and also to branding building for the startup.
	8ZC27	**INDIAN HISTORY, CULTURE AND GEOGRAPHY**	**C01**	To appreciate and understand our Indian History, Culture and Indian heritage.
			C02	To understand secularism of our country.
			C03	To appreciate and understand the social reformers who brought revolutionary changes in Indian society.
			CO4	To understand earth evolution and world climatic change.
			CO5	To understand India Oceanography, Able to enhance and understand Indian monsoons, Indian agriculture.
	8ZC15	**FINANCIAL INSTITUTIONS, MARKETS AND SERVICES**	**C01**	This unit enables the students to understand the financial structure and the financial sector reforms after 1991.
			C02	The unit gives the exposure on the role of RBI and the Regulating and credit policies adopted by the RBI.
			C03	The students get awareness on the role of Non-Banking financial institutions and the role of financial institutions in India.
			CO4	The unit educates the students to know the role of regulatory bodies like SEBI and also to know the capital and money market instruments.
			CO5	The unit equips the students to understand about the asset fund based financial services.
			CO6	The students will get exposure about the investment banking and merchant banking.
		PRINCIPLES OF	**C01**	Understand the need for manufacturing processes and various material properties.
			C02	Understand the principle of casting, Patterns used, Pattern allowance and Gating systems used in casting, and various casting methods.
			C03	Understand the basic principle of welding and distinguish between various welding types and their applications.
			CO4	Understand the principles of metal working,

	8BC52	**MANUFACTURING PROCESSES**		various types of metal working techniques, Knowledge of hot working and cold working, Ability to understand the bulk deformation processes of rolling.
			CO5	Understand the bulk deformation processes of extrusion and forging, their applications and forces involved in these operations.
			CO6	Understand and distinguish the various press working operations with respect to their applications, advantages and disadvantages, understand the various types of plastics and their processing techniques.
	8AC45	**FUNDAMENTALS OF RENEWABLE ENERGY SOURCES**	**C01**	Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
			C02	Demonstrates the knowledge of different techniques of solar collection and storage.
			C03	The student becomes familiar with the different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
			CO4	Aware of the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
			CO5	Aware of the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
			CO6	Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.
	8CC44	**ELECTRONICS CIRCUIT DESIGN AND ANALYSIS**	**CO1**	Analyse and Design of BJT Single stage, multistage amplifiers at low and high frequencies.
			C02	Analyse and Design JFET and MOSFET amplifiers.
			C03	Design different types of Feedback Amplifier, Oscillators and their analysis.
			CO4	Analyse and Design power amplifiers. Understand distortions.

			CO5	Analyse and Design tuned and RF amplifiers such as single tuned, double tuned, stagger tuned and wide band amplifier.
			CO6	Understand the stability of oscillators and tuned amplifiers.
	8EC15	**MOBILE ADHOC AND SENSOR NETWORKS**	**CO1**	Recognize of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
			C02	Comprehend the characteristics of wireless sensor networks (WSNs).
			C03	Report how proactive protocols function and their implications on data transmission delay and bandwidth consumption.
			CO4	Assess how reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
			CO5	Analyze the functioning of proactive routing protocols and their implications on data transmission delay and bandwidth consumption.
			CO6	Analyze the functioning of reactive routing protocols and their implications on data transmission delay and bandwidth consumption. And become familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.
	8FC13	**ADVANCED SOFTWARE ENGINEERING**	**CO1**	Understand the issues affecting the organization, planning, and development of large and complex software systems.
			C02	Understand the concepts of software metrics and reuse-based software engineering.
			C03	Apply software engineering principles in the development of distributed software systems.
			CO4	Design and implement service-oriented software systems.
			CO5	Understand the design and development of aspect-oriented software systems.
			CO6	Understand software re-engineering process model.
	8EC21	**CLOUD COMPUTING**	**CO1**	Describe the characteristics of cloud.
			C02	Describe the cloud services.
			C03	Understand different architectures for cloud applications, Creation and running of python programs, running amazon ec2 instance
			CO4	Understand Data Intensive applications and future trends of Internet Clouds supporting Mobile Computing, Ubiquitious Computing and Social Networking.

			CO5	Discuss mapreduce and image processing app on cloud.
			CO6	Discuss cloud security architecture.
	8DC55	**INTERNET OF THINGS**	**CO1**	Get familiar with terminology, technology and applications of IoT.
			C02	Understand and explain IoT system management using M2M (machine to machine) with necessary protocols.
			C03	Design and develop Python Scripting Language programs preferred for many IoT applications.
			CO4	Use Raspberry PI as a hardware platform for designing the IoT sensor interfacing.
			CO5	Implement web based services for IoT.
			CO6	Understand and analyze the case studies illustrating IoT Design.
	8E885	**PROJECT - II**	**CO1**	Develop plans with relevant people to achieve the project's goals.
			C02	Break work down into tasks and determine handover procedures.
			C03	Identify links and dependencies, and schedule to achieve deliverables.
			CO4	Estimate the human and physical resources required, and make plans to obtain the necessary resources.
			CO5	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO6	Design and develop the software or prototype using modern software tools wherever applicable to meet societal needs.

SREENIDHI EDUCATIONAL GROUP | SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY SNIST AUTONOMOUS

Course Outcomes of IT Department

Department of Information Technology

COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year courses/subjects

Year and Regulation	Course Code	Course Name	Co's	
I-I & A22	9HC04	Engineering Chemistry	C01	Understand and analyze microscopic chemistry in terms of atomic orbital's, molecular orbital's and intermolecular forces.
			C02	Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
			C03	Recognize and select the domestic and industrial problems caused by hardwater and also learn about the municipal water treatment using various methods.
			C04	Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
			C05	Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques.
			C06	Understand the synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.
	9FC01	Problem Solving using C	C01	Formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs (in C language).
			C02	Execute and test the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion.
			C03	Distinguish a problem into functions and synthesize a complete program using divide and conquer approach.
			C04	Understand arrays, pointers and structures to formulate algorithms and programs.
			C05	Analyse programming to solve matrix addition and multiplication problems and searching and sorting problems.
			C06	Understand programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.
	9HC11	Matrix Algebra and Calculus	C01	Check the consistency or inconsistency of a linear system and can solve the problems.
			C02	Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
			C03	Find the nature, index and signature of the quadratic

				lubricant, acid value of an oil.
			C03	Estimate hardness of water.
			C04	Analyze the amount of chloride content.
			C05	Determine cell constant and conductance of solutions, redox potential and emf of solutions, the rate constant of acid.
			C06	Synthesize a polymer (Thiakol rubber / Urea-Farmaldehyde resin), a drug- Aspirin.
			C07	Estimate of Mn+7 by Colorimetry method.
	9BC61	**Workshop/ Manufacturing Process Lab**	**C01**	Understand various types of conventional manufacturing Processes.
			C02	Describe manufacturing components from wood, MS flat, GI Sheet etc. – hands on experience.
			C03	Illustrate Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			C04	Produce small devices / products /appliances by assembling different components.
I-II & A22	**9HC07**	**Engineering Physics**	**C01**	Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schroedinger's wave concept and its application for a particle in one dimension box.
			C02	Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy).
			C03	Classify magnetism types, Hysteresis, domain theory, Anti-ferro and ferri-magnetism, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
			C04	Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).
			CO 5	Elaborate semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
			CO 6	Summarize Nano & bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD, SEM, TEM and

				form.
			C04	Verify the applicability of mean value theorems and also can express the given standard function in series form using Taylor's and Maclaurin series.
			C05	Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
			C06	Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	**English-Essential English Language Skills**	**C01**	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
			C02	State the definition of nouns, verbs, adjectives, and adverbs.
			C03	Identify the differences of each tense and use the tenses accurately.
			C04	Identify specialized reading strategies for specific types of texts.
			C05	Produce written work that is substantive, organized, and grammatically accurate.
	9HC61	**Oral Communications Lab-1**	**C01**	Describe people, objects and situations using simple sentences.
			C02	Use appropriate tenses and expressions in different contexts of conversations.
			C03	Identify major areas of concern in their oral communication and address them.
			C04	Create a SMART plan to enhance their communication skills in English.
	9FC61	**Problem Solving using C Lab**	**C01**	Enumerate the algorithms for simple problems.
			C02	Classify the given algorithms to a working and correct program.
			C03	Correct the syntax errors as reported by the compilers.
			C04	Identify and correct logical errors encountered at run time.
			C05	Write iterative as well as recursive programs.
			C06	Represent data in arrays, strings and structures and manipulate them through a program.
			C07	Declare pointers of different types and use them in defining self referential structures.
			CO 8	Create, read and write to and from simple text files.
	9HC64	**Engineering Chemistry Lab**	**C01**	Prepare the Inorganic compounds.
			C02	Determine surface tension of a liquid, viscosity of

				also to understand the radioactivity, fusion & fission, alpha, beta and gamma rays decay and its applications.
	9EC01	**Data Structures**	**C01**	Demonstrate the concepts of Abstract data type and also applications of stack and Queues.
			C02	Select the data structures that efficiently model the information in a problem.
			C03	Design programs using variety of data structures including Trees, AVL Trees and Graphs and their applications.
			C04	Solve problems and also assess efficiency trade off among searching and sorting using time complexity of each algorithm and also the applications of hashing and hash tables.
			CO 5	Describe the concepts of OOPs and implement programs using objects, classes, constructors and destructors.
			CO 6	Apply concepts of OOPs to write program on over loading functions and concepts of Inheritance.
	9HC12	**ADVANCED CALCULUS**	**C01**	Find the limits and test for the continuity and differentiability of a function.
			C02	Solve the problems on multiple integrals.
			C03	Solve linear and nonlinear first order partial differential equations.
			C04	Find Series expansion a function defined over the intervals.
			CO 5	Find directional derivative, gradient, divergence and curl of a function.
			CO 6	Solve problems of line, surface and volume integrals.
	9AC48	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	**C01**	Understand and apply the principles of electrical engineering to solve basic equations.
			C02	Apply the knowledge gained to explain the principles of single and three phase AC circuits.
			C03	Apply the knowledge gained to explain the principle and operation of DC machine along with its applications.
			C04	Use the principles of single phase transformer along with its applications and solve the equations.
			CO 5	Realize the principle and operation of three phase induction motor with its applications.
			CO 6	Understand the operation of different measuring instruments along with its applications.
	9BC01	**ENGINEERING GRAPHICS**	**C01**	Understand the instruments to solve the engineering problem and draw various type of curves used in

				engineering.
			C02	Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes.
			C03	Draw projections of different types of regular solids in various positions wrt principal planes of projection.
			C04	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO 5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views.
			CO 6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software.
	9HC62	**ORAL COMMUNICATION LAB – II**	**C01**	Understand, Analyse and respond to the audience by listening effectively.
			C02	Practice effectively the speaking skills with the apt body language.
			C03	Develop strategies to improve speaking skills.
			C04	Plan, prepare and present effectively to meet the standards of corporate and real world in a group.
			CO 5	Comprehend the reading skills through note taking and other study skills.
			CO 6	Express the opinions effectively on the given topic through role play and situational dialogues in group discussions.
	9HC66	**ENGINEERING PHYSICS LAB**	**C01**	Understand the concepts of photo electric effect, importance, photo current, colour filters, optical sensors.
			C02	Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
			C03	Recognize the difference between the interference and diffraction, grating, laser characteristics.
			C04	Analyze the concepts of fiber optics, fundamentals, numerical aperture its importance, attenuation in fiber and applications.
			CO 5	Understand and search to apply the fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law.
			CO 6	Know the difference between AC and DC fundamentals, Magnetostriction, resonance, air column vibrations.
			C07	Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance,

				capacitance and electrical and electronic fundamentals.
			C08	Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook's law.
			C09	Analyze the concept a semiconductors, types, calculation of energy gap of a semiconductor diode and importance.
			C010	Analyze the difference between normal diode & LED, forward bias, reverse bias, I-V characteristics, direct and indirect band gap semiconductors.
			CO 11	Characterize the RC network, time constant, capacitor functioning and its application.
	9EC61	**DATA STRUCTURES Lab Using C**	**C01**	Implement Stacks, Queues and circular queues.
			C02	Write programs using tree traversals. Inorder, Preorder and Postorder.
			C03	Program searching, sorting and hashing operations.
			C04	Write programs on Binary trees.
			C05	Implement classes and operator overloading.
II-I & A22	**9AC41**	**BASIC ELECTRICAL ENGINEERING**	**CO1**	Understand and apply the principles of electrical engineering to solve basic equations.
			CO2	Apply the knowledge gained to explain the principles of single and three phase AC circuits.
			CO3	Apply the knowledge gained to explain the principle and operation of DC machine along with its applications.
			CO4	Use the principles of single phase transformer along with its applications and solve the equations.
			CO5	Realize the principle and operation of three phase induction motor with its applications.
			CO6	Understand the operation of different measuring instruments along with its applications.
	9CC54	**ANALOG ELECTRONIC CIRCUITS**	**CO1**	Understand the Fundamentals of diode & BJT operation, Characteristics, diode application as rectifiers.
			CO2	Comprehend different biasing circuits of BJT amplifiers.
			CO3	Analyze small signal model of BJT with h-parameters.
			CO4	Describe the working and construction of FETs and characteristics & biasing of FET and Analyze the small signal model of FET.
			CO5	Understand the fundamentals of JFET and its operation and characteristics.
			CO6	Determine the feedback and analysis of oscillators.

	9EC02	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA**	**CO1**	Comprehend the fundamentals of Java, Classes,Objects and design the java programs using constructors and String handling methods.
			CO2	Design the programs using inheritance, polymorphism and interface.
			CO3	Develop programs using Packages, I/O Streams and collections.
			CO4	Apply the concepts of Exception handling and Multithreading for various scenarios.
			CO5	Create programs using AWT, Swings and develop applications using event handling.
			CO6	Develop applications using Applets and client server programs using networking concepts.
	9F303	**DISCRETE MATHEMATICS**	**CO1**	Define the syntax and semantics of propositional logic.
			CO2	Translate statements from a natural language into its symbolic structures in logic.
			CO3	Prove elementary properties of modular arithmetic and explain their applications in Computer Science, for example, in cryptography and hashing algorithms.
			CO4	Apply the notion of relations on some finite structures, like strings and databases.
			CO5	Analyze algorithms using the concept of functions and function complexity.
			CO6	Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling.
	9DC12	**COMPUTER ORGANIZATION**	**CO1**	Perceive basic operational concept of computer and data processing.
			CO2	Use data types with instruction set of specified architecture.
			CO3	Justify different control unit design and algorithms for various operations.
			CO4	Elaborate basic architecture of 8086 processor.
			CO5	Write assembly language programming and debug to 8086.
			CO6	Interface devices to 8086 processor.
	9HC03	**SOFT SKILLS**	**CO1**	Assess themselves using SWOT analysis.
			CO2	Appraise the importance of certain soft skills like time management and goal setting.
			CO3	Improve their verbal ability to handle the competitive exams.
			CO4	Enhance their team skills and design thinking capabilities for effective problem solving and

				decision making.
			CO5	Know their emotional quotient which guides their thinking, behavior and helps them manage stress efficiently.
			CO6	Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews.
	9HC17	**UNIVERSAL HUMAN VALUES**	**CO1**	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values.
			CO2	Understanding Harmony is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.
	9EC62	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**	**CO1**	Evaluate programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
			CO2	Implement small application such as banking system.
			CO3	Compare programs on operator, function overloading and dynamic method dispatch.
			CO4	Evaluate programs to implement interface and packages.
			CO5	Explain and write programs to implement threads.
			CO6	Illustrate programs to implement applets and event handling.
			CO7	Illustrate an application to implement client and server scenario.
	9AC91	**BASIC ELECTRICAL ENGINEERING AND ANALOG ELECTRONICS CIRCUITS LAB**	**CO1**	Understand the working of single-phase transformer under different conditions, the performance of three phase induction motor, different speed control methods of DC motor with and without loading with its performance.
			CO2	Understand the applications of Thevenin's Theorem in circuit analysis.
			CO3	Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
			CO4	Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
			CO5	Explain and demonstrate working of PN Junction

				and Zener diode.
			CO6	Explain and demonstrate working Half and Full wave Rectifier without filters.
			CO7	Demonstrate working of CE characteristics and its application as an amplifier.
	9DC62	**COMPUTER ORGANIZATION LAB**	**CO1**	Familiarize the architecture of 8086 processor, assembling language programming and interfacing with various modules.
			CO2	Experiment with Arithmetic operations of binary number system.
			CO3	Simulate any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.
	9E378	**COMPREHENSIVE TEST AND VIVA-VOCE**	**CO1**	Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	9E386	**TECHNICAL SEMINAR - III**	**CO1**	Identify topics related to Computer Scienec and Engineering domain.
			CO2	Collect, survey and organize content in PPT form.
			CO3	Present seminar in an effective manner.
II-II& A22	**9HC16**	**PROBABILITY AND STATISTICS**	**CO1**	Solve the random variable problems and probability distributions.
			CO2	Estimate the parameters and solve the problems using central limit theorem.
			CO3	Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	Solve the problems on measures of central tendency, Correlation.
			CO6	Classify and differentiate various regression models.
	9CC55	**DIGITAL ELECTRONICS**	**CO1**	Apply the rules of Boolean algebra to simplify Boolean expressions.
			CO2	Simplify of Boolean expressions using K-map.
			CO3	Design MSI combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters.
			CO4	Design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers

			CO5	Create digital design using PLD's such as ROM's, PLA's, PAL s.
			CO6	Design the digital controllers using Algorithmic State Machine Charts.
	9FC05	**DESIGN AND ANALYSIS OF ALGORITHMS**	**CO1**	Analyze worst-case running times of algorithms using asymptotic analysis.
			CO2	Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
			CO3	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
			CO4	Comprehend the concept of dynamic programming algorithms, their applications and analyze them.
			CO5	Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.
			CO6	Comprehend the concept of P and NP Problems and its usage in the applications.
	9EC03	***DATABASE MANAGEMENT SYSTEMS***	**CO1**	Analyze importance and significance of models, Database languages, architecture and design of Data Base Systems.
			CO2	Understand Relational Model – Integrity Constraints, Logic.
			CO3	Analyse data base Design and Views of databases, queries using Relational Algebra and Relational Calculus.
			CO4	Solve Queries with Comparison Operators, Aggregative Operators and nested queries. Queries with joins.
			CO5	Apply Schema refinement through all forms of Normalization to eliminate database redundancy.
			CO6	Apply ACID properties in transaction. Ensuring serializability in concurrent transactions. Concurrent control methods and recovery of transaction.
			CO7	Analyze External Storage Organization mechanisms and apply Indexing in databases for query optimization to enhance system performance.
	9F404	**SOFTWARE ENGINEERING AND OOAD**	**CO1**	Identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish lifecycles for developing software product.
			CO2	Describe the importance and principles of Unified Modeling Language, its building blocks and to

				relate UML paradigm for problem solving.
			CO3	Define and design models for the requirements stated in the software project.
			CO4	Comprehend what and how to gather the requirements for a project.
			CO5	Design class, object and interactive diagrams and know their significance of an application.
			CO6	Design advanced behavioral and architectural modeling and work on case studies.
	9ZC01	**ECONOMICS, ACCOUNTANCY AND MANAGEMENT SCIENCE**	**CO1**	Acquire the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular.
			CO2	Expose on Cost concept, Revenues and Market structure and describe the concepts.
			CO3	Understand the basic concepts of Accounting, Double entry system and Bookkeeping.
			CO4	Interpret the concepts of Capital expenditure, Revenue expenditure and Final accounts ad their significance.
			CO5	Identify knowledge and elaborate the basics of Management, its principles and various functions performed in organization.
			CO6	Recognize various personality traits, perception, attitudes of individuals working in organization.
	9HC05	**ENVIRONMENTAL SCIENCE AND ECOLOGY**	**CO1**	Understand about ecosystem and energy flow among the organisms.
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity.
			CO4	Understand the causes and effect of pollution and implement measures in control of pollution.
			CO5	Understand the sustainable development and implement green technology for sustainable development.
			CO6	Learn and implement policy to protect the environment
	9EC63	**DATABASE MANAGEMENT SYSTEMS LAB**	**CO1**	Understand how to create tables for a database and apply Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
			CO2	Explore Queries using Aggregate functions such as [COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING], Conversion functions and use string functions for a given application.
			CO3	Learn and demonstrate write programs using PL/SQL programs using exceptions, COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block

			CO4	Gain knowledge in implementing programs using WHILE LOOPS, FOR LOOPS, nested loops using BUILT– IN Exceptions and Implement Procedures.
			CO5	Understand Programs for stored functions invoke functions in SQL Statement and Implement programs for packages specification.
			CO6	Know the significance and Implement programs using features of CURSORs and its variables and develop Programs implementing Triggers.
	9FC63	**COMPUTER AIDED SOFTWARE ENGINEERING (CASE) TOOLS LAB**	**CO1**	Identify software process and software engineering practices to select and
			CO2	Justify approaches for a given project and its constraints and distinguish life cycles for developing software product.
			CO3	Understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO4	Define and design models for the requirements stated in the software project.
			CO5	Design class, object and interactive diagrams and know their significance.
			CO6	Design advanced behavioral and architectural modeling and work on case
	9FC64	**DESIGN AND ANALYSIS OF ALGORITHMS LAB**	**CO1**	Implement Merge sort algorithm for sorting a list of integers in ascending order, Dijkstra's algorithm for the single source shortest path problem.
			CO2	Implement Prim's algorithm to generate minimum cost spanning tree.
			CO3	Solve the job sequencing with deadlines problem using greedy algorithm.
			CO4	Design the solution for the 0/1 knapsack problem using implement Dynamic Programming and implement.
			CO5	Using Dynamic programming approach solve the Optimal Binary search Tree problem.
			CO6	Design and implement n-queens problem using backtracking approach.
	9E479	**COMPREHENSIVE TEST AND VIVA VOCE - IV**	**CO1**	Asses the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	9E487	**TECHNICAL SEMINAR – IV**	**CO1**	Identify topics related to Computer Scienec and Engineering domain or disruptive technologies.
			CO2	Collect, survey and organize content in PPT form.
			CO3	Present seminar in an effective manner.

	9E491	**SUMMER BREAK INTERNSHIP – I**		
III-I & A20	**8ZC22**	**BASICS OF ENTREPRENEURSHIP**	**CO1**	The students will acquire basic knowledge on Skills of Entrepreneurship.
			CO2	The students will understand the techniques of selecting the customers through the process of customer segmentation and Targeting.
			CO3	Business Models and their validity are understood by the students.
			CO4	The basic cost structure, Revenue Streams and the pricing strategies are understood by the students.
			CO5	The students will acquire knowledge about the project management and its techniques.
			CO6	The students get exposure on marketing strategies and business regulations for the Start up.
	8ZC25	**BASICS OF INDIAN ECONOMY**	**CO1**	Gain knowledge relating to Economics, various sectors and its growth.
			CO2	Will gain knowledge relating to various concepts of National income and related aggregates.
			CO3	Students will learn about Indian Industrial policy and benefits of LPG to India.
			CO4	Comprehend knowledge relating to Fiscal policy & Taxation system in India.
			CO5	Learn about inflation & business cycles.
			CO6	Know about the BoP and its influence on economy.
	8ZC05	**BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT**	**CO1**	Describe the new dimensions and products served by the banking system in INDIA.
			CO2	Explain the credit control system and create awareness on NPA's.
			CO3	Apply the knowledge of Insurance concepts in real life scenarios.
			CO4	Recognize the importance of regulatory and legal frame work of IRDA.
			CO5	Identify the risk management process and methods.
			CO6	Calculate the diversity of risk and return.
	8BC51	**INTRODUCTION TO ADDITIVE MANUFACTURING PROCESS**	**CO1**	Understand the Additive manufacturing processes and their relationship with subtractive manufacturing.
			CO2	Demonstrate comprehensive knowledge of the broad range of liquid based rapid prototype processes, devices, capabilities and materials that are available.
			CO3	Apply the principles of casting in Additive manufacturing processes.
			CO4	Articulate the various tradeoffs of Additive manufacturing software's/data format that must be

				made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements.
			CO5	Learn various applications of additive manufacturing, such as in architecture art, health care direct part production and mass customization.
	8AC46	**CONTROL SYSTEM ENGINEERING**	**CO1**	Understand basic concepts of control systems.
			CO2	Study about time response analysis.
			CO3	Understand basic concepts of stability and root locus method.
			CO4	Study about frequency response analysis.
			CO5	Learn basic concepts stability analysis in frequency domain.
			CO6	Outline fundamentals of state space analysis.
	8DC42	**EMBEDDED SYSTEMS**	**CO1**	Classify embedded systems and their applications.
			CO2	Write ALP for 8051 architecture.
			CO3	Implement interfaces for Embedded System using various protocols and hardware modules.
			CO4	Understand the principles of Communication Interface, Wireless and Mobile Systems Protocols
			CO5	Design the interrupt routines for variois OS concepts and Memory Management techniques in an RTOS Environment.
			CO6	Recognize the issues and design of basic Real-Time Operating System principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations.
	8ZC08	**DESIGN LITERACY AND DESIGN THINKING**	**CO1**	Gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
			CO2	Understand the techniques of idea generation.
			CO3	Classify different phases of design thinking.
			CO4	Realize the product design process.
			CO5	Understand design thinking for service design.
			CO6	Gain knowledge on various cases related to design thinking.
	8EC11	**SEMANTIC WEB & SOCIAL NETWORKS**	**CO1**	Appraise the role of the Web, its need and Intelligence.
			CO2	Outline the concepts of Machine Intelligence Ontology, Inference engines, Software Agents, Berners-Lee www and Semantic Road Map.
			CO3	Conceptualize Knowledge Representation for the Semantic Web with Resource Description Framework (RDF) / RDF Schema, Ontology Web Language (OWL), UML and XML Schema.

			CO4	Apply Ontology Engineering using Ontology Development Tools/ Methods, Ontology Libraries, Ontology Mapping, Logic and Inference Engines.
			CO5	Illustrate Semantic Web Applications, Services and Technology.
			CO6	Apply Social Network Analysis, Semantic web networks analysis and describe Building of Semantic Web Applications with social network features.
	8FC12	**SOFTWARE ARCHITECTURE AND DESIGN PATTERNS**	**CO1**	Explain Architecture Business Cycle, Architectural patterns, reference models, reference architectures, and architecture structures.
			CO2	Describe architecture, Quality Attributes, styles, patterns and design of Architecture along with the Documentation of architecture.
			CO3	Discuss Software Architecture evaluation, Architecture design decision making, SAAM, ATAM and CBAM. And plan software architecture in future.
			CO4	Plan and use Creational patterns and Structural patterns application development.
			CO5	Solving problems using Induction learning, Decision Tree, Statistical learning methods, learning with hidden variables, EM algorithm, Instance based learning and Neural Networks.
			CO6	Explain Behavioral patterns using Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template method and Visitor.
	8EC16	**INTRODUCTION TO DATA SCIENCE**	**CO1**	Understand basic terms related to Big Data, Data Science and Analysis of Data. Learn Statistical Inference, Probability Distributions and Fitting a model.
			CO2	Implement Data analysis techniques for solving practical problems.
			CO3	Perform Data analysis on variety of data using R.
			CO4	Exercise appropriate manipulation techniques on lists and vectors using operators in R. Comprehend the significance and use the iterative programming and functions in R.
			CO5	Learn and describe the various Dimensionality Reduction techniques available.
			CO6	Apply the suitable visualization techniques to output analytical results.
			CO1	Understandfundamental terms in Computer Graphics, various visible surface determination algorithms and midpoint and line segment analysis.

	8FC17	**COMPUTER GRAPHICS**	**CO2**	Explore 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations.
			CO3	Apply functions 2D viewing and apply clipping algorithms.
			CO4	Understand the concepts and techniques used in 3D computer graphics, including viewing transformations, hierarchical modeling, color, lighting and texture mapping.
			CO5	Apply single and multiple 3-D viewing techniques like viewing coordinates etc and also back-face detection, depth-buffer, and scan-line methods.
			CO6	Analyze the animation production pipeline and Produce a short animation.
	8FC06	**INFORMATION SECURITY**	**CO1**	Understand the fundamental concepts of Security Attacks and security standards with the model for network Security.
			CO2	Review and analyze conventional cryptographic techniques and authentication.
			CO3	Review and analyze public cryptographic techniques and outline the concepts of Kerberos and email privacy.
			CO4	Recognize architecture, key management and header formats of IPSEC.
			CO5	Outline the various web security threats and protocols.
			CO6	Understand Intrusion Detection System and Design principles of Firewalls.
	8EC04	**DATA WAREHOUSING AND DATA MINING**	**CO1**	Understand the fundamentals of Data Mining and Identify the techniques used in data preprocessing.
			CO2	Understand the fundamentals of Data Warehousing and issues of mining with respect to architectures, technologies such as OLAP.
			CO3	Learn insights of Data Mining Primitives and Infer the significance of Concept Description.
			CO4	Apply the algorithms for mining association rules in large databases.
			CO5	Discuss and apply the models of classification and use those models for the prediction of the new samples.
			CO6	Apply various clustering techniques available for numerous applications. Identify the optimal clustering technique for a particular application.
			CO1	Understand concepts of different networks, network models and transmission medias.
			CO2	Classify various data conversion techniques and

				Multiplexing, Demultiplexing techniques.
	8EC05	**DATA COMMUNICATIONS AND NETWORKS**	**CO3**	Summarize the design issues of Datalink layer and solve problems on Error and Flow control.
			CO4	Infer MAC layer protocols, various connecting devices, IP addressing concepts and design a network(using subnetting and supernetting techniques).
			CO5	Analyze various routing algorithms and outline the concepts of Internet control protocols and congestion control techniques.
			CO6	Recognize services and protocols of transport layer, application layer along with network security issues.
	8EC64	**DATA WAREHOUSING AND DATA MINING LAB**	**CO1**	Work with the ETL and Mining tools.
			CO2	Demonstrate the classification, clustering techniques on the data sets.
			CO3	Comprehend the results obtained in the clustering, Association and Classification techniques applied on the data sets with varied input parameters.
			CO4	Ability to apply mining techniques for realistic data.
	8EC65	**COMPUTER NETWORKS LAB**	**CO1**	Implement and analyze framing methods of the data link layer.
			CO2	Implement and analyze framing methods of the data link layer.
			CO3	Illustrate and implement error detection & correction techniques.
			CO4	Implement different Routing Algorithms.
			CO5	Understand basic Network Commands.
			CO6	Use of Wireshark and NS-2 tools.
	8FC65	**INFORMATION SECURITY LAB**	**CO1**	Understanding ofSymmetric Encryption Algorithms, Asymmetric Encryption Algorithms, Hash and Key Exchange, Digital Signature and Digital Envelope, Demonstration of NS3 Tool.
	8EC49	**INTELLECTUAL PROPERTY RIGHTS**	**CO1**	Demonstrate a breadth of knowledge in Intellectual property.
			CO2	Overview of Patents, Searching, filling and drafting of Patents.
			CO3	Overview of copyright & GI.
			CO4	Overview of Trade Mark & Trade Secret,
			CO5	Overview of Integrated Circuit and Industrial Design.
			CO6	Knowledge about different national and international: Conventions and Treaties Governing

				the IPRs.
	8E491	**SUMMER INDUSTRY INTERNSHIP-I**	**CO1**	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills.
III-II & A20	**8ZC23**	**ADVANCED ENTREPRENEURSHIP**	**CO1**	Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
			CO2	Exposed to the various business models and critically evaluating the effectiveness of the business models and products.
			CO3	Understand the method of business traction, create roles and build their A- team.
			CO4	Understand the various channels of revenue building and exploration of new revenue avenues.
			CO5	Understand the need of sales planning and people plan and also financial modeling.
			CO6	Exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support startups.
	8ZC26	**BASICS OF POLITY AND ECOLOGY**	**CO1**	Outline knowledge relating to the Indian Constitution and the Preamble to the Constitution.
			CO2	Relate to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
			CO3	Identify about the federal structure and judiciary of India.
			CO4	Understand knowledge relating to the conservation of the environment.
			CO5	Analyse about bio-diversity and climatic changes occurring in the environment.
			CO6	Discuss about the international treaties, conventions and organizations active in the field of environmental protection.
			CO1	Students will understand the nature of Entrepreneurship and its importance.
			CO2	Will gain knowledge regarding project, its life

				cycle and organization.
	8ZC19	**ENTREPRENEURSHIP PROJECT MANAGEMENTAND STRUCTURED FINANCE**	**CO3**	Will gain knowledge relating to project formulation and implementation.
			CO4	Comprehend the components of structured finance.
			CO5	Establish a framework of CMBS.
			CO6	Students will gain knowledge relating to the CRE Servicing.
	8BC52	**PRINCIPLES OF OPERATIONS RESEARCH**	**CO1**	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.
			CO2	Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations.
			CO3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy.
			CO4	Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost.
			CO5	Apply simulation techniques for solving various types of problems and general idea development about Markov chains.
	8AC44	**FUNDAMENTALS OF MEASUREMENTS AND INSTRUMENTATION**	**CO1**	Understand the principle of operation of different types of instruments viz., PMMC, moving iron type of instruments, the required characteristics of an instrument in general. The student demonstrates the ability to compensate for the errors in the instruments and to extend the range of the instruments.
			CO2	Demonstrates the knowledge of Potential and Current transformers; the errors in them and the effect of having an open/short in the secondary circuits; Understand the principle of operation of Dynamometer and Moving-iron type of Power factor meters.
			CO3	Understand the principle of operation of dynamometer type of Wattmeter and Induction type of Energy meter; use the wattmeter to measure the Active and Reactive power and demonstrates the ability to extend the range of them.
			CO4	Identify and use different techniques of measurement of Resistance, Inductance and Capacitance values.

			CO5	Understand the principle of operation of Different type of digital voltmeters, wave analyzers, spectrum analyzers and Cathode ray Oscilloscope.
			CO6	Demonstrates the ability in characterizing the different types of transducers and uses them to measure Strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque and Temperature.
	8DC43	**INTRODUCTION TO VLSI DESIGN**	**CO1**	Identify the working principle of diffusion, ion implantation, metallization and other basic components.
			CO2	Comprehend basic electrical properties of various types of mos transistors.
			CO3	Identify the significance of cmos logic gates and design the multiplexers.
			CO4	Draw layouts for a cmos circuit and logic design and validate them.
			CO5	Differentiate the various types of memories and clocking strategies.
			CO6	Design various combinational and sequential circuits.
	8ZC09	**CO – CREATION AND PRODUCT DESIGN**	**CO1**	Understand the inputs required for human centric design thinking the students learn the techniques of idea generation.
			CO2	Explore the different phases of Ideation process.
			CO3	Outline emerging technologies and understand 3d printing in manufacturing.
			CO4	Indicate developments of prototypes.
			CO5	Understand reverse engineering methods in product development.
			CO6	Review the information on IPR, and patent application.
	8EC12	**ADVANCED COMPUTER NETWORKS**	**CO1**	Appraise networking and Internet concepts and be familiar with OSI Model and TCP/IP model.
			CO2	Detect networking errors learn correction techniques.
			CO3	Infer the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.
			CO4	Differentiate Internet addressing IPv4 and IPv6 and Internet protocols.
			CO5	Conceptualize wireless networking and to Develop new protocols in networking.
			CO6	Design new virtual private networks.
			CO1	Outline Forensic science and Digital Forensic concepts.

	8EC22	**DIGITAL FORENSICS**	**CO2**	Comprehend the technical concepts involved in understanding the digital forensics.
			CO3	Interpret the cyber pieces of evidence, Digital forensic process model.
			CO4	Familiarize the computer operating system concepts involved in digital forensics.
			CO5	Determine the legal aspects of Digital Forensics.
			CO6	Demonstrate various forensic tools to investigate the cyber crime and to identify the digital pieces of evidence.
	8FC13	**SOFTWARE PROJECT MANAGEMENT**	**CO1**	Explain primitives of Project Planning and evolution of software economics.
			CO2	Describe software economics; reduce Software product size, improvement in software processes, improving team effectiveness, improving automation, Achieving quality.
			CO3	Explain Life cycle phases and Artifacts of the process.
			CO4	Describe Model based software architectures and Work Flows.
			CO5	Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for a iterative process within cost and schedule. Describe Project Organizations and Responsibilities.
			CO6	Describe Automation and Project Control and Process instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management.
	8EC17	**MACHINE LEARNING**	**CO1**	Understand the fundamental concepts of ML and Designing a Learning System.
			CO2	Understand the basic concepts of MLP, RBF and SVM and their applications.
			CO3	Understand the Probability models namely supervised, unsupervised, basic statistics analyze their analysis of algorithms along with their applications.
			CO4	Understand various Dimensionality Reduction Techniques and Apply various Evolutionary Algorithms with models.
			CO5	Understand the Graphical models and their applications.
			CO6	Understanding Analytical Learning and Analyze KBANN Algorithm.
			CO1	Analyze general terminology of image processing.

	8FC18	**IMAGE PROCESSING**	**CO2**	Examine various types of images, intensity transformations and spatial filtering.
			CO3	Develop Fourier transform for image processing in frequency domain.
			CO4	Evaluate the methodologies for image segmentation, restoration etc.
			CO5	Implement image process and analysis algorithms.
			CO6	Apply image processing algorithms in practical applications.
	8FC26	**C# AND .NET FRAMEWORK**	**CO1**	Introducing .Net Architecture and learn basic programming in C# and the object oriented programming concepts.
			CO2	Explain advance features and enhance skills in writing windows applications, ADO.NET and ASP.NET.
			CO3	Discuss various class libraries for different applications and data manipulation functions.
			CO4	Understand the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
			CO5	Develop distributed applications using .NET Framework.
			CO6	Create mobile applications using .NET compact Framework.
	8FC07	**AUTOMATA THEORY AND COMPILER DESIGN**	**CO1**	Design the finite automata different Languages.
			CO2	Construct finite Automata for a given regular expressions, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
			CO3	Design the push down automata and Turing Machine for complex languages.
			CO4	Understand LEX tool and relate parsing techniques.
			CO5	Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
			CO6	Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.
	8EC06	**OPERATING SYSTEMS**	**CO1**	Understand the functional architecture of an Operating System with usage of system calls.
			CO2	Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems.
			CO3	Solve issues related to process synchronization and Deadlocks in the Operating System.

			CO4	Illustrate the concepts of Memory Management.
			CO5	Outline the directory structure & analyze disk scheduling algorithms.
			CO6	Summarize the aspects of Protection and Security, and understand the concepts of I/O systems.
	8EC07	**WEB TECHNOLOGIES**	**CO1**	Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap.
			CO2	Develop dynamic programs using Javascript and Typescript.
			CO3	Develop scripts using XML and validate using parsers.
			CO4	Design a data-interchange format using JSON.
			CO5	Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
			CO6	Design responsive web applications with Forms, Scope, Dependency Injection & Services, and Single Page Application (SPA) of Angular.
			CO7	Comprehend the uses of Web servers and design the server-side scripts using Servlets.
			CO8	Design and develop server-side scripts and components using PHP.
	8FC08	**CYBER SECURITY AND CYBER LAWS**	**CO1**	Familiarize the cryptographic procedures and Understand its primitives.
			CO2	Outline Security policy in Legislation and Comprehend E-Commerce. frame work, models and its associated threats.
			CO3	Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
			CO4	Categorize international cyber laws and cyber crimes.
			CO5	Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000.
			CO6	Classify and Outline the offences under the Cyberspace law and the Internet in India.
	8FC66	**COMPILER DESIGN LAB**	**CO1**	Implementation of DFA for a given Languages/ Regular Expression.
			CO2	Usage LEX of tool to implement lexical analyzer in compiler design and implementation of Top-Down Parser.
			CO3	Usage of YACC tools for implementing bottom up parser.
	8EC66	**OPERATING SYSTEMS LAB**	**CO1**	Implement scheduling algorithms, Deadlocks, File allocation and Memory management techniques.
			CO1	Understand the basic fundamentals of computer vision and diversity of computer vision

				applications.
	8FC19	**COMPUTER VISION**	**CO2**	Explore the various camera models, multi view geometry, structures and generate 3D model from images.
			CO3	Analyze and apply image preprocessing, continuous and discrete representation methods and feature extraction techniques.
			CO4	Apply regularization theory, optical communication, stereo vision, and motion estimation techniques to detect moving objects in a video.
			CO5	Illustrate different image shape representations and understand Fourier and wavelet descriptors and segmentation methods.
			CO6	Understand various object recognition methods, Hough transforms and illustrate shape matching.
	8EC67	**WEB TECHNOLOGIES LAB**	**CO1**	Demonstrate the use of HTML tags and be able to design web pages.Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.
			CO2	Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
			CO3	Implement Angular with Expressions, Filters, Directives, Controller, and Modules.
			CO4	Develop a Single Page Application with implementation of Scope and Form.
			CO5	Implement Java servlets using Apache Tomcat Server for User authentications.
			CO6	Develop an application in PHP with Database connectivity
	8E694	**GROUP PROJECT**	**CO1**	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.

	8E681	**COMPREHENSIVE VIVA VOCE**	**CO1**	Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	8E692	**SUMMER INDUSTRY INTERNSHIP-II**		
IV-I & A20	**8EC13**	**DATABASE SECURITY**	**C01**	Comprehend the various access control rules available to assign privileges and protect data in databases.
			C02	Describe and compare the popular Security Models.
			C03	Categorize the security mechanisms and their functions.
			CO4	Identify the Security Software Design principles to protect data in databases.
			CO5	Classify and compare the Statistical Database Protection & Intrusion Detection Systems.
			CO6	Learn the new models of database systems and the models of protection.
	8FC11	**SOFTWARE REQUIREMENTS AND ESTIMATION**	**C01**	Explain need, practices and Risk issues in Software requirements.
			C02	Describe Software Requirements Engineering elements such as review, quality and priorities.
			C03	Explain software Modeling and Requirements Management.
			CO4	Apply Estimation methods for size using Mark II FPA, Full Function Points, LOC Estimation.
			CO5	Apply Cost and Schedule estimation factors during software development.
			CO6	Apply tools for Requirements Management and Estimation.
	8EC18	**BIG DATA ANALYTICS**	**C01**	Discuss the importance of big data.
			C02	Interpret the challenges with big data; elaborate the knowledge about the technological developments in big data environment.
			C03	Assess about NOSQL data environment.
			CO4	Capability of understanding the usage of big data in context to cloud and other technologies.
			CO5	Justify about map reduce work flows.
			CO6	Implement Data Analysis with HADOOP and related tools.
	8FC16	BLOCK CHAIN TECHNOLOGIES	**C01**	Understand basic principles of HDFS and digital signature.
			C02	Learn about blockchain advantages, Simplified Payment Verification protocol and its life cycle.

			C03	Explain the Nakamoto consensus and List and describe differences between proof-of-work and proof-of-stake consensus.
			CO4	Understand Bitcoin and Ethereum.
			CO5	Learn about the legal issues of Blockchain through some applications.
			CO6	Discuss new trends in Blockchain technologies.
	8EC14	**INFORMATION SECURITY. MANAGEMENT AND STANDARDS**	**C01**	Understand the Security Issues and Measures.
			C02	Know the KEY Elements and Logical Elements of Networks.
			C03	Understand the Data Leakage, its Threats and Mitigation.
			CO4	Understand the Database Security.
			CO5	Understand the Policies, Guideline and Framework of Information Security.
			CO6	Understand the Ethics, Roles and Responsibilities of ISM.
	8FC12	**AGILE SOFTWARE DEVELOPMENT**	**C01**	To understand the essence of agile development methods.
			C02	To apply the principles and practices of extreme programming in real world problems.
			C03	To incorporate proper coding standards and guidelines in an agile process.
			CO4	To optimize an agile process by exploring the possible risks and threats in the software process.
			CO5	To improve the process by eliminating waste.
			CO6	To design an agile process for a business application and deal with appropriate tradeoff.
	8EC19	**BUSINESS INTELLIGENCE**	**C01**	Elaborate the fundamentals of business intelligence.
			C02	Link data mining with business intelligence.
			C03	Apply various modeling techniques.
			CO4	Perform the data analysis and knowledge delivery stages.
			CO5	Apply business intelligence methods to various situations.
			CO6	Decide on appropriate technique for the given model.
	8FC17	**AUGMENTED AND VIRTUAL REALITY**	**C01**	Understand the fundamentals of Virtual Reality.
			C02	Comprehend multiple Models of Input and Output Interface in Virtual Reality like Gloves, Video-based Input, 3D Menus & 3DScanner etc.
			C03	Describe the fundamentals or Advanced topics of Computer Graphics.
			CO4	Explain the Interactive Techniques on VR in respect of Body Track, Hand Gesture, 3D Manus,

				Object Grasp.
			CO5	Know about the developments Tools of VR and describe.
			CO6	Familiarize the Conceptual idea on Augmented Reality and relate the illustrations.
	8F719	**SOFTWARE AUTOMATION AND TESTING**	**C01**	Describe concepts of Software testing.
			C02	Describe and apply the concepts Flow graphs, Path testing and Data Flow Testing.
			C03	Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
			CO4	Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing.
			CO5	Demonstrate Software Testing Techniques such as JADs, Pareto Analysis ,Regression Testing, Structured walkthroughs, Thread testing , Performance testing and White box testing.
			CO6	Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP.
	8EC08	**INFORMATION SECURITY**	**C01**	Get familiarized with the fundamental concepts of security attacks, security services.
			C02	Implement the conventional cryptographic techniques.
			C03	Simulate the Public key cryptography techniques.
			CO4	Comprehend IP security Architecture and its role in security framework.
			CO5	Implement SSL and TLS for Web Security.
			CO6	Design Intrusion Detection Systems and Firewall.
	8F708	**LINUX PROGRAMMING**	**C01**	Describe the basic Linux commands.
			C02	Write Shell Scripts.
			C03	Enlist various System Calls in Linux.
			CO4	Classify various system calls to handle the processes and signal the process.
			CO5	Elaborate the working of IPC.
			CO6	Demonstrate the significance of Semaphores for Kernel support and simulate program using the same.
			C01	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural

				language. Also select a search algorithm for a problem and estimate its time and space complexities.
	8EC20	**ARTIFICIAL INTELLIGENCE**	**C02**	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			C03	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
			CO6	Analyze Supervised Learning Vs. Learning Decision Trees.
	8FC20	**CYBER SECURITY**	**C01**	Understand cyber-attacks, types of cybercrimes.
			C02	Realize the importance of cyber security and various forms of cyber attacks and counter measures.
			C03	Get familiarity of cyber forensics.
			CO4	Get familiar with obscenity and pornography in cyber space and understand the violation of right of privacy on Internet.
			CO5	Appraise Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
			CO6	Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.
	8F778	**SOFTWARE AUTOMATION AND TESTING LAB**	**C01**	Prepare Test Plan document and write Test Cases for Small scale Project (Like for their B.Tech IV Year Project or Post-Graduate Projects), they are learn how to Analyze SRS document in order to prepare Test Plan Document.
			C02	Demonstrate skills to use modern software testing tools (EX: UFT, TestLink, Bugzilla, Selenium, Test Director and Quality Center) and test application (web, Window application) by using the tools.
			C03	Demonstrate the ability to differentiate between different Testing tools present in the market (like functional testing tools, Test Management Tools, Bug Tracking Tools and Performance Testing Tools) and prepare Test Plan document and write Test Cases for Small scale Project (Like for their B.Tech IV Year Project or Post-Graduate Projects).

	8F777	**LINUX PROGRAMMING LAB**	**C01**	To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
			C02	To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
			C03	To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
			CO4	To gain knowledge in implementing processes aspects, mastering the process APIs.
			CO5	To understand how to implement pipes, FIFO, how to use for communication purpose in IPC.
			CO6	To understand the significance of Semaphores for Kernel support and simulate program using the same.
	8EC76	**INFORMATION SECURITY LAB**	**C01**	Design and Implement symmetric key encryption algorithms.
			C02	Simulate asymmetric key encryption algorithms.
			C03	Implement hashing and key exchange algorithms.
			CO4	Simulate and execute Digital Signature and Digital envelope.
			CO5	Install and execute various projects in NS3.
	8E784	**PROJECT - I**	**C01**	Develop plans with relevant people to achieve the project's goals.
			C02	Break work down into tasks and determine handover procedures.
			C03	Identify links and dependencies, and schedule to achieve deliverables.
			CO4	Estimate the human and physical resources required, and make plans to obtain the necessary resources.
			CO5	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO6	Design and develop the software or prototype to meet societal needs.
	8E682	**SUMMER INDUSTRY INTERNSHIP-II**	**C01**	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			C02	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			C03	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.

			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.
IV-II & A20	**8ZC24**	**INNOVATION AND DESIGN THINKING**	**C01**	The students gain the knowledge on the inputs required for innovation and also gain familiarity on Entrepreneurship.
			C02	The students will get exposure on creative methods of ideation and the importance of protecting the ideas.
			C03	The students gain knowledge on design thinking and types of thinking.
			CO4	The students gain familiarity on emerging technologies like Internet of things (IOT).
			CO5	The students understand the process of building the startup.
			CO6	The students gain knowledge on various startup funding and also to branding building for the startup.
	8ZC27	**INDIAN HISTORY, CULTURE AND GEOGRAPHY**	**C01**	To appreciate and understand our Indian History, Culture and Indian heritage.
			C02	To understand secularism of our country.
			C03	To appreciate and understand the social reformers who brought revolutionary changes in Indian society.
			CO4	To understand earth evolution and world climatic change.
			CO5	To understand India Oceanography, Able to enhance and understand Indian monsoons, Indian agriculture.
	8ZC15	**FINANCIAL INSTITUTIONS, MARKETS AND SERVICES**	**C01**	This unit enables the students to understand the financial structure and the financial sector reforms after 1991.
			C02	The unit gives the exposure on the role of RBI and the Regulating and credit policies adopted by the RBI.
			C03	The students get awareness on the role of Non-Banking financial institutions and the role of financial institutions in India.
			CO4	The unit educates the students to know the role of regulatory bodies like SEBI and also to know the capital and money market instruments.
			CO5	The unit equips the students to understand about the asset fund based financial services.
			CO6	The students will get exposure about the investment banking and merchant banking.

	8BC52	**PRINCIPLES OF MANUFACTURING PROCESSES**	**C01**	Understand the need for manufacturing processes and various material properties.
			C02	Understand the principle of casting, Patterns used, Pattern allowance and Gating systems used in casting, and various casting methods.
			C03	Understand the basic principle of welding and distinguish between various welding types and their applications.
			CO4	Understand the principles of metal working, various types of metal working techniques, Knowledge of hot working and cold working, Ability to understand the bulk deformation processes of rolling.
			CO5	Understand the bulk deformation processes of extrusion and forging, their applications and forces involved in these operations.
			CO6	Understand and distinguish the various press working operations with respect to their applications, advantages and disadvantages, understand the various types of plastics and their processing techniques.
	8AC45	**FUNDAMENTALS OF RENEWABLE ENERGY SOURCES**	**C01**	Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
			C02	Demonstrates the knowledge of different techniques of solar collection and storage.
			C03	The student becomes familiar with the different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
			CO4	Aware of the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
			CO5	Aware of the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
			CO6	Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc.

				and the principle of operation of Fuel Cells.
	8CC44	**ELECTRONICS CIRCUIT DESIGN AND ANALYSIS**	**CO1**	Analyse and Design of BJT Single stage, multistage amplifiers at low and high frequencies.
			C02	Analyse and Design JFET and MOSFET amplifiers.
			C03	Design different types of Feedback Amplifier, Oscillators and their analysis.
			CO4	Analyse and Design power amplifiers. Understand distortions.
			CO5	Analyse and Design tuned and RF amplifiers such as single tuned, double tuned, stagger tuned and wide band amplifier.
			CO6	Understand the stability of oscillators and tuned amplifiers.
	8EC15	**MOBILE ADHOC AND SENSOR NETWORKS**	**CO1**	Recognize of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
			C02	Comprehend the characteristics of wireless sensor networks (WSNs).
			C03	Report how proactive protocols function and their implications on data transmission delay and bandwidth consumption.
			CO4	Assess how reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
			CO5	Analyze the functioning of proactive routing protocols and their implications on data transmission delay and bandwidth consumption.
			CO6	Analyze the functioning of reactive routing protocols and their implications on data transmission delay and bandwidth consumption. And become familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.
	8FC13	**ADVANCED SOFTWARE ENGINEERING**	**CO1**	Understand the issues affecting the organization, planning, and development of large and complex software systems.
			C02	Understand the concepts of software metrics and reuse-based software engineering.
			C03	Apply software engineering principles in the development of distributed software systems.
			CO4	Design and implement service-oriented software systems.
			CO5	Understand the design and development of aspect-oriented software systems.
			CO6	Understand software re-engineering process model.

	8EC21	**CLOUD COMPUTING**	**CO1**	Describe the characteristics of cloud.
			C02	Describe the cloud services.
			C03	Understand different architectures for cloud applications, Creation and running of python programs, running amazon ec2 instance
			CO4	Understand Data Intensive applications and future trends of Internet Clouds supporting Mobile Computing, Ubiquitious Computing and Social Networking.
			CO5	Discuss mapreduce and image processing app on cloud.
			CO6	Discuss cloud security architecture.
	8DC55	**INTERNET OF THINGS**	**CO1**	Get familiar with terminology, technology and applications of IoT.
			C02	Understand and explain IoT system management using M2M (machine to machine) with necessary protocols.
			C03	Design and develop Python Scripting Language programs preferred for many IoT applications.
			CO4	Use Raspberry PI as a hardware platform for designing the IoT sensor interfacing.
			CO5	Implement web based services for IoT.
			CO6	Understand and analyze the case studies illustrating IoT Design.
	8E885	**PROJECT - II**	**CO1**	Develop plans with relevant people to achieve the project's goals.
			C02	Break work down into tasks and determine handover procedures.
			C03	Identify links and dependencies, and schedule to achieve deliverables.
			CO4	Estimate the human and physical resources required, and make plans to obtain the necessary resources.
			CO5	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO6	Design and develop the software or prototype using modern software tools wherever applicable to meet societal needs.

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Course Outcomes of ECM Department

Department of Electronics and computer Engineering

COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year course/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC07	Engineering Physics	CO1	Explain semiconductor behaviour, types and their applications
			CO2	Differentiate the wave and particle, and its application for a particle in one dimension box
			CO3	Explain about emission, its types, laser principle and applications of optical fibers (sensors and medical endoscopy)
			CO4	Reveals about the magnetism-its origin and types and its applications
			CO5	Explain the basic concepts of dielectric materials, polarization and its types, their applications (piezo, ferro and Pyro electricity).
			CO6	Summarize nano& bulk concepts, surface to volume ratio and its applications.
	9FC01	Problem Solving using C	CO1	Explain basic fundamentals of Computer Systems , computing environments , Computer Languages – Machine Languages
			CO2	Describe C language Programs, Structure of a C Program
			CO3	Describe write programs using control structures such as Pre-test and post-test loops, while, do while, for, break
			CO4	Write programs implementing application on arrays
			CO5	Write programs using Pointers and string handling functions
			CO6	Write programs using Enumerated, Structure, Union types and files.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	*Basic operation of matrices and about the linear system and some analytical methods for solution.*
			CO2	*Concept of Eigen value and Eigen vector and their properties and applications.*
			CO3	*Quadratic form and its properties.*
			CO4	*Mean value theorems and their applications to the given functions, series expansions of a function.*
			CO5	*Various analytical methods to solve first order first degree and also the equations not of first degree ordinary differential equations.*
			CO6	*Methods to solve higher order ordinary differential equations.*
	9HC01	Essential English Language Skills (EELS)	CO1	*Demonstrate competence with suitable accuracy in vocabulary, and language fluency.*
			CO2	*State the definition of nouns, verbs, adjectives, and adverbs.*
			CO3	*Identify the differences of each tense and use the tenses accurately.*
			CO4	*Identify specialized reading strategies for specific types of texts*
			CO5	*Produce written work that is substantive, organized, and grammatically accurate.*
			CO6	
	9BC01		CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves

		Engineering Graphics		used in engineering
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			CO3	Draw projections of different types of regular solids in various positions wrt principal planes of projection
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software
	9HC61	Oral Communication Lab-I	CO1	*Describe people, objects and situations using simple sentences.*
			CO2	*Use appropriate tenses and expressions in different contexts of conversations.*
			CO3	*Identify major areas of concern in their oral communication and address them.*
			CO4	*Create a SMART plan to enhance their communication skills in English*
			CO5	
			CO6	
	9HC66	Engineering Physics Lab	CO1	Demonstrate the wave length of monochromatic source of light by using Newton's Rings
			CO2	Analyze refractive index of a material prism and Dispersive power of a glass Prism by using spectrometer
			CO3	Determine the wave length of spectral light and laser Source of light by using Diffraction Grating
			CO4	Design and Analyze RC Circuits
			CO5	Analyze RLC Series circuit and parallel circuit
			CO6	Investigate magnetic Circuits
	9FC61	Problem Solving using C Lab	CO1	*To formulate the algorithms for simple problems*
			CO2	*To translate given algorithms to a working and correct program*
			CO3	*To be able to correct syntax errors as reported by the compilers*
			CO4	*To be able to identify and correct logical errors encountered at run time*
			CO5	*To be able to write iterative as well as recursive programs*
			CO6	*To be able to represent data in arrays, string manipulation through a program*
			CO7	*To be able to create, read and write to and from simple text files.*

Year and regulation	Course code	Course name	Co's	
I-II & A22	9HC04	Engineering Chemistry	CO1	
			CO2	*Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.*
			CO3	*Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.*
			CO4	*Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.*
			CO5	*Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.*
			CO6	*Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques*
	9EC01	Data Structures	CO1	*Design the programs using structures, unions and enum.*
			CO2	*Demonstrate the concepts of Abstract data type and also applications of stacks and queues.*
			CO3	*Implement basic operations on single, double and circular linked list.*
			CO4	*Solve problems involving Binary Search trees and AVL trees.*
			CO5	*Articulate the concepts of graphs, heaps and hashing.*
			CO6	*Develop algorithms for various searching and sorting techniques and analyze their performance.*
	9HC12	Advanced Calculus	CO1	*Find the limits and test for the continuity and differentiability of a function.*
			CO2	*Solve the problems on multiple integrals.*
			CO3	*Solve linear and nonlinear first order partial differential equations.*
			CO4	*Find Series expansion a function defined over the intervals.*
			CO5	*Find directional derivative, gradient, divergence and curl of a function.*
			CO6	*Solve problems of line, surface and volume integrals.*
	9AC42	Electric Circuits and Networks Analysis	CO1	*Understand the principle of different methods of electrical circuit reduction.*
			CO2	*Understand the principle of single phase A.C circuits.*
			CO3	*Understand the principle of magnetic circuits.*
			CO4	*Understand the principles of network theorems along with its applications.*
			CO5	*Understand the principle two port networks along with its applications.*

			CO6	*Understand the principle of transients with both DC and AC excitation*
	9HC62	Oral Communication Lab – II	CO1	*Understand the nuances of striking a great conversation in formal and informal situations.*
			CO2	*Gain experience of facing an audience and speaking in public.*
			CO3	*Design a winning presentation and present it with ease*
			CO4	
			CO5	
			CO6	
	9HC64	Engineering Chemistry Lab	CO1	Preparation of Inorganic compounds
			CO2	Determination surface tension of a liquid
			CO3	Determination viscosity of lubricant
			CO4	Determination acid value of an oil
			CO5	Estimation hardness of water
			CO6	Analysis the amount of chloride content
			CO7	Determination of cell constant and conductance of solutions
			CO8	Determination of redox potential and emf of solutions
			C9	Determination of the rate constant of acid
			CO10	Synthesis of a polymer (Thiakol rubber / Urea-Farmaldehyde resin)
			CO11	Synthesis of a drug- Aspirin
			CO12	Estimation of Mn^{+7} by Colorimetry method
	9EC61	Data Structures using C Lab	CO1	*Write programs on structures and unions.*
			CO2	*Implement Stacks, Queues and circular queues using arrays.*
			CO3	*Write programs to implement basic operations on various types of linked list.*
			CO4	*Implement insertion and traversal operations on binary search tree*
			CO5	*Develop programs on various searching, sorting algorithms.*
			CO6	
	9BC61	Workshop/Manufacturing Processes Lab	CO1	*Use various types of conventional manufacturing Processes*
			CO2	*Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience*
			CO3	*Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.*
			CO4	*Produce small devices / products /appliances by assembling different components*
			CO5	
			CO6	

Year and regulation	Course code	Course name	Co's	
II-I & A22	9D301	Discrete Structure and Graph Theory	CO1	*Describe Connectives, Normal Forms and Theory of Inference with suitable examples.*
			CO2	*Solve problems with Predicate Calculus and generate inferences.*
			CO3	*Solve and explain Relations and Ordering problems and solve problems of Lattices.*
			CO4	*Distinguish algebraic systems like semi-groups, monoids and groups and apply concepts of Combinatorics for solving problems*
			CO5	*Solve problems with recurrence relations.*
			CO6	*Explain and apply concepts of Euler's Formula, Multigraphs, Euler's Circuits, Hamiltonian graph and Chromatic Numbers for solving problems.*
	9D309	Python and Shell Programming	CO1	*Gains exposure towards Python versions and their specifications*
			CO2	*Build programs using primitive data types and write applications that include functions, modules, packages along with respective exceptional handling mechanism*
			CO3	*Writes applications using OO features of Python and also handle files*
			CO4	*Understand and use the commands for text process, files management in the real time environment*
			CO5	*Develop the commands for data management*
			CO6	*Write shell scripts for the real time applications*
	9CC01	Electronic Devices and Circuits	CO1	*Demonstrate the concepts of pn Diode, Zener Diode, Bipolar Junction Transistor, Field Effect Transistor and their characteristics.*
			CO2	*Design and Analyze the Amplifier circuits usingBJT and FET.*
			CO3	*Classify and characterize the Feed Back amplifiers and design various Oscillator circuits.*
			CO4	*Understand the Basic regulator circuits and voltage multipliers.*
			CO5	
			CO6	
	9CC02	Digital Logic Design	CO1	*An ability to understand number systems and apply the rules of Boolean algebra and K-maps to simplify Boolean expressions.*
			CO2	*An ability to design MSI combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters.*
			CO3	*An ability to design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers*
			CO4	*An ability to design digital design using PLD's such as ROM's, PLA's, PALs and digital controllers using Algorithmic State Machine Charts.*
	9CC03		CO1	*Understand the concepts of signals, comparison of signals, orthogonal signal space and Apply the orthogonality properties to understand the Fourier methods of signal*

		Signals and Systems		*analysis- Fouries series and Fourier Transforms.*
			CO2	*Understand the concepts of systems, their characterization in the Time as well as Transformed domains and apply the mathematical tools, such as Convolution, Correlation and the Laplace transform to analyze signals and systems.*
			CO3	*Determine the sampling frequency for any low pass and band pass signals applying the sampling theorem.*
			CO4	*Distinguish between continuous and Discrete time signals and systems. Apply the concepts of Z-Transforms in the analysis of DT signals and systems.*
	9D310	Software Engineering	CO1	*Apply process models in real world software products.*
			CO2	*Classify software requirement specification document.*
			CO3	*Design system models and user interface.*
			CO4	*Evaluate test strategies for various softwares.*
			CO5	*Describe product metrics,risks.*
			CO6	*Understand the quality management.*
	9ZC01	Economics, Accountancy and Management Science	CO1	*To understand the basics of Managerial Economics at Micro level*
			CO2	*To understand cost concept*
			CO3	*To understand and identify various basic concepts of Accounting*
			CO4	*To understand the concepts of Capital expenditure*
			CO5	*To make student understand the basics of Management*
			CO6	*To make student learn about various personality traits*
	9HC05	Environmental Science and Ecology	CO1	*Understand about ecosystem and energy flow among the organisms.*
			CO2	*Know the resources available, use of them and overexploitation of the resources in the nature.*
			CO3	*Learn the value, use and value of biodiversity.*
			CO4	*Understand the causes and effect of pollution and implement measures in control of pollution.*
			CO5	*Understand the sustainable development and implement green technology for sustainable development.*
			CO6	*Learn and implement policy to protect the environment.*
	9D361	Python and Shell Programming Lab	CO1	*Install and run the Python interpreter*
			CO2	*Apply the best features of mathematics*
			CO3	*Describe the Numbers*
			CO4	*Understand and summarize different File handling operations*
	9CC71	Electronic Devices and Circuits Lab	CO1	*Understand color coding, operations on Diode, BJT, FET and other electronic components.*
			CO2	*Correlate theoretical concepts with practical implementation.*
			CO3	*Apply the knowledge of Diodes, Capacitors and Transistors for the realization of rectifiers, regulators, amplifiers and Oscillator circuits.*
			CO4	*Adapt effective Communication, presentation and report writing skills*
	9D385	Comprehensive Test and Viva Voce- III [2 Mids (Viva) and End Semester (Test and Viva) =	CO1	*Comprehend the concepts in the Core Courses of 1st year 1st Semester*
			CO2	*Assess technical knowledge to face interviews.*
			CO3	*Exhibit lifelong learning skills to pursue higher studies or professional practice.*

		30+70]		
	9D393	Technical Seminar – III	CO1	*Identify current general, political and technology related topics.*
			CO2	*Arrange and presentseminar in a effective manner*
			CO3	*Collect, survey and organize content in presentablemanner*
			CO4	*Demonstrateoratoryskillswith the aidof Power Point Presentations*
			CO5	*Exhibit interview facingskillsand teamleadingqualities*

Year and regulation	**Course code**	**Course name**	**Co's**	
II-II & A22	9HC16	Probability and Statistics	CO1	*Solve the random variable problems and probability distributions.*
			CO2	*Estimate the parameters and solve the problems using central limit theorem.*
			CO3	*Test the hypothesis related to samples concerning to the means and proportions of large size samples.*
			CO4	*Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.*
			CO5	*Solve the problems on measures of central tendency, Correlation and regression models*
			CO6	
	9EC02	Object Oriented Programming through Java	CO1	*Describe fundamentals of JAVA, its Classes, and Objects and write simple programs usingconstructors.*
			CO2	*Explain and write programs using inheritance, interface andpackages.*
			CO3	*Explain and write programs using Packages, I/O Stream andcollections.*
			CO4	*Describe and write programs to implement Exception handling andMultithreading.*
			CO5	*Describe and write programs using AWT, Swings and develop applications using event handling.*
			CO6	*Describe and develop applications using Applets and develop client server programs using networkingconcepts.*
	9D403	Computer Organization and Operating Systems	CO1	*Basicstructureofadigitalcomputer*
			CO2	*Arithmeticoperationsofbinarynumbersystem*
			CO3	*TheorganizationoftheControlunit,ArithmeticandLogicalunit,Memoryunitand theI/Ounit.*
			CO4	*Operatingsystemfunctions,types,systemcalls.*
			CO5	*Memorymanagement techniquesanddead lockavoidance*
			CO6	*Operatingsystemsfile systemimplementationanditsinterface*
	9EC03	Database Management Systems	CO1	*Comprehend importance, significance, models, Database languages, architecture and design of Data BaseSystems.*
			CO2	*Design Relational Models and apply Integrity Constraints, Querying fundamentals, Logical data base Design and Views of databases along with application of Relational Algebra.*
			CO3	*Apply queries in SQL Query using Nested Queries Set, Comparison Operators, Aggregative Operators, Logical connectivity's with Joins statements and develop applications.*
			CO4	*Eliminate data redundancy through normalforms.*
			CO5	*Ensure ACID properties and Serializability in Transaction management and*

				Database Recovery.
			CO6	*Use different External Storage Organization techniques and apply Indexing in databases to enhance systemperformance.*
	9D414	Analog and Pulse Circuits	CO1	*Distinguish between small and large signal amplifiers.*
			CO2	*Analyze and Design tuned and RF amplifiers .*
			CO3	*Understand linear and non-linear wave shapingmethods.*
			CO4	*Understand analyze and design various types of multivibrators, their analysis, designing and applications*
			CO5	*Explain different sweep generators and their applications.*
			CO6	*Analyze various types of Logic gates and Sampling gates.*
	9HC03	Soft Skills	CO1	*Assess themselves using SWOT analysis.*
			CO2	*Appraise the importance of certain soft skills like time management and goal setting.*
			CO3	*Improve their verbal ability to handle the competitive exams.*
			CO4	*Enhance their team skills and design thinking capabilities for effective problem solving and decision making.*
			CO5	*Know their emotional quotient which guides their thinking, behavior and helps the manage stress efficiently.*
			CO6	*Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews*
	9HC17	Universal Human Values	CO1	*Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.*
			CO2	*Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence*
			CO3	*Strengthening of self-reflection.*
			CO4	*Development of commitment and courage to act.*
	9HC63	Soft Skills Lab	CO1	*Assess themselves using SWOT analysis.*
			CO2	*Appraise the importance of certain soft skills like time management and goal setting.*
			CO3	*Improve their verbal ability to handle the competitive exams.*
			CO4	*Enhance their team skills and design thinking capabilities for effective proble solving and decision making.*
			CO5	*Know their emotional quotient which guides their thinking, behavior and helps themmanage stress efficiently.*
			CO6	*Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews.*
	9D463	Analog and Pulse Circuits Lab	CO1	*To understand the design and working of various linear and non-linear wave shaping circuits.*
			CO2	*To demonstrate the working principle of various multivibrators.*
			CO3	*To verify the functionalities of various logic gates.*
			CO4	*To perform and verify the BJT/ FET and feedback amplifiers.*
			CO5	*To perform and verify the working of oscillators and voltage regulators.*
			CO6	*To perform laboratory experiment to verify the conversion efficiency of various power amplifiers*
	9EC63	Database Management Systems Lab	CO1	*Create tables for a database and apply Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET,Constraints.*
			CO2	*Write Queries using Aggregate functions such as [COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING], Conversion functions and use string functions for a given application.*
			CO3	*Explain and write programs using PL/SQL programs using exceptions, COMMIT, ROLLBACK and SAVEPOINT in PL/SQLblock.*
			CO4	*Develop programs using WHILE LOOPS, FOR LOOPS, nested loops using BUILT–IN Exceptions and writeProcedures.*
			CO5	*Write Programs for stored functions invoke functions in SQL Statement and write Programs for packagesspecification.*
			CO6	*Describe and write programs using features of CURSORs and itsvariables.*
	9EC62	Object	CO1	*Write programs to generate Prime numbers, Roots of quadratic equation*

		Oriented Programming through Java Lab		*and Fibonacciseries.*
			CO2	*Write small application such as bankingsystem.*
			CO3	*Write programs on operator, function overloading and dynamic methoddispatch.*
			CO4	*Write programs to implement interface andpackages.*
			CO5	*Explain and write programs to implementthreads.*
			CO6	*Write programs to implement applets and eventhandling.*
			CO7	*Write an application to implement client and serverscenario*
	9D486	Comprehensive Test and Viva Voce- IV [2 Mids (Viva) and End Semester (Test and Viva) = 30+70]	CO1	*Comprehend the concepts in the Core Courses of 1st year 1st Semester*
			CO2	*Assess technical knowledge to face interviews.*
			CO3	*Exhibit lifelong learning skills to pursue higher studies or professional practice.*
	9D494	Technical Seminar - IV	CO1	*Identifycurrentgeneral, political and technologyrelated topics.*
			CO2	*Arrange and presentseminar in a effective manner*
			CO3	*Collect, survey and organize content in presentablemanner*
			CO4	*Demonstrateoratoryskillswith the aidof Power Point Presentations*
			CO5	*Exhibit interview facingskillsand teamleadingqualities*
			CO6	

Year and regulation	**Course code**	**Course name**	**Co's**	
	9FC05	Design and Analysis of Algorithms	CO1	*Analyze worst-case running times of algorithms using asymptotic analysis.*
			CO2	*Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.*
			CO3	*Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.*
			CO4	*Comprehend the concept of dynamic programming algorithms, their applications and analyze them.*
			CO5	*Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.*
			CO6	*Comprehend the concept of P and NP Problems and its usage in the applications.*
	9CC06	Analog and Digital Communications	CO1	*Analyze and design of various continuous wave and angle modulation and demodulation techniques*
			CO2	*Understand the effect of noise present in continuous wave and angle modulation techniques.*
			CO3	*Attain the knowledge about AM , FM Transmitters and*

III-I & A20				*Receivers*
			CO4	*Analyze and design the various Pulse Modulation Techniques.*
			CO5	*Understand the concepts of Digital Modulation Techniques and Baseband transmission, source coding and channel coding.*
			CO6	*Analyze and design of various continuous wave and angle modulation and demodulation techniques*
	8CC07	IC Applications	CO1	*Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics.*
			CO2	*Design the basic circuits using IC 741 op-amp.*
			CO3	*Explore, design and analyze active filters, timers, oscillators, voltage controlled oscillator DACs and ADCs, and IC regulators.*
			CO4	*Classify and characterize the TTL/ECL/CMOS Logic Families and design of various logic gates using them.*
			CO5	
			CO6	
	8D504	Data Communication and Computer Networks	CO1	*Identify & summarize the functionalities of each layer in the OSI model.*
			CO2	*Implement Error detection & Error correction techniques.*
			CO3	*Develop Network layer routing algorithms.*
			CO4	*Design a mechanism which can detect, prevent or recover from a security attack.*
			CO5	*Implementation of Hierarchical routing and subnets-routing algorithm.*
			CO6	*Protocols of transport layer and application layer.*
	8FC06	Information Security	CO1	*To learn the fundamental concepts of security attacks, security services.*
			CO2	*To apply conventional cryptographic techniques in order to do encryption.*
			CO3	*To apply Public key cryptography techniques in order to do encryption.*
			CO4	*To learn IP security Architecture and its role in security framework.*
			CO5	*To apply SSL and TLS for Web Security. To design and develop Intrusion Detection Systems and Firewall.*
			CO6	
	8FC65	Information Security Lab	CO1	*Understanding ofSymmetric Encryption Algorithms, Asymmetric Encryption Algorithms, Hash and Key Exchange, Digital Signature and Digital Envelope, Demonstration of NS3 Tool*
	8CC76	IC Applications Lab	CO1	*To explore the operating modesof IC 741 OP-AMP.*
			CO2	*To design applications using 741Op-Amp*
			CO3	*To understand and implement applications using 555 Timers*
			CO4	*To design D to A converters and IC voltage regulators*
			CO5	
			CO6	
	8EC77	Web Technologies Lab	CO1	*Demonstrate the use of HTML tags and be able to design web pages.Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.*
			CO2	*Develop scripts using XML and XSLT and read XML*

				documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
			CO3	*Implement Angular with Expressions, Filters, Directives, Controller, and Modules.*
			CO4	*Develop a Single Page Application with implementation of Scope and Form.*
			CO5	*Implement Java servlets using Apache Tomcat Server for User authentications*
			CO6	*Develop an application in PHP with Database connectivity*
	8D580	Summer Industry Internship - I	CO1	*Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.*
			CO2	*Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.*
			CO3	*Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.*
			CO4	*Improve their communicative skills and team skills largely improve.*
			CO5	*Work as an individual and in a team.*
			CO6	*Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.*

Year and regulation	**Course code**	**Course name**	**Co's**	
	8DC05	Microprocessors and Microcontrollers	CO1	*Understanding the concepts of 8086 Architecture*
			CO2	*Understanding the concepts of Instruction set & developing skills in writing assembly language programs.*
			CO3	*Ability to interface keyboard, stepper motor ADC, DAC to 8086 using 8255*
			CO4	*Understanding the concepts of 8051 Architecture*
			CO5	*Exploring the concepts of instruction set of 8051*
			CO6	*Ability to interface LED, LCD, Keyboard DAC, ADC with 8051*
	8CC09	Digital Signal Processing	CO1	*Distinguish between CT and DT signals and systems and understand the growing need of DSP and study the concepts of discrete time signals and systems.*
			CO2	*Represent periodic DT signals as a Fourier series; non-periodic DT signals as a Fourier Transform and use a powerful mathematical*

III-II & A20				*tool called DFT.*
			CO3	*Compute the Fourier Transform of DT signals using the FFT algorithms.*
			CO4	*Realize a digital IIR filter in several forms and structures for a given transfer function H(z)and can design IIR filter as per specifications .*
			CO5	*Design of digital FIR filters by several methods as per the given specifications and can realize FIR Filter*
			CO6	*Understand the need and implement the multirate sampling techniques*
	8D602	Automata and Compiler Design	CO1	*Convert regular expressions to finite automata, Context Free Grammar (CFG) and work with LEX and YACC tool.*
			CO2	*Parse the input string using CFG through Top down techniques.*
			CO3	*Parse the input string using CFG through Bottom up techniques.*
			CO4	*Generate intermediate code from syntax tree and analyze semantic rules.*
			CO5	*Implement various run time environments strategies.*
			CO6	*Generate machine dependent code from optimized code.*
	8FC08	Cyber Security and Cyber Laws	CO1	*Familiarize the cryptographic procedures and Understand its primitives*
			CO2	*Outline Security policy in Legislation and Comprehend E-Commerce frame work, modelsand its associated threats*
			CO3	*Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.*
			CO4	*Categorize international cyber laws and cybercrimes.*
			CO5	*Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000*
			CO6	*Classify and Outline theoffences under the Cyberspace law and the Internet in India*
	8DC66	Microprocessors and Microcontrollers Lab	CO1	*Analyze and apply working of 8086.*
			CO2	*Compare the various interface techniques. Analyze and apply the working of 8255, 8279,8259, 8251, 8257 ICs and design and develop the programs.*
			CO3	*Learning the Communication Standards.*
	8D664	Signal Processing and Communication Lab	CO1	*Analyze and simulate various signals and study their properties in time and frequency domain*
			CO2	*Understand the LTI system operation and learn to find the response for other related applications*
			CO3	*Grasp the nature and significance of communication systems using various modulation and demodulation technique like AM, FM, ASK, FSK and PSK*
			CO4	*Understand and demonstrate the process involved in analog to digital conversion*
			CO5	*Understand the concept of sampling rate conversion in terms of Interpolation and Decimation*

			CO6	*Analyze and simulate various signals and study their properties in time and frequency domain*
	8D665	Automata and Complier Design Lab	CO1	*Implement the lexical analyzer using lexical analyzer generating tool such as LEX.*
			CO2	*1. Design top down parser for the given language*
			CO3	*2. Design bottom up parser for the given language using YACC parser tool.*
	8D677	Group Project	CO1	*Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.*
			CO2	*Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.*
			CO3	*Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.*
			CO4	*Improve their communicative skills and team skills largely improve.*
			CO5	*Work as an individual and in a team.*
			CO6	*Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.*
	8D688	Comprehensive Viva Voce-V	CO1	*Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.*
	8ZC22	BASICS OF ENTREPRENEURSHIP(WADHWANI MODEL) (Open Elective-I)	CO1	*The students' will acquire basic knowledge on Skills of Entrepreneurship.*
			CO2	*The students' will understand the techniques of selecting the customers through the process of customer segmentation and Targeting*
			CO3	*Business Models and their validity are understood by the students'.*
			CO4	*The basic cost structure, Revenue Streams and the pricing strategies are understood by the students'.*
			CO5	*The students' will acquire knowledge about the project management and its techniques.*
			CO6	*The students' get exposure on marketing strategies and business regulations for the Start up.*
	8ZC25	BASICS OF INDIAN ECONOMY (OPEN ELECTIVE-I)	CO1	*Gain knowledge relating to Economics, various sectors and its growth*
			CO2	*Will gain knowledge relating to various concepts of National income and related aggregates*
			CO3	*Students will learn about Indian Industrial policy and benefits of LPG to India*
			CO4	*Comprehend knowledge relating to Fiscal policy & Taxation system in India*

			CO5	*Learn about inflation & business cycles.*
			CO6	*Know about the BoP and its influence on economy*

Year and regulation	Course code	Course name	Co's	
IV-I & A20	8D706	Embedded and Real Time Systems	CO1	*Identify and summarize the characteristics and challenges of designing an embedded system*
			CO2	*Utilize and apply ARM architecture for Embedded System Design*
			CO3	*ARM Architecture and Programming (Assembly and C)*
			CO4	*Design simple input output hardware interfaces using ARM*
			CO5	*Explain the concepts and design requirements related to a real time systems*
			CO6	*Getting embedded software into target system – Debugging*
	8D707	VLSI Design	CO1	*Understand the existing device technologies and IC fabrication process*
			CO2	*Explore and analyze the electrical properties of MOS device & Inverter design and analysis*
			CO3	*Do physical design of basic logic gates, combinational and sequential circuits*
			CO4	*Analyze the paracitic effect on IC power and performance*
			CO5	*Design memory cells and basic data-path units*
			CO6	*Explore on the need for testing and design verification of VLSI circuits*
	8DC72	Embedded Systems Lab	CO1	*After completion of this course, the student should be able to design simple input output hardware interfaces using ARMLPC2148*
	8DC73	VLSI Lab	CO1	*To learn Verilog HDL and implement digital circuits on FPGA using Xilinx tools.*
			CO2	*To draw and simulate layout for digital logic gates using Micro-wind tool*
	8D788	Python Programming Lab	CO1	*Install and run the Python interpreter*
			CO2	*Apply the best features of mathematics*
			CO3	*Describe the Numbers*
			CO4	*Understand and summarize different File handling operations*
			CO5	
			CO6	
	8D779	Project – I	CO1	*Develop plans with relevant people to achieve the project's goals*
			CO2	*Break work down into tasks and determine handover procedures*
			CO3	*Identify links and dependencies, and schedule to achieve deliverables*
			CO4	*Estimate the human and physical resources required, and make plans to obtain the necessary resources*

			CO5	*Allocate roles with clear lines of responsibility and accountability with team spirit.*
			CO6	*Design the architectures and various diagrams.*
			CO7	*Implement the designs and present the project execution.*
	8D785	Evaluation of Summer Industry Internship-II	CO1	*Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.*
			CO2	*Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.*
			CO3	*Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.*
			CO4	*Improve their communicative skills and team skills largely improve.*
			CO5	*Work as an individual and in a team.*
			CO6	
	8EC18	Big Data Analytics (PE-III)	CO1	*Understand the importance of big data*
			CO2	*Understand challenges with big data*
			CO3	*Knowledge about the technological developments in big data environment*
			CO4	*Understanding about map reduce work flows*
			CO5	*Knowledge about nosql data environment.*
			CO6	*Analysis with Hadoop and related tools*
			CO7	*Capability of understanding the usage of big data in context to cloud and other technologies.*
	8FC16	Block Chain Technologies (PE-III)	CO1	*1) Familiarize the functional/operational aspects of crypto currency ECOSYSTEM.*
			CO2	*2) Understand emerging abstract models for Block chain Technology.*
			CO3	*3) Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain*
	8EC13	Cyber Security & Cyber Laws Semantic (PE-III)	CO1	*Realize the importance of cyber security and various forms of cyber attacks and countermeasures.*
			CO2	*Get familiar with the E-Commerce frame work and the various model of E-Commerce, security threats to cyberspace and E-Commerce and the basic laws associated with it.*
			CO3	*Understand the role of electronic signatures in E-Commerce and the role of certifying authority in regulating license with the various laws relating to it.*
			CO4	*Understand the various laws related to trades and WTO, council of Europe related to cyber crimes and have awareness with the various penalty and compensation in failure to protect data.*
			CO5	*Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.*

			CO6	*Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.*

Year and regulation	**Course code**	**Course name**	**Co's**	
IV-II & A20	8D880	Project-II	CO1	*Develop plans with relevant people to achieve the project's goals*
			CO2	*Break work down into tasks and determine handover procedures*
			CO3	*Identify links and dependencies, and schedule to achieve deliverables*
			CO4	*Estimate the human and physical resources required, and make plans to obtain the necessary resources*
			CO5	*Allocate roles with clear lines of responsibility and accountability with team spirit.*
			CO6	*Design the architectures and various diagrams.*
			CO7	*Implement the designs and present the project execution.*
	8EC20	Cloud Computing (PE-V)	CO1	*Describe the characteristics of cloud*
			CO2	*Describe the cloud services.*
			CO3	*Understand different architectures for cloud applications, Creation and running of python programs, running amazon ec2 instance*
			CO4	*Understand Data Intensive applications and future trends of Internet Clouds supporting Mobile Computing, Ubiquitious Computing and Social Networking*
			CO5	*Discuss mapreduce and image processing app on cloud.*
			CO6	*Discuss cloud security architecture*

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Course Outcomes of

CSE - (Cyber Security)

Department

Department of Computer Science & Engineering (Cyber Security)
COs for A22-1st Year and 2nd Year, A20-3rd Year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC04	Engineering Chemistry	CO1	Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
			CO2	Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
			CO3	Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
			CO4	Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
			CO5	Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques
			CO6	Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.
	9FC01	Problem Solving using C	CO1	To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs(in C language)
			CO2	To test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
			CO3	To use arrays to formulate algorithms and programs and apply programming to solve matrix addition and multiplication problems and searching
			CO4	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

			CO5	To use pointers to formulate algorithms and programs.
			CO6	To apply files to do various file manipulation functions.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	Check the consistency or inconsistency of a linear system and can solve the problems.
			CO2	Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
			CO3	Find the nature, index and signature of the quadratic form.
			CO4	Verify the applicability of mean value theorems and also can express the givenstandard function in series form using Taylor's and Maclaurin series.
			CO5	Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
			CO6	Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	Essential English Language Skills (EELS)	CO1	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
			CO2	State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	Identify the differences of each tense and use the tenses accurately.
			CO4	Identify specialized reading strategies for specific types of texts
			CO5	Produce written work that is substantive, organized, and grammatically accurate
	9HC61	Oral Communication Lab-I		Describe people, objects and situations using simple sentences.
				Use appropriate tenses and expressions in different contexts of conversations.
				Identify major areas of concern in their

				oral communication and address them.
				Create a SMART plan to enhance their communication skills in English
	9HC64	Engineering Chemistry Lab	CO1	Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
			CO2	Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
			CO3	Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
			CO4	Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
			CO5	Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques
			CO6	Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.
	9FC61	Problem Solving using C Lab	CO1	Enumerate the algorithms for simple problems
				Classify the given algorithms to a working and correct program
				Correct the syntax errors as reported by the compilers
				Identify and correct logical errors encountered at run time
				Write iterative as well as recursive programs
				Represent data in arrays, strings and structures and manipulate them through a program
				Declare pointers of different types and use them in defining self referential structures.
				Create, read and write to and from simple text files.
	9BC61	Workshop/Manufacturing Processes Lab		Use various types of conventional manufacturing Processes
				Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
				manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
				Produce small devices / products

				/appliances by assembling different components
I-II & A22	**9HC07**	Engineering Physics	CO1	Differentiate the wave and particle, de-Broglie matter waves its experimental evidence, Schroedinger's wave concept and its application for a particle in one dimension box.
			CO2	Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy)
			CO3	Reveals about the magnetism-its origin and types, Hysteresis, domain theory, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
			CO4	Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (Piezo, Ferro and Pyro electricity).
			CO5	Explain semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
			CO6	Summarize nano& bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD & TEM.
	9EC01	Data Structures	CO1	Design the programs using structures, unions and enum.
			CO2	Demonstrate the concepts of Abstract data type and also applications of stacks and queues.
			CO3	Implement basic operations on singly, doubly and circular linked list.
			CO4	Solve problems involving Binary Search trees and AVL trees.

			CO5	Develop algorithms for various searching and sorting techniques and analyze their performance.
			CO6	Articulate the concepts of graphs, heaps and hashing.
	9HC12	Advanced Calculus	CO1	Find the limits and test for the continuity and differentiability of a function.
			CO2	Solve the problems on multiple integrals.
			CO3	Solve linear and nonlinear first order partial differential equations.
			CO4	Find Series expansion a function defined over the intervals.
			CO5	Find directional derivative, gradient, divergence and curl of a function.
			CO6	Solve problems of line, surface and volume integrals.
	9BC01	Engineering Graphics	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			CO2	Understand Orthographic projections and draw projections of simple drawing entities such as points Lines.
			CO3	Draw projections of different types of regular Planes, solids in various positions wrt principal planes of projection
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections
			CO5	Construct Isometric Scale, Isometric Projections and Views
			CO6	Convert Isometric to orthographic views and understand basic sketching using computer aided design (CAD) software.
	9AC48	Basic Electrical and Electronics Engineering	CO1	Outline the fundamentals of electrical engineering and DC machines
			CO2	Summarize the principles of AC circuits.
			CO3	Inspect the principle and operation of three phase induction motor and measuring instruments
			CO4	Comprehend the principle and operation of diode.
			CO5	Explain the principle and operation of transistor.
			CO6	Enlist and describe the principles of digital

				electronics.
	9HC62	Oral Communication Lab-II	CO1	Strike a conversation and engage in effective small talk
			CO2	Lose stage fear and confidently interact with others in different roles and tap their creative side.
			CO3	Speak for a minute, fluently and cohesively.
			CO4	Make official presentations with effective use of PPTs.
			CO5	Engage in group discussions in a confident and professional manner.
			CO6	Shed fear of questions from the audience and the interviewers.
	9HC66	Engineering Physics Lab		Understand the concepts of photo electric effect, importance, photo current, colour filters, optical sensors.
				Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
				Recognize the difference between the interference and diffraction, grating, laser characteristics.
				Analyze the concepts of fiber optics, fundamentals, numerical aperture its importance, attenuation in fiber and applications
				Understand and search to apply the fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law
				Know the difference between AC and DC fundamentals, Magnetostriction, resonance, air column vibrations
				Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance, capacitance and electrical and electronic fundamentals
				Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook's law.
				Analyze the concept a semiconductors, types, calculation of energy gap of a semiconductor diode and importance
				Analyze the difference between normal diode & LED, forward bias, reverse bias,

				I-V characteristics, direct and indirect band gap semiconductors.
	9EC61	Data Structures using C Lab	CO1	Write programs on structures and unions.
			CO2	Implement Stacks, Queues and circular queues using arrays.
			CO3	Write programs to implement basic operations on various types of linked list.
			CO4	Implement insertion and traversal operations on binary search tree
			CO5	Develop programs on various searching, sorting algorithms.
II-I A22	9HC16	Probability and Statistics	CO1	Solve the random variable problems and probability distributions.
			CO2	Estimate the parameters and solve the problems using central limit theorem.
			CO3	Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	Solve the problems on measures of central tendency, Correlation
			CO6	Classify and differentiate various regression models
	9AC48	**Elements of Electrical and Electronics Engineering**	CO1	Understand the fundamentals of electrical engineering and DC machines.
			CO2	Understand the principles of AC circuits.
			CO3	Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	Comprehend the principle and operation of diode.
			CO5	Understand the principle and operation of transistor.
			CO6	Understand the principles of digital electronics
	9EC02	**Object Oriented Programming through Java**	CO1	Comprehend the fundamentals of Java, Classes, Objects and design the java programs using constructors and String handling methods.
			CO2	Design the programs using inheritance, polymorphism and interface.

			CO3	Develop programs using Packages, I/O Streams and collections.
			CO4	Apply the concepts of Exception handling and Multithreading for various scenarios.
			CO5	Create programs using AWT, Swings and develop applications using event handling.
			CO6	Develop applications using Applets and client server programs using networking concepts.
	9F303	**Discrete Mathematics**	CO1	Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
			CO2	Reasoning about arguments represented in Predicate logic.
			CO3	Perform operations on sets, functions, relations.
			CO4	Solve problems that involve: computing permutations and combinations, Binomial and Multinomial theorems
			CO5	Analyze and deduce problems involving recurrence relations and generating functions
			CO6	Apply graph theory Spanning trees, planar graphs, Isomorphism and connectivity
	9DC10	**Computer Organization & Architecture**	CO1	Perceive basic operational concept of computer and data processing.
			CO2	Use data types with instruction set of specified architecture
			CO3	Justify different control unit design and algorithms for various operations.
			CO4	Elaborate basic architecture of 8086 processor
			CO5	Write assembly language programming and debug to 8086
			CO6	Interface devices to 8086 processor
	9D310	**Software Engineering**	CO1	Apply process models in real world software products.
			CO2	Classify software requirement specification document.
			CO3	Design system models and user interface.
			CO4	Evaluate test strategies for various software's.
			CO5	Describe product metrics, risks.
			CO6	Comprehend the quality management
	9HC17	**Universal Human Values**	CO1	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature,

				which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values
			CO2	Understanding Harmony is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.
	9EC62	**Object Oriented Programming through Java Lab**	CO1	Write programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
			CO2	Write small application such as banking system.
			CO3	Write programs on operator, function overloading and dynamic method dispatch.
			CO4	Write programs to implement interface and packages.
			CO5	Explain and write programs to implement threads.
			CO6	Write programs to implement applets and event handling.
				Write an application to implement client and server scenario
	9EC77	**Software Engineering and Computer Organization Lab**	CO1	Identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish life cycles for developing software product.
			CO2	Outline the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO3	Define and design models for the requirements stated in the software project.
			CO4	Design class, object and interactive diagrams and know their significance.
			CO5	Design advanced behavioral and architectural modeling and work on case studies.
	9AC77	**Elements of Electrical and Electronics Engineering Lab**	CO1	Understand the working of single-phase transformer under different conditions, the performance of three phase induction motor,

				different speed control methods of DC motor with and without loading with its performance.
			CO2	Understand the applications of Thevenin's Theorem in circuit analysis.
			CO3	Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
			CO4	Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
			CO5	Explain and demonstrate working of PN Junction and Zener diode.
			CO6	Explain and demonstrate working Half and Full wave Rectifier without filters.
				Demonstrate working of CE characteristics and its application as an amplifier
	9J386	**Technical Seminar - III**	CO1	Identify topics related to Computer Science and Engineering domain
			CO2	Collect, survey and organize content in PPT form
			CO3	Present seminar in an effective manner
II-II A22	**9EC41**	**Introduction to Cyber Security**	CO1	Describe typical threats to modern digital systems,
			CO2	Outline techniques of defense against each threat.
			CO3	Describe the fundamentals of modern cryptography
			CO4	Compare popular computer and network security mechanisms and protocols used in Authentication and Remote Access.
			CO5	Categorize the procedures used in the intrusion detection and prevention systems.
			CO6	Identify security tasks that need to be used in e-banking by experts
	9FC05	**Data Communications and Computer Networks**	CO1	To Study in detail about various analog and digital modulation and demodulation
			CO2	techniques.
			CO3	To have a thorough knowledge of various multiplexing schemes and Data communication protocols,
			CO4	To Learn flow control, error control and access control mechanisms.
			CO5	To Learn routing and congestion control algorithms, internet protocols.
			CO6	To Understand Transport layer entities such as DNS and HTTP

	9EC03	**Database Management Systems**	CO1	Analyze importance and significance of models, Database languages, architecture and design of Data Base Systems.
			CO2	Understand Relational Model – Integrity Constraints, Logic
			CO3	Analyze data base Design and Views of databases, queries using Relational Algebra and Relational Calculus.
			CO4	Solve Queries with Comparison Operators, Aggregative Operators and nested queries. Queries with joins.
			CO5	Apply Schema refinement through all forms of Normalization to eliminate database redundancy.
			CO6	Apply ACID properties in transaction. Ensuring serializability in concurrent transactions. Concurrent control methods and recovery of transaction.
				Analyze External Storage Organization mechanisms and apply Indexing in databases for query optimization to enhance system performance
	9EC06	**Operating Systems**	CO1	Understand the functional architecture of an Operating System with usage of system calls.
			CO2	Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems.
			CO3	Solve issues related to process synchronization and Deadlocks in the Operating System.
			CO4	Illustrate the concepts of Memory Management.
			CO5	Outline the directory structure & analyze disk scheduling algorithms.
			CO6	Summarize the aspects of Protection and Security, and understand the concepts of I/O systems.
	9CC55	**Digital Electronics**	CO1	Apply the rules of Boolean algebra to simplify Boolean expressions.
			CO2	Simplify of Boolean expressions using K-map.
			CO3	Design MSI combinational circuits such as full adders, multiplexers, decoders, encoders.

				Code converters.
			CO4	Design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers
			CO5	Create digital design using PLD's such as ROM's, PLA's, PAL s.
			CO6	Design the digital controllers using Algorithmic State Machine Charts
	9ZC01	**Economics, Accountancy and Management Science**	CO1	Acquire the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular
			CO2	Gain exposure on Cost concept, Revenues and Market structure and describe the concepts
			CO3	Comprehend the basic concepts of Accounting, Double entry system and Bookkeeping.
			CO4	Interpret the concepts of Capital expenditure, Revenue expenditure and Final accounts ad their significance.
			CO5	Gain knowledge and elaborate the basics of Management, its principles and various functions performed in organization.
			CO6	Recognize various personality traits, perception, attitudes of individuals working in organization
	9HC03	**Soft Skills**	CO1	Assess themselves using SWOT analysis.
			CO2	Appraise the importance of certain soft skills like time management and goal setting.
			CO3	Improve their verbal ability to handle the competitive exams.
			CO4	Enhance their team skills and design thinking capabilities for effective problem solving and decision making.
			CO5	Know their emotional quotient which guides their thinking, behavior and helps them manage stress efficiently.
			CO6	Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews
	9EC63	**Database Management Systems Lab**	CO1	Create tables for a database and apply Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.

			CO2	Write Queries using Aggregate functions such as [COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING], Conversion functions and use string functions for a given application.
			CO3	Explain and write programs using PL/SQL programs using exceptions, COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
			CO4	Develop programs using WHILE LOOPS, FOR LOOPS, nested loops using BUILT–IN Exceptions and write Procedures.
			CO5	Write Programs for stored functions invoke functions in SQL Statement and write Programs for packages specification.
			CO6	Describe and write programs using features of CURSORs and its variables.
				Develop Programs implementing Triggers
	9EC66	**Operating Systems Lab**	CO1	Simulate and implement operating system concepts such as scheduling, deadlock management, page replacement techniques, file management and memory management
	9EC65	**Computer Networks Lab**	CO1	Implement and analyze framing methods of the data link layer.
			CO2	Illustrate and implement error detection & correction techniques.
			CO3	Implement different Routing Algorithms.
			CO4	Understand basic Network Commands.
			CO5	Demonstrate the features of NS2 tool
	9J479	**Comprehensive Test and Viva Voce - IV**	CO1	Assesed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year
	9J487	**Technical Seminar – IV**	CO1	Identify topics related to Computer Science and Engineering domain or disruptive technologies
			CO2	Collect, survey and organize content in PPT form
			CO3	Present seminar in an effective manner

Year and regulation	**Course code**	**Course name**	**Co's**	
	9ZC22	Basics of Entrepreneurship	CO1	The students will acquire basic knowledge onSkills of Entrepreneurship.
			CO2	The students will understand the techniques ofselecting the customers through the process of customer segmentation and Targeting
			CO3	Business Models and their validity are understood by the students.
			CO4	The basic cost structure, Revenue Streams and the

				pricing strategies are understood by the students.
			CO5	The students will acquire knowledge about theproject management and its techniques.
			CO6	The students get exposure on marketing strategiesand business regulations for the Start up.
III-I & A20	8EC20	Cloud Computing	CO1	Summarize the characteristics of cloud models.
			CO2	Demonstrate the different kinds of cloud services.
			CO3	Analyze different architectures for c through python programs
			CO4	Assess the performance of cloud services and summarize the innovative applications of IOT oncloud.
			CO5	Design architecture of an Apps such as map reduce, image processing app etc on cloud.
			CO6	Understand various security aspects in cloud.
	8FC06	Information Security	CO1	Understand the fundamental concepts of SecurityAttacks and security standards with the model for network Security.
			CO2	Review and analyze conventional cryptographic techniques and authentication
			CO3	Review and analyze public cryptographic techniques and outline the concepts of Kerberosand email privacy
			CO4	Recognize architecture, key management and header formats of Ipsec
			CO5	Outline the various web security threats and protocols
			CO6	Understand Intrusion Detection System Design principles of Firewalls
	8EC07	Web Technologies	CO1	Demonstrate the use of HTML tags. Apply Stylesusing CSS and Bootstrap.
			CO2	Develop dynamic programs using Java script and Typescript.
			CO3	Develop scripts using XML and validate using parsers and design a data-interchange formatusing JSON.
			CO4	Comprehend the uses of Web servers and design the server-side scripts using Servlets

			CO5	Design and develop server-side and scripts components using PHP.
			CO6	Design responsive web applications with Forms,Scope, Dependency Injection & Services, and Single Page Application (SPA) of Angular.
	8FC05	Design and Analysis of Algorithms	CO1	alyze worst-case running times of algorithms usingmptotic analysis.
			CO2	Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
			CO3	scribe the greedy paradigm and explain when an orithmic design situation calls for it. Recite orithms that employ this paradigm. Synthesize edy algorithms, and analyze them.
			CO4	mprehend the concept of dynamic programming orithms, their applications and analyze them.
			CO5	alyze the Backtracking and Branch and Bound orithms and also identify the scenarios for its plicability.
			CO6	mprehend the concept of P and NP Problems and usage in the applications.
	8MC13	Fundamentals of Data Science	CO1	Learn about various data types, types of datasets a data quality
			CO2	Implementation of R fundamentals and perform factors and data frames.
			CO3	Implementation of data structures iterative programming & function concepts using R
			CO4	Learn about data visualization techniques and apply suitable visualization techniques
			CO5	Learn about dimensionality reduction based on examples illustrations
			CO6	Perform predictive data analysis on variety of data along with appropriate statistical tests using R.
	8HC05	Environmental Science and Ecology	CO1	Understand about ecosystem and energy flowamong the organisms.
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity.
			CO4	Understand the causes and effect of pollution and implement measures in control of
			CO5	Understand the sustainable development and implement green technology for sustainable development.

			CO6	Learn and implement policy to protect theenvironment.
	8JC61	Web Technologies and Information Security Lab	CO1	Design and implement dynamic webpages using HTML, Javascript, XML, servlets, and PHP.
				Implement various cryptographic, hashing and key exchange techniques.
	8MC61	Design and Analysis of Algorithms and R Programming Lab	CO1	Implement Merge sort algorithm for sorting a list of integers in ascending order, Dijkstra's algorithm for the single source shortest pathproblem.
			CO2	Implement Prim's algorithm to generate minimum cost spanning tree.
			CO3	Solve the job sequencing with deadlines problem using greedy algorithm.
			CO4	Design the solution for the 0/1 knapsack problemusing implement Dynamic Programming and implement.
			CO5	Using Dynamic programming approach solve the Optimal Binary search Tree problem.
			CO6	Design and implement n-queens problem usingbacktracking approach.
	8J491	Summer Industry Internship –I (Evaluation of Summer Internship- 2 Internal Reviews and 1External Evaluation)	CO1	
			CO2	
			CO3	
			CO4	
			CO5	
			CO6	
III-II& A20	8ZC23	Advanced Entrepreneur ship	CO1	Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
			CO2	Exposed to the various business models and criticallyevaluating the effectiveness of the business models and products
			CO3	Understand the method of business traction, create rolesand build their A- team
			CO4	Understand the various channels of revenue building andexploration of new revenue avenues.
			CO5	Understand the need of sales planning and people plan andalso financial modeling
			CO6	Exposed to the legal implications affecting the company'sprospects and identifying right mentors and advisors to support startups
			CO1	Understand the importance of business intelligenceand its applications in today's world.

	8EC19	Business Intelligence	CO2	Illustrate the different form of analytics such as business analytics, predictive analytics.
			CO3	Compare in detail the various aspects of business intelligence.
			CO4	Understand the technological components of operational intelligence.
			CO5	Analyze and understand the broad concepts in
				prescriptive analytics with Decision Tables.
			CO6	Apply business intelligence process for
	8EC04	Data Warehousing and Data Mining	CO1	Understand the fundamentals of Data Mining and Identify the techniques used in data preprocessing.
			CO2	Understand the fundamentals of Data Warehousing and issues of mining with respect toarchitectures, technologies such as OLAP.
			CO3	Learn insights of Data Mining Primitives and Infer the significance of Concept Description.
			CO4	Apply the algorithms for mining association rules in large databases.
			CO5	Discuss and apply the models of classification anduse those models for the prediction of the new samples.
			CO6	Apply various clustering techniques available for numerous applications. Identify the optimalclustering technique for a particular application
	8FC08	Cyber Security and Cyber Laws	CO1	Familiarize the cryptographic procedures and Understand its primitives
			CO2	Outline Security policy in Legislation Comprehend E-Commerce framework, models and its associated threats
			CO3	Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
			CO4	Categorize international cyber laws cybercrimes.
			CO5	Explore Penalties, Compensation and Adjunction of violations of provisions of IT

				Act 2000
			CO6	Classify and outline the offences under the Cyberspace law and the Internet in India
	8LC01	Introduction to Artificial Intelligence	CO1	Learn the distinction between optimal reasoning vs. human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Search algorithm for a problem and estimate its time and space complexities.
			CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			CO3	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and Space complexities.

			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks, analyzeSupervisedLearningvs.LearningDecision Trees.
	8FC07	Automata Theory and Compiler Design	CO1	Design the finite automata different Languages
			CO2	Construct finite Automata for a given regular expressions, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
			CO3	Design the push down automata and Turing Machine for complex languages.
			CO4	Understand LEX tool and relate parsing techniques
			CO5	Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
			CO6	Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.
	8JC62	Data Mining Lab and Artificial Intelligence Lab		
			CO1	Demonstrate the classification, clustering techniques on the data sets.
			CO2	Comprehend the results obtained in the clustering, Association and Classification techniques applied on the data sets with varied input parameters.
			CO3	Implement the simple AI programs using prolog.
	8JC63	Cyber Security and Compiler Design Lab	CO1	Use Autopsy tool to perform Memory capture and analysis.
			CO2	Demonstrate Network analysis using Network miner tools
			CO3	Demonstrate Lex and Yacc tools to simulate the grammar types used in the compilers.
	8J681	Comprehensive Viva Voce		
			CO1	Describe the core concepts of the subjects that they have studied till the completion of that academic year.
			CO2	Comprehensive Viva Voce will be conducted in third year second semester for 100 marks. Out of 100 marks 30 marks are evaluated internally and 70 marks for external evaluation.
			CO3	**Internal:**Comprehensive Viva Voce is conducted twice in a semester and evaluated for 30 marks each and average will be considered for internal.

	8J694	Group Project	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.

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Course Outcomes of CSE - (AIML) Department

Department of Computer Science & Engineering (Artificial Intelligence & Machine Learning)
COs for A22-1st Year and 2nd Year, A20-3rd year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC04	Engineering Chemistry	CO1	Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
			CO2	Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
			CO3	Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
			CO4	Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
			CO5	Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques
			CO6	Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.
	9FC01	Problem Solving using C	CO1	To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs(in C language)
			CO2	To test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
			CO3	To use arrays to formulate algorithms and programs and apply programming to solve matrix addition and multiplication problems and searching
			CO4	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
			CO5	To use pointers to formulate algorithms and programs.
			CO6	To apply files to do various file manipulation functions.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	Check the consistency or inconsistency of a linear system and can solve the problems.
			CO2	Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
			CO3	Find the nature, index and signature of the quadratic form.
			CO4	Verify the applicability of mean value theorems and also can express the given standard function in series form using Taylor's and Maclaurin series.
			CO5	Find the solutions of first order first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
			CO6	Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	Essential English Language Skills (EELS)	CO1	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
			CO2	State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	Identify the differences of each tense and use the tenses accurately.
			CO4	Identify specialized reading strategies for specific types of

				texts
			CO5	Produce written work that is substantive, organized, and grammatically accurate.
			CO6	Understand the appropriate use of active and passive voice in certain context
	9HC61	Oral Communication Lab – I	CO1	Describe people, objects and situations using simple sentences.
			CO2	Use appropriate tenses and expressions in different contexts of conversations.
			CO3	Identify major areas of concern in their oral communication and address them.
			CO4	Create a SMART plan to enhance their communication skills in English
			CO5	
			CO6	
	9HC64	Engineering Chemistry Lab	CO1	To reparation of Inorganic compounds , To determine surface tension of a liquid
			CO2	To determine viscosity of lubricant, To determine acid value of an oil.
			CO3	To estimate hardness of water, To analyze the amount of chloride content.
			CO4	To determine cell constant and conductance of solutions, To determine redox potential and emf of solutions.
			CO5	To determine the rate constant of acid , To synthesize a polymer (Thiakol rubber / Urea-Farmaldehyde resin).
			CO6	To synthesize a drug- Aspirin, To estimate of Mn^{+7} by Colorimetry method.
	9FC61	Problem Solving using C Lab	CO1	To be able to understand the fundamentals of programming in C Language
			CO2	To be able to write, compile and debug programs in C
			CO3	To be able to formulate problems and implement in C.
			CO4	To be able to effectively choose programming components
			CO5	To solve computing problems in real-world.
			CO6	To be able to understand the fundamentals of programming in C Language
	9BC61	Workshop / Manufacturing Processes Lab	CO1	Use various types of conventional manufacturing Processes
			CO2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
			CO3	Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			CO4	Produce small devices / products /appliances by assembling different components
			CO5	
			CO6	
	9HC18	Induction Program	CO1	Learns Being a human, understands human values and purpose of education
			CO2	Understands the importance of different harmony levels needed. Understand Self and being in the current moment are the sources of happiness.
			CO3	Improves Learning capabilities and communication skills.
			CO4	Improves Personality Development and Life Skills
			CO5	Understands and appreciate the importance of personality development and yoga for a holistic life.
			CO6	Understands the essence and Values and Social responsibilities for successful life.

Year and regulation	Course code	Course name	Co's	
I-II & A22	9HC07	Engineering Physics	CO1	Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schroedinger's wave concept and its application for a particle in one dimension box.
			CO2	Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy).
			CO3	Classify magnetism types, Hysteresis, domain theory, Anti-ferro and ferri-magnetism, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
			CO4	Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).
			CO5	Elaborate semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
			CO6	Summarize nano& bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD, SEM,
	9EC01	Data Structures	CO1	Demonstrate the concepts of Abstract data type and also applications of stack and Queues
			CO2	Select the data structure that efficiently model the information in a problem
			CO3	Design programs using variety of data structures including Trees, AVL Trees and Graphs and their applications.
			CO4	Solve problems and also assess efficiency trade off among searching and sorting using time complexity of each algorithm and also the applications of hashing and hash tables.
			CO5	Describe the concepts of OOPs and implement programs using objects, classes, constructors and destructors.
			CO6	Apply concepts of OOPs to write program on over loading functions and concepts of inheritance.
	9HC12	Advanced Calculus	CO1	Find the limits and test for the continuity and differentiability of a function.
			CO2	Solve the problems on multiple integrals.
			CO3	Solve linear and nonlinear first order partial differential equations.
			CO4	Find Series expansion a function defined over the intervals.
			CO5	Find directional derivative, gradient, divergence and curl of a function.
			CO6	Solve higher order ordinary differential equations with

				constant coefficients using some standard methods.
	9AC48	Basic Electrical and Electronics Engineering	CO1	Understand the fundamentals of electrical engineering and DC machines.
			CO2	Understand the principles of AC circuits.
			CO3	Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	Understand the principle and operation of diode.
			CO5	Understand the principle and operation of transistor.
			CO6	Understand the principles of digital electronics.
	9HC62	Oral Communication Lab - II	CO1	Understand the nuances of striking a great conversation in formal and informal situations.
			CO2	Gain experience of facing an audience and speaking in public.
			CO3	Design a winning presentation and present it with ease.
			CO4	Understand the nuances of striking a great conversation in formal and informal situations.
			CO5	
			CO6	
	9HC66	Engineering Physics Lab	CO1	Understand the concepts of photo electric effect
			CO2	Know about the light properties-dispersion
			CO3	Recognize the difference between the interference and diffraction
			CO4	Analyze the concepts of fiber optics
			CO5	Understand and search to apply the fundamentals of magnetic induction
			CO6	Know the difference between AC and DC fundamentals
	9EC61	Data Structures using C Lab	CO1	Implement Stacks, Queues and circular queues.
			CO2	Write programs using tree traversals. In-order, preorder and post-order.
			CO3	Program searching, sorting and hashing operations.
			CO4	Write programs on Binary trees
			CO5	Implement classes and operator overloading.
	9BC01	Engineering Graphics	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			CO3	Draw projections of different types of regular solids in various positions wrt principal planes of projection
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software

Year and regulation	Course code	Course name	Co's	
II-I & A22	9EC02	Object Oriented Programming through Java	CO1	Understand and comprehend the fundamentals of JAVA, its Classes, and Objects and write simple programs using constructors.
			CO2	Write programs using inheritance, interface and packages.
			CO3	Implement programs using Packages, I/O Stream and collections.
			CO4	Implement Exception handling and Multithreading.
			CO5	Design programs using AWT, Swings and develop applications using event handling.
			CO6	Develop applications using Applets and develop client server programs using networking concepts.
	9HC15	Probability and Statistics	CO1	Solve the random variable problems and probability distributions.
			CO2	Estimate the parameters and solve the problems using central limit theorem.
			CO3	Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	Solve the problems on measures of central tendency, Correlation
			CO6	Classify and differentiate various regression models
	9HC16	Quantitative Aptitude and Logical Reasoning	CO1	Number system, HCF and LCM, Averages, Ages and ratio and proportion.
			CO2	Various important topics of quantative aptitude.
			CO3	Mensuration and data interpretation topics.
			CO4	Series Completion, analogy, classification and coding and decoding topics.
			CO5	Various topics of logical reasoning.
			CO6	Venn-diagrams, cubes and dice and also on clocks and calendar problems.
	9FC02	Python Programming	CO1	Select Python versions and mention their specifications.
			CO2	Build programs using primitive data types.
			CO3	Design applications that include functions, modules, packages along with respective exceptional handling mechanism.
			CO4	Design applications using OO features of Python
			CO5	Write applications using Files.
			CO6	Make use of NumPy/Tkinter/Plotpy modules in applicaitons.
	9F303		CO1	Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
			CO2	Reason about arguments represented in Predicate logic.

		Discrete Mathematics	CO3	Perform operations on discrete structures such as sets, functions, relations, and sequences.
			CO4	Solve discrete mathematics problems that involve: computing permutations and combinations of a set.
			CO5	Analyze and deduce problems involving recurrence relations and generating functions.
			CO6	Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling.
	9HC03	Universal Human Values	CO1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
			CO2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
			CO3	Strengthening of self-reflection.
			CO4	Development of commitment and courage to act.
			CO5	
			CO6	
	9EC62	Object Oriented Programming through Java Lab	CO1	Write programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
			CO2	Write small application such as banking system.
			CO3	Write programs on operator, function overloading and dynamic method dispatch.
			CO4	Write programs to implement interface and packages.
			CO5	Explain and write programs to implement threads.
			CO6	Write programs to implement applets and event handling.
	9LC61	Python Programming Lab and IT workshop	CO1	Install and run the Python interpreter
			CO2	Apply the best features of mathematics
			CO3	Describe the Numbers
			CO4	Understand operations and summarize different File handling
	9AC95	Basic Electrical and Electronics Engineering Lab	CO1	Examine the performance of DC machines and AC Machines. (L4)
			CO2	Illustrate the principles circuit theorems. (L2)
			CO3	Examine the principle of operation of diode and its applications. (L4) Analyze the principle of operation of transistor. (L4)
			CO4	Develop the principles of Verification of Logic gates. (L3) Examine the performance of DC machines and AC Machines. (L4)
			CO5	Illustrate the principles circuit theorems. (L2)
			CO6	Examine the principle of operation of diode and its applications. (L4)

Year and regulation	Course code	Course name	Co's	
II-II & A22	9CC56	Computer Organization and Architecture	CO1	Perceive basic operational concept of computer and data processing.
			CO2	Use data types with instruction set of specified architecture
			CO3	Justify different control unit design and algorithms for various operations.
			CO4	Elaborate basic architecture of 8086 processor
			CO5	Write assembly language programming and debug to 8086
			CO6	Interface devices to 8086 processor.
	9FC04	Database Management Systems	CO1	Comprehend importance, significance, models, Database languages, architecture and design of Data Base Systems.
			CO2	Design Relational Models and apply Integrity Constraints, Querying fundamentals, Logical data base Design and Views of databases along with application of Relational Algebra.
			CO3	Apply queries in SQL Query using Nested Queries Set, Comparison Operators, Aggregative Operators, Logical connectivity's with Joins statements and develop applications.
			CO4	Eliminate data redundancy through normal forms.
			CO5	Ensure ACID properties and Serializability in Transaction management and Database Recovery.
			CO6	Use different External Storage Organization techniques and apply Indexing in databases to enhance system performance.
	9EC16	Introduction to Data Science	CO1	At the end of this course, the student will be able to
			CO2	Learn about various data types, types of data sets a data quality
			CO3	Implementation of R fundamentals and perform factors and data frames.
			CO4	Implementation of data structures iterative programming & function concepts using R
			CO5	Learn about data visualization techniques and apply suitable visualization techniques
			CO6	Learn about dimensionality reduction based on examples illustrations
	9FC05	Design and Analysis of Algorithms	CO1	Analyze worst-case running times of algorithms using asymptotic analysis.
			CO2	Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
			CO3	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
			CO4	Comprehend the concept of dynamic programming algorithms, their applications and analyze them.
			CO5	Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.
			CO6	Comprehend the concept of P and NP Problems and its usage in the applications.
	9ZC01		CO1	To understand the nuances of Business and its relation to

		Business Economics And Financial Analysis		economics
			CO2	To understand the production function and cost concepts
			CO3	To learn the basic market structures and their relevance to business
			CO4	To learn the fundamentals of financial accounting concepts
			CO5	To apply the fundamental concepts of financial accounting in preparation of financial statements.
			CO6	To understand the financial ratios that are used to analyze the financial performance of the company.
	9HC05	Environmental Science	CO1	Understand about ecosystem and energy flow among the organisms.
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity.
			CO4	Understand the causes and effect of pollution and implement measures in control of pollution.
			CO5	Understand the sustainable development and implement green technology for sustainable development.
			CO6	Learn and implement policy to protect the environment.
	9HC63	Soft Skills Lab	CO1	Determine the significance of soft skills in the working environment
			CO2	Understand how to demonstrate empathy in a wide range of situations.
			CO3	Effectively communicate through verbal/oral communication and improve the listening
			CO4	Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
			CO5	Develop a positive and responsible attitude to their own well-being
			CO6	
	9LC62	R Programming Lab and Design and Analysis of Algorithms Lab	CO1	Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
			CO2	CO-2: Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA
			CO3	CO-3: Apply basic machine learning algorithms and to identify common approaches used for Feature Generation
			CO4	CO-4: Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components
			CO5	
			CO6	
	9FC63	Database Management Systems Lab	CO1	Create tables and apply constraints.
			CO2	Write Queries using Aggregate functions, Conversion functions and use string functions
			CO3	Explain and write PL/SQL programs using exceptions.
			CO4	Develop programs using loops, exceptions and write

				Procedures.
			CO5	Write Programs for stored functions, invoke functions in SQL Statement.
			CO6	Describe and write programs using features of CURSORs and its variables.
	9CC83	Computer Organization Lab	CO1	Familiarize the architecture of 8086 processor, assembling language programming and interfacing with various modules.
			CO2	Experiment with Arithmetic operations of binary number system.
			CO3	Simulate any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.
			CO4	Familiarize the architecture of 8086 processor, assembling language programming and interfacing with various modules.
			CO5	
			CO6	
	9L484	Technical Seminar	CO1	Identify current general, political and technology related topics.
			CO2	Arrange and present seminar in a effective manner
			CO3	Collect, survey and organize content in presentable manner
			CO4	Demonstrate oratory skills with the aid of Power Point Presentations
			CO5	Exhibit interview facing skills and team leading qualities
			CO6	

Year and regulation	Course code	Course name	Co's	
	9ZC22	BASICS OF ENTREPRENEURSHIP Open Elective-I	CO1	The students will acquire basic knowledge on Skills of Entrepreneurship.
			CO2	The students will understand the techniques of selecting the customers through the process of customer segmentation and Targeting
			CO3	The students understand business Models and their validity.
			CO4	The students understand the basic cost structure, Revenue Streams and the pricing strategies.
			CO5	The students will acquire knowledge about the project management and its techniques.
			CO6	The students get exposure on marketing strategies and business regulations for the Start up.
		SOFTWARE TESTING	CO1	Describe concepts of software testing.
			CO2	Describe and apply the concepts Flow graphs, Path

III-I & A20		**METHODOLOGIES** Professional Elective –I		testing and Data Flow Testing.
			CO3	Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
			CO4	Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing.
			CO5	Demonstrate Software Testing Techniques such as JADs, Pareto Analysis , Regression Tasting, Structured walkthroughs, Thread testing , Performance testing and White box testing.
			CO6	Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP.
	9FC05	Data Warehousing and Data Mining	CO1	Understand the functionality of the various data mining functions.
			CO2	Apply pre-processing techniques on various datasets.
			CO3	Build a Data warehouse system and perform business analysis with OLAP tools.
			CO4	Characterize the kinds of patterns that can be discovered by association rule mining.
			CO5	Compare and contrast between different classification and clustering algorithms.
			CO6	
	9EC03	Software Engineering	CO1	Students can able to identify software processes and software engineering practices to select and justify approaches for a given project and its constraints and distinguish lifecycles for developing software products.
			CO2	Students can able to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
			CO3	Students understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO4	Students can define and design models for the requirements stated in the baseline document.
			CO5	Students can able to understand and experience the testing process in improving the quality of the product by using software testing techniques/tools.
			CO6	
	9LC01	Introduction to Artificial Intelligence	CO1	Learn the distinction between optimal reasoning vs. human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			CO3	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation,

				exhaustive search, heuristic search together with the time and space complexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks,analyze Supervised Learning vs. Learning Decision Trees.
			CO6	
	9EC05	Computer Networks	CO1	Identify the different types of network topologies and protocols useful for real time applications and transmission media.
			CO2	Discuss design issues of data link layer and solve problems on Checksum and flow control.
			CO3	Analyze MAC layer protocols and LAN technologies.
			CO4	Obtain the skills of subnetting, routing mechanisms and congestion control.
			CO5	Discuss the concepts, services and protocols of Transport and Application layers along with the network security
			CO6	
	9EC06	Operating Systems	CO1	Understand the functional architecture of an Operating System with usage of system calls.
			CO2	Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems.
			CO3	Solve issues related to process synchronization and Inter process Communication (IPC) in the Operating System.
			CO4	Comprehend the concepts of Deadlock and illustrate the concepts of Memory Management.
			CO5	Explain the concepts of File System with regard to Directory and Disk Management Algorithms, summarize the aspects of I/O Systems, Protection and Security.
			CO6	
	9LC63	Software Engineering Lab and Computer Networks Lab	CO1	Students can able to identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish life cycles for developing software product.
			CO2	Students understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO3	Students can define and design models for the requirements stated in the software project.
			CO4	Students can able to design class, object and interactive diagrams and know their significance.
			CO5	Discuss design issues of data link layer and solve problems on Checksum and flow control.
			CO6	Analyze MAC layer protocols and LAN technologies.
	9LC64	Artificial Intelligence Lab and Data Mining Lab	CO1	Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
			CO2	Apply pre-processing statistical methods for any given

				raw data.
			CO3	Gain practical experience of constructing a data warehouse.
			CO4	Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
			CO5	Apply OLAP operations on data cube construction.
			CO6	
	9L591	Summer Industry Internship -I	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills.
			CO5	
			CO6	
	9ZC25	BASICS OF INDIAN ECONOMY (Open Elective –I)	CO1	Describe the new dimensions and products served by the banking system in INDIA.
			CO2	Explain the credit control system and create awareness on NPA's
			CO3	Apply the knowledge of Insurance concepts in real life scenarios
			CO4	Recognize the importance of regulatory and legal frame work of IRDA
			CO5	Identify the risk management process and methods.
			CO6	Calculate the diversity of risk and return.

	9BC51	INTRODUCTION TO ADDITIVE MANUFACTURING PROCESS (Open Elective –I)	CO1	Understand the Additive manufacturing processes and their relationship with subtractive manufacturing.
			CO2	Demonstrate comprehensive knowledge of the broad range of liquid based rapid prototype processes, devices, capabilities and materials that are available.
			CO3	Apply the principles of casting in Additive manufacturing processes
			CO4	Articulate the various tradeoffs of Additive manufacturing software's/data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements.
			CO5	Learn various applications of additive manufacturing, such as in architecture art, health care direct part production and mass customization.
			CO6	

	9LC11	SOFTWARE TESTING METHODOLOGIES (Professional Elective-I)	CO1	Describe concepts of software testing.
			CO2	Describe and apply the concepts Flow graphs, Path testing and Data Flow Testing.
			CO3	Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
			CO4	Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing.
			CO5	Demonstrate Software Testing Techniques such as JADs, Pareto Analysis , Regression Tasting, Structured walkthroughs, Thread testing , Performance testing and White box testing.
			CO6	Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP
	9LC13	DESIGN THINKING (Professional Elective –I)	CO1	Gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
			CO2	Understand the techniques of idea generation
			CO3	Classify different phases of design thinking
			CO4	Realize the product design process.
			CO5	Understand design thinking for service design.
			CO6	Gain knowledge on various case studies related to design thinking.
	9FC10	**HUMAN COMPUTER INTERACTION (Professional Elective-I)**	CO1	Explain role of user Interface
			CO2	Describe the concept of direct manipulation
			CO3	Describe Human interaction with computers
			CO4	Apply and explain Screen Designing formalities such as Screen planning
			CO5	Explain Windows–Navigation schemes and screen based controls. Apply Components – text and messages
			CO6	Develop applications with the aid of Software tools

Year and regulation	Course code	Course name	Co's	
	9EC09	**CRYPTOGRAPHY AND NETWORK SECURITY** (Professional Elective –II)	CO1	Understand the most common type of security attacks.
			CO2	Understand the Encryption Principles, public key cryptography and algorithms.
			CO3	Understand security protocols for protecting data on networks.
			CO4	Be able to digitally sign emails and files.
			CO5	Understand vulnerability assessments and the weakness of using passwords for authentication
			CO6	Understand the most common type of security attacks.
	9FC13	**SOFTWARE PROJECT MANAGEMENT** (Professional Elective –II)	CO1	Explain primitives of Project Planning and evolution of software economics.
			CO2	Describe software economics; reduce Software product size, improvement in software processes, improving

III-II & A20				team effectiveness, improving automation, Achieving quality.
			CO3	Explain Life cycle phases and Artifacts of the process.
			CO4	Describe Model based software architectures and Work Flows.
			CO5	Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for a iterative process within cost and schedule. Describe Project Organizations and Responsibilities.
			CO6	Describe Automation and Project Control and Process instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management.
	9FC08	INFORMATION RETRIEVAL SYSTEMS (Professional Elective –II)	CO1	Ability to apply IR principles to locate relevant information large collections of data
			CO2	Ability to design different document clustering algorithms
			CO3	Implement retrieval systems for web search tasks.
			CO4	Design an Information Retrieval System
			CO5	
			CO6	
	9IC45	INTRODUCTION TO INTERNET OF THINGS (Professional Elective –II)	CO1	Getting familiar with terminology, technology and applications of IOT
			CO2	Understand and explain IoT system management using M2M (machine to machine) with necessary protocols
			CO3	Design and develop Python Scripting Language programs preferred for many IoT applications
			CO4	Use Raspberry PI as a hardware platform for designing the IoT sensor interfacing
			CO5	Implement web based services for IoT
			CO6	Understand and analyze the case studies illustrating IoT Design
	9JC05	BLOCKCHAIN TECHNOLOGIES (Professional Elective – III)	CO1	Understand the principles of HDFS and digital signature.
			CO2	Explore the block chain Technology, Simplified Payment Verification protocol and its life cycle.
			CO3	Analyze the Nakamoto consensus and differentiate proof-of-work and proof-of-stake consensus algorithms.
			CO4	Understand the working of crypto currency, Bitcoin and Ethereum.
			CO5	Explore Applications on legal issues of block chain.
			CO6	Explore new trends in block chain technologies.
		UNIFIED MODELING	CO1	Understand various stages and phases of software projects.
			CO2	Select the basic elements of modeling such as Things, Relationships and Diagrams

	9LC16	LANGUAGE (Professional Elective – III)		depending on the views of UML Architecture and SDLC.
			CO3	Design class and object diagrams that represent static aspects of a software system.
			CO4	Design component and deployment diagrams for software systems.
			CO5	Design activity and state chart diagrams for software systems.
			CO6	
	9LC08	AUGMENTED REALITY AND VIRTUAL REALITY (Professional Elective – III)	CO1	Understand the fundamentals of Virtual Reality.
			CO2	Analyze multiple Models of Input and Output Interface in Virtual Reality like Gloves, Video-based Input, 3D Menus & 3DScanner etc.
			CO3	Illustrate the fundamentals or advanced topics of Computer Graphics.
			CO4	Analyze the Interactive Techniques on VR in respect of Body Track, Hand Gesture, 3D Manus, and Object Grasp.
			CO5	Understand the development tools of VR.
			CO6	Explore the Conceptual idea on Augmented Reality and relate the illustrations.
	9FC09	IMAGE PROCESSING (Professional Elective – III)	CO1	Analyze general terminology of image processing.
			CO2	Examine various types of images, intensity transformations and spatial filtering.
			CO3	Develop Fourier transform for image processing in frequency domain.
			CO4	Evaluate the methodologies for image segmentation, restoration etc.
			CO5	Implement image process and analysis algorithms.
			CO6	Apply image processing algorithms in practical applications.
	9LC03	MACHINE LEARNING	CO1	Understand the fundamental concepts of ML and Designing a Learning System.
			CO2	Understand the basic concepts of linear models, tree and Probabilistic Models.
			CO3	Understand various Dimensionality Reduction Techniques and Apply Various, Evolutionary Algorithms with models.
			CO4	Understand the Graphical models and Analytical Learning.
			CO5	
			CO6	
	9LC04	COMPILER DESIGN	CO1	Design the finite automata different Languages
			CO2	Construct finite Automata for a given regular expression, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
			CO3	Design the push down automata and Turing Machine for complex languages.

			CO4	Understand LEX tool and relate parsing techniques,
			CO5	Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
			CO6	Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.
	9IC04	INTELLECTUAL PROPERTY RIGHTS	CO1	Demonstrate a breadth of knowledge in Intellectual property
			CO2	Overview of Patents, Searching, filling and drafting of Patents
			CO3	Overview of copyright & GI .
			CO4	Overview of Trade Mark & Trade Secret,
			CO5	Overview of Integrated Circuit and Industrial Design.
			CO6	Knowledge about different national and international: Conventions and Treaties, Governing the IPRs.
	9FC06	WEB TECHNOLOGIES	CO1	1. Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap.
			CO2	2. Develop scripts using XML and validate using parsers.
			CO3	3. Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
			CO4	4. Design responsive web applications.
			CO5	5. Comprehend the uses of Web servers and design the server-side scripts using Servlets.
			CO6	6. Design and develop server-side scripts and components using PHP.
	9LC65	MACHINE LEARNING LAB AND COMPILER DESIGN LAB	CO1	Apply common Machine Learning algorithms in practice and implementing their own.
			CO2	Perform experiments in Machine Learning using real-world data.
			CO3	Implementation of DFA for a given Languages/ Regular Expression.
			CO4	
			CO5	
			CO6	
			CO1	Demonstrate the use of HTML tags and be able to design web pages. Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.

	9FC66	WEB TECHNOLOGIES LAB	CO2	Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
			CO3	Implement Angular with Expressions, Filters, Directives, Controller, and Modules.
			CO4	Develop a Single Page Application with implementation of Scope and Form.
			CO5	Implement Java servlets using Apache Tomcat Server for User authentications
			CO6	Develop an application in PHP with Database connectivity.
	9LC04	COMPREHENSIVE VIVA VOCE	CO1	Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year
			CO2	
			CO3	
			CO4	
			CO5	
			CO6	

Year and regulation	Course code	Course name	Co's	
	9BC52	PRINCIPLES OF OPERATIONS RESEARCH (Open Elective –II)	CO1	Formulate and solve mathematical model (linear programming problem) for a physical situation like production, distribution of goods and economics.
			CO2	Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations
			CO3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
			CO4	Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost
			CO5	Apply simulation techniques for solving various

				types of problems and general idea development about Markov chains
			CO6	
IV-I & A20	8ZC23	ADVANCED ENTREPRENEURSHIP (Open Elective –II)	CO1	Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
			CO2	Exposed to the various business models and critically evaluating the effectiveness of the business models and products
			CO3	Understand the method of business traction, create roles and build their A- team
			CO4	Understand the various channels of revenue building and exploration of new revenue avenues.
			CO5	Understand the need of sales planning and people plan and also financial modeling
			CO6	Exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support startups
	8ZC19	ENTREPRENEURSHIP PROJECT MANAGEMENT AND STRUCTURED FINANCE (Open Elective –II)	CO1	Students will understand the nature of Entrepreneurship and its importance.
			CO2	Will gain knowledge regarding project, its life cycle and organization.
			CO3	Will gain knowledge relating to project formulation.
			CO4	Comprehend the components of structured finance
			CO5	Establish a framework of CMBS
			CO6	Students will gain knowledge relating to the CRE Servicing
	8ZC26	BASICS OF POLITY AND ECOLOGY (Open Elective –II)	CO1	Outline knowledge relating to the Indian Constitution and the Preamble to the Constitution.
			CO2	Relate to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
			CO3	Identify about the federal structure and judiciary of India.
			CO4	Understand knowledge relating to the conservation of the environment.
			CO5	Analyze about bio-diversity and climatic changes occurring in the environment.
			CO6	Discuss about the international treaties, conventions and organizations active in the field of environmental protection.
	8FC77	SCRIPTING LANGUAGES (Professional Elective –IV)	CO1	Identify the differences between typical scripting languages and typical system and application programming languages.
			CO2	Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
			CO3	Acquire programming skills in scripting languages.
			CO4	
			CO5	
			CO6	
			CO1	Understand various stages and phases of software projects.
			CO2	Select the basic elements of modeling

	8FC16	AGILE SOFTWARE DEVELOPMENT (Professional Elective –IV)		such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.
			CO3	Design class and object diagrams that represent static aspects of a software system.
			CO4	Design component and deployment diagrams for software systems.
			CO5	Design activity and state chart diagrams for software systems.
			CO6	
		DEVOPS (Professional Elective –IV)	CO1	Identify components of Devops environment.
			CO2	Describe Software development models and architectures of DevOps.
			CO3	Apply different project management, integration, testing and code deployment tool.
			CO4	Investigate different DevOps Software development models.
			CO5	Assess various Devops practices.
			CO6	Collaborate and adopt Devops in real-time projects.
	8JC04	ETHICAL HACKING (Professional Elective –IV)	CO1	Gain the knowledge of the use and availability of tools to support an ethical hack.
			CO2	Interpret the results of a controlled attack.
			CO3	Explain the role of inherent and imposed limitations and metrics for planning of a test.
			CO4	Comprehend the dangers associated with penetration testing.
			CO5	
			CO6	
	8FC17	**CLOUD COMPUTING (Professional Elective – V)**	CO1	Summarize the characteristics of cloud and differentiate the cloud service and deployment models and to explore vendor specific services
			CO2	2.Analyze different architectures for cloud applications, Create and run Amazon ec2 instance through python programs, assess the performance of cloud services and summarize the innovative applications of IOT on cloud.
			CO3	3.Design architecture of an Apps such as map reduce, image processing app etc on cloud and understand various security aspects in cloud.
			CO4	
			CO5	
			CO6	
			CO1	Understand the importance of business intelligence and its applications in today's world.
			CO2	Illustrate the different form of analytics

		BUSINESS INTELLIGENCE (Professional Elective –V)		such as business analytics, predictive analytics.
			CO3	Compare in detail the various aspects of business intelligence.
			CO4	Understand the technological components of operational intelligence.
			CO5	Analyze and understand the broad concepts in prescriptive analytics with Decision Tables.
			CO6	Apply business intelligence process for web mining and web analytics.
	8LC21	**QUANTUM COMPUTING (Professional Elective – V)**	CO1	Understand basics of quantum computing
			CO2	Understand physical implementation of Qubit
			CO3	Understand Quantum algorithms and their implementation
			CO4	Understand the Impact of Quantum Computing on Cryptography
			CO5	
			CO6	
		PARALLEL AND DISTRIBUTED COMPUTING (Professional Elective – V)	CO1	Explore the methodologies adopted for parallel and distributed environments.
			CO2	Analyze the networking aspects of Distributed and Parallel Computing.
			CO3	Explore the different performance issues and tasks in parallel and distributed computing.
			CO4	1. Tools usage for parallel and distributed computing.
			CO5	Understanding high performance computing techniques
			CO6	
	8LC02	**ADVANCED ARTIFICIAL INTELLIGENCE AND DEEP LEARNING**	CO1	Identify different types of agents and their relationships with the environment.
			CO2	Demonstrate the application of agents handling applications dealing with conflict resolution.
			CO3	Represent knowledge in logical level and also be able to convert it to a form suitable for implementation.
			CO4	Derive inferences applying rules of First Order Logic.
			CO5	Formulate an approach for applications involving complete and incomplete Planning.
			CO6	Choose the appropriate learning strategy needed for solving a given problem.
			CO1	Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.

	8LC18	**NATURAL LANGUAGE PROCESSING**	CO2	Understand and carryout proper experimental methodology for training and evaluating empirical NLP systems.
			CO3	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
			CO4	Able to design, implement, and analyze NLP algorithms.
			CO5	Able to design different language modeling Techniques.
			CO6	
	8FC15	**BIG DATA ANALYTICS**	CO1	Comprehend the fundamentals of big data analytics and understand how Hadoop solves the big data problem in real life.
			CO2	Interpret the challenges with big data and elaborate the knowledge about the technological developments in big data environment.
			CO3	Demonstrate the difference between NOSQL and SQL databases.
			CO4	Discuss the Hadoop distributed file system (HDFS) framework and anatomy of Hadoop map-reduce.
			CO5	Design the algorithms to process big data using Apache Spark Low Level API.
			CO6	Apply Hadoop Data Analysis to social Media Analytics and Opinion Mining on Tweets.
	8LC66	**DEEP LEARNING LAB AND BIG DATA ANALYTICS LAB**	CO1	Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
			CO2	Learn The Fundamental Principles Of Deep Learning.
			CO3	Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains.
			CO4	Implement Deep Learning Algorithms and Solve Real-world problems.
			CO5	Use Excel as an Analytical tool and visualization tool.
			CO6	Program using HADOOP and Map Reduce.
	8LC67	**PE-IV (SCRIPTING LANGUAGES) LAB**	CO1	Identify components of Devops environment
			CO2	Apply different project management, integration, testing and code deployment tool
			CO3	Investigate different DevOps Software development models

	8LC67	**PE-IV (AGILE SOFTWARE DEVELOPMENT) LAB**	CO1	Identify components of Devops environment
			CO2	Apply different project management, integration, testing and code deployment tool
			CO3	Investigate different DevOps Software development models
	8LC67	**PE-IV (DEVOPS) LAB**	CO1	Identify components of Devops environment
			CO2	Apply different project management, integration, testing and code deployment tool
			CO3	Investigate different DevOps Software development models
	8LC67	**PE-IV (ETHICAL HACKING)**	CO1	At the end of this course, the student will be able to
			CO2	Use the available tools to support an ethical hacking procedure.
			CO3	Interpret the results of a controlled attack.
	8L792	**SUMMER INDUSTRY INTERNSHIP**	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills

Year and regulation	Course code	Course name	Co's	
	8AC45	FUNDAMENTALS OF RENEWABLE ENERGY SOURCES (Open Elective-III)	CO1	Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
			CO2	Demonstrates the knowledge of different techniques of solar collection and storage.
			CO3	Classify different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
			CO4	Understand the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
			CO5	Differentiate the different methods of kinetic

				energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
			CO6	Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.
	8ZC24	PRODUCT AND SERVICES (Open Elective-III)	CO1	Understand the basic concepts of product.
			CO2	Determine the process of new product development and stages in the process.
			CO3	Understand the concept of product testing, product planning and the preparatory groundwork for launching a new product
			CO4	Differentiate various types of services, its differences with the goods and the application of marketing principles for services.
			CO5	Understand the attributes of a good service design and the tools for producing and distributing the services.
			CO6	Identify the importance of quality of services and also introduce some measurement scales to evaluate the service quality.
	8ZC10	ENTREPRENEURSHIP AND BUSINESS DESIGN (Open Elective –III)	CO1	Understand the essentials of entrepreneurship and the key role played by the entrepreneurs.
			CO2	Differentiate the different phases of UI /UX.
			CO3	Outline the attentiveness on designing a business strategy.
			CO4	Explore on designing and delivery of services.
			CO5	Understand reverse engineering methods in product development.
			CO6	Indicate information on IPR, and patent application.
	8ZC15	FINANCIAL INSTITUTIONS, MARKETS AND SERVICES (Open Elective –III)	CO1	Understand the financial structure and the financial sector reforms after 1991.
			CO2	Identify the role of RBI and the Regulating and credit policies adopted by the RBI.
			CO3	Analyze the role of Non-Banking financial institutions and the role of financial institutions in India.
			CO4	Understand the role of regulatory bodies like SEBI and also to know the capital and money market instruments.
			CO5	Understand about the asset fund based financial services
			CO6	Expose to investment banking and merchant banking.
	8FC07	CYBER SECURITY AND CYBER LAWS	CO1	Familiarize the cryptographic procedures and Understand its primitives
			CO2	Outline Security policy in Legislation and Comprehend E-Commerce frame work, models and its associated threats
			CO3	Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
			CO4	Categorize international cyber laws and cyber

				crimes.
			CO5	Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000
			CO6	Classify and Outline the offences under the Cyberspace law and the Internet in India
	8L896	PROJECT	CO1	Estimate the human and physical resources required, and make plan for the development of Project.
			CO2	Break down the Project into tasks and determine handover procedures.
			CO3	Identify links and dependencies, and schedule to achieve deliverables.
			CO4	Allocate roles with clear lines of responsibility and accountability with team spirit.
			CO5	Design and develop the software or prototype using modern software tools wherever applicable to meet societal needs.
			CO6	Present the Project done and submit the report.

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Course Outcomes of

CSE - (Data Science)

Department

Department of Computer Science & Engineering (Data Science)

COs for A22-1st Year and 2nd Year, A20-3rd year and 4th Year courses/subjects

Year and regulation	Course code	Course name	CO's	
I-I & A22	9HC04	Engineering Chemistry	CO1	Understand and analyses microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
			CO2	Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
			CO3	Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
			CO4	Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
			CO5	Differentiate the types of corrosion and methods used to prevent the corrosion, surface coating techniques
			CO6	Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.
	9FC01	Problem Solving using C	CO1	Formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs (in C language)
			CO2	Test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
			CO3	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
			CO4	To use arrays, pointers and structures to formulate algorithms and programs.
			CO5	To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
			CO6	To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.
	9HC11		CO1	Check the consistency or inconsistency of a

		MATRIX ALGEBRA AND CALCULUS		linear system and also solve real time problems.
			CO2	Calculate the Eigen values and Eigen vectors of a matrix and their application for orthogonal transformation.
			CO3	Identify the dependence and independence of vectors and solve the problems on basis.
			CO4	Solve problems on Inner product spaces.
			CO5	Verify the mean value theorems and also express the given function in series form using Taylor's theorem.
			CO6	Solve the problems using special functions; evaluate surface areas and volumes of revolutions.
	8HC01	Essential English Language Skills (EELS)	CO1	Understand, Analyze and respond to the audience by listening effectively.
			CO2	Practice effectively the speaking skills with the apt body language.
			CO3	Develop strategies to improve speaking skills.
			CO4	Plan, prepare and present effectively to meet the standards of corporate and real world in a group.
			CO5	Comprehend the reading skills through note taking and other study skills.
			CO6	Express the opinions effectively on the given topic through role play and situational dialogues in group discussions.
	8HC64	Engineering Chemistry Lab	CO1	Prepare the Inorganic compounds.
			CO2	Determine surface tension of a liquid, viscosity of lubricant, acid value of an oil.
			CO3	Estimate hardness of water.
			CO4	Analyze the amount of chloride content.
			CO5	Determine cell constant and conductance of solutions, redox potential and emf of solutions, the rate constant of acid.
			CO6	Synthesize a polymer (Thiokol rubber / Urea-Formaldehyde resin), a drug- Aspirin.
			CO7	Estimate of Mn+7 by Colorimetry method.
	8FC61	Problem Solving using C Lab	CO1	Formulate the algorithms for simple problems. Translate the given algorithms to a working and correct program.
			CO2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience.
			CO3	Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.

			CO4	Produce small devices / products /appliances by assembling different components.
	9HC61	Oral Communication Skills Lab	CO1	Describe people, objects and situations using simple sentences.
			CO2	Use appropriate tenses and expressions in different contexts of conversation.
			CO3	Identify major areas of concern in their oral communication and address them.
			CO4	Create a SMART plan to enhance their communication skills in English

Year and regulation	**Course code**	**Course name**	**C**	
I-II & A22	9HC07	Engineering Physics	CO1	Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schrodinger's wave concept and its application for a particle in one dimension box.
			CO2	Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy)
			CO3	Classify magnetism types, Hysteresis, domain theory, Anti-ferro and ferry-magnetism, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
			CO4	Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).
			CO5	Elaborate semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
			CO6	Summarize nano & bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation

				methods (physical & chemical), analysis the techniques like XRD, SEM, TEM and also to understand the radioactivity, fusion & fission, alpha, beta and gamma rays decay and its applications.
	9EC01	Data Structures using C	CO1	Demonstrate the concepts of Abstract data type and also applications of stack and Queues.
			CO2	Select the data structure that efficiently model the information in a problem.
			CO3	Design programs using variety of data structures including Trees, AVL Trees and Graphs and their applications.
			CO4	Solve problems and also assess efficiency trade off among searching and sorting using time complexity of each algorithm and also the applications of hashing and hash tables.
			CO5	Describe the concepts of OOPs and implement programs using objects, classes, constructors and destructors.
			CO6	Apply concepts of OOPs to write program on over loading functions and concepts of inheritance.
	9HC12	Basic Electronics and Electrical Engineering	CO1	Understand and apply the principles of electrical engineering to solve basic equations.
			CO2	Apply the knowledge gained to explain the principles of single and three phase AC circuits.
			CO3	"Apply the knowledge gained to explain the principle and operation of DC machine along with its applications".
			CO4	Use the principles of single-phase transformer along with its applications and solve the equations.
			CO5	Realize the principle and operation of three phase induction motor with its applications.
	9BC01	Engineering Graphics	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering.
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes.

			CO3	Draw projections of different types of regular solids in various positions write principal planes of projection.
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views.
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software.
	9HC02	Oral Communications Lab	CO1	Understand, Analyze and respond to the audience by listening effectively
			CO2	Practice effectively the speaking skills with the apt body language
			CO3	Develop strategies to improve speaking skills
			CO4	Plan, prepare and present effectively to meet the standards of corporate and real world in a group
			CO5	Comprehend the reading skills through note taking and other study skills
			CO6	Express the opinions effectively on the given topic through role play and situational dialogues in group discussions
	9HC66	Engineering Physics Lab	CO1	Understand the concepts of photo electric effect, importance, photo current, color filters, optical sensors.
			CO2	Write programs using tree traversals. In order, preorder and post order.
			CO3	Program searching, sorting and hashing operations.
			CO4	Write programs on Binary trees
			CO5	Implement classes and operator overloading.

Year and regulation	Course code	Course name	Co's	
	9HC16	Probability & Statistics	CO1	Solve the random variable problems and probability distributions.
			CO2	Estimate the parameters and solve the problems

II-I & A22				using central limit theorem.
			CO3	Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	Solve the problems on measures of central tendency, Correlation
			CO6	Classify and differentiate various regression models
	9AC48	Elements of Electrical and Electronics Engineering	CO1	Understand the fundamentals of electrical engineering and DC machines.
			CO2	Understand the principles of AC circuits.
			CO3	Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	Understand the principle and operation of diode.
			CO5	Understand the principle and operation of transistor.
			CO6	Understand the principles of digital electronics.
	9EC02	Object Oriented Programming through Java	CO1	Understand and comprehend the fundamentals of JAVA, its Classes, and Objects and write simple programs using constructors.
			CO2	Write programs using inheritance, interface and packages.
			CO3	Write programs using inheritance, interface and packages.
			CO4	Implement Exception handling and Multithreading.
			CO5	Design programs using AWT, Swings and develop applications using event handling.
	9F303	Discrete Mathematics	CO1	Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
			CO2	Reason about arguments represented in Predicate logic.
			CO3	Perform operations on discrete structures such as sets, functions, relations, and sequences.
			CO4	Solve discrete mathematics problems that involve: computing permutations and combinations of a set.
			CO5	Analyze and deduce problems involving recurrence relations and generating functions.

			CO6	Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling.
	9DC10	Computer Organization and Architecture	CO1	Perceive basic operational concept of computer and data processing.
			CO2	Use data types with instruction set of specified architecture
			CO3	Justify different control unit design and algorithms for various operations.
			CO4	Elaborate basic architecture of 8086 processor
			CO5	Write assembly language programming and debug to 8086
			CO6	Interface devices to 8086 processor.
	9D310	Software Engineering	CO1	Apply process models in real world software products.
			CO2	Classify software requirement specification document.
			CO3	Design system models and user interface.
			CO4	Evaluate test strategies for various softwares.
			CO5	Describe product metrics, risks.
			CO6	Understand the quality management.
	9HC17	Universal Human values	CO1	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as “H-102 Universal Human Values
			CO2	Understanding Harmony is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.
	9EC62	Object oriented programming through Java Lab	CO1	Write programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
			CO2	Write small application such as banking system.
			CO3	Write programs on operator, function overloading and dynamic method dispatch.
			CO4	Write programs to implement interface and packages.
			CO5	Explain and write programs to implement threads.
			CO6	Write programs to implement applets and event

				handling.
			CO7	Write an application to implement client and server scenario.
	9EC77	Software Engineering and Computer Organization Lab	CO1	Students can able to identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish life cycles for developing software product.
			CO2	Students understand the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving.
			CO3	Students can define and design models for the requirements stated in the software project.
			CO4	Students can able to design class, object and interactive diagrams and know their significance.
			CO5	Students can able to design advanced behavioral and architectural modeling and work on case studies.
	9AC77	Elements of Electrical and Electronics Engineering Lab	CO1	Understand the working of single-phase transformer under different conditions, the performance of three phase induction motor, different speed control methods of DC motor with and without loading with its performance.
			CO2	Understand the applications of Thevenin's Theorem in circuit analysis.
			CO3	Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
			CO4	Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
			CO5	Explain and demonstrate working of PN Junction and Zener diode.
			CO6	Explain and demonstrate working Half and Full wave Rectifier without filters.
			CO7	Demonstrate working of CE characteristics and its application as an amplifier.
	9M378	Comprehensive Test and Viva-voce – III	CO1	Comprehend the concepts in the Core Courses 1styearand 2nd year 1st Semester.
			CO2	Assess technical knowledge to face interviews.
			CO3	Exhibit lifelong learning skills to pursue higher studies or professional practice.
	9M386	Technical Seminar – III	CO1	Identify current general, political and technology related topics.
			CO2	Arrange and present seminar in a effective

				manner
			CO3	Collect, survey and organize content in presentable manner
			CO4	Demonstrate oratory skills with the aid of Power Point Presentations.
			CO5	Exhibit interview facing skills and team leading qualities

Year and regulation	Course code	Course name	Co's	
II-II & A22	9EC40	Introduction to Data Science	CO1	Learn about various data types, types of data sets a data quality
			CO2	Implementation of R fundamentals and perform factors and data frames.
			CO3	Implementation of data structures iterative programming & function concepts using R
			CO4	Learn about data visualization techniques and apply suitable visualization techniques
			CO5	Learn about dimensionality reduction based on examples illustrations
			CO6	"
	9FC05	Design and Analysis of Algorithms	CO1	Analyze worst-case running times of algorithms using asymptotic analysis.
			CO2	Synthesize divide and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
			CO3	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
			CO4	Comprehend the concept of dynamic programming algorithms, their applications and analyze them.
			CO5	Analyze the Backtracking and Branch and Bound algorithms and also identify the scenarios for its applicability.
			CO6	Comprehend the concept of P and NP Problems and its usage in the applications.
	9EC03	Database Management Systems	CO1	Comprehend importance, significance, models, Database languages, architecture and design of DataBaseSystems.
			CO2	Design Relational Models and apply Integrity Constraints, Querying

				fundamentals, Logical data base Design and Views of databases along with application of Relational Algebra.
			CO3	Apply queries in SQL Query using Nested Queries Set, Comparison Operators, Aggregative Operators, Logical connectivity's with Joins statements and develop applications.
			CO4	Eliminate data redundancy through normalforms.
			CO5	Ensure ACID properties and Serializability in Transaction management and Database Recovery.
			CO6	Use different External Storage Organization techniques and apply Indexing in databases to enhance systemperformance.
	98EC06	Operating Systems	CO1	Understand the functional architecture of an Operating System with usage of system calls.
			CO2	Analyze various process scheduling algorithms & pragmatics of scheduling algorithms used by various Operating Systems.
			CO3	Solve issues related to process synchronization and Deadlocks in the Operating System.
			CO4	Illustrate the concepts of Memory Management.
			CO5	Outline the directory structure & analyze disk scheduling algorithms.
			CO6	Summarize the aspects of Protection and Security, and understand the concepts of I/O systems.
	9CC55	Digital Electronics	CO1	Apply the rules of Boolean algebra to simplify Boolean expressions.
			CO2	Simplify of Boolean expressions using K-map.
			CO3	Design MSI combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters.
			CO4	Design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers
			CO5	Create digital design using PLD's such as ROM's, PLA's, PAL s.
			CO6	Design the digital controllers using

				Algorithmic State Machine Charts.
	9HC03	Soft Skills	CO1	Assess themselves using SWOT analysis.
			CO2	Appraise the importance of certain soft skills like time management and goal setting.
			CO3	Improve their verbal ability to handle the competitive exams.
			CO4	Enhance their team skills and design tinking capabilities for effective problem solving and decision making.
			CO5	Know their emotional quotient which guidestheir thinking, behavior and helps them manage stress efficiently.
			CO6	Equip themselves with the prerequisites, and relevant techniques to effectively attend corporate interviews.
	9ZC01	Economics, Accountancy and Management Science	CO1	Acquire the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular
			CO2	Gain exposure on Cost concept, Revenues and Market structure and describe the concepts.
			CO3	Comprehend the basic concepts of Accounting, Double entry system and Book keeping.
			CO4	. Interpret the concepts of Capital expenditure, Revenue expenditure and Final accounts ad their significance.
			CO5	Gain knowledge and elaborate the basics of Management, its principles and various functions performed in organization
			CO6	Recognize various personality traits, perception, attitudes of individuals working in organization
	98EC63	Database Management SystemsLab	CO1	application."
			CO2	"Write Queries using Aggregate functions such as [COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING], Conversion functions and use string functions for a given
			CO3	"Explain and write programs using PL/SQL programs using exceptions, COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block."
			CO4	"Develop programs using WHILE LOOPS, FOR LOOPS, nested loops using BUILT–
			CO5	"Write Programs for stored functions invoke functions in SQL Statement and write
			CO6	Describe and write programs using features of CURSORs and its variables.Develop
			CO7	Programs implementing Triggers.
	9MC61	Design and Analysis of Algorithms and R programming Lab	CO1	Implement Merge sort algorithm for sorting a list of integers in ascending order, Dijkstra's algorithm for the single source shortest path problem.
			CO2	Implement Prim's algorithm to generate minimum cost spanning tree.
			CO3	Solve the job sequencing with deadlines problem using greedy algorithm.
			CO4	Design the solution for the 0/1 knapsack problem using implement DynamicProgramming and implement.

			CO5	Using Dynamic programming approach solve the Optimal Binary search Tree problem.
			CO6	Design and implement n-queens problem using backtracking approach.
	9EC66	Operating Systems Lab	CO1	Simulate and implement operating system concepts such as scheduling, deadlock management, page replacement techniques, file management and memory management
	9M479	Comprehensive Test and Viva –Voce – IV	CO1	Comprehend the concepts in the Core Courses 1st year and 2nd year.
			CO2	Assess technical knowledge to face interviews.
			CO3	Exhibit lifelong learning skills to pursue higher studies or professional practice.
	9M487	Technical Seminar – IV	CO1	Deliver lecture on emerging technologies.
			CO2	Explain domain knowledge to resolve real time technical issues
			CO3	Demonstrate ability to lead and explain concepts and innovative ideas.
			CO4	Demonstrate team leading qualities.
			CO5	Demonstrate public speaking and lifelong learning skills for higher studies and to pursue professional practice.
			CO6	Exchange new information that would not have been available otherwise.
			CO7	Develop debating and interview skills.

Year and regulation	**Course code**	**Course name**	**Co's**	
	9ZC05	Banking Operations, Insurance and Risk Management **Open Elective-I**	CO1	Describe the new dimensions and products served by the banking system in INDIA.
			CO2	Explain the credit control system and create awareness on NPA's.
			CO3	Apply the knowledge of Insurance concepts in real life scenarios.
			CO4	Recognize the importance of regulatory and legal frame work of IRDA.
			CO5	Identify the risk management process and methods.

			CO6	Calculate the diversity of risk and return.
III-I & A20	8FC13	Software Project Management	CO1	Explain primitives of Project Planning and evolution of software economics.
			CO2	Describe software economics; reduce Software product size, improvement in software processes, improving team effectiveness, improving automation, Achieving quality.
			CO3	Explain Life cycle phases and Artifacts of the process.
			CO4	Describe Model based software architectures and Work Flows.
			CO5	Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for a iterative process within cost and schedule. Describe Project Organizations and Responsibilities.
			CO6	Describe Automation and Project Control and Process instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management.
	8EC07	Web Technologies	CO1	Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap. Develop dynamic programs using Javascript and Typescript.
			CO2	Develop scripts using XML and validate using parsers. Design a data-interchange format using JSON.
			CO3	Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
			CO4	Design responsive web applications with Forms, Scope, Dependency Injection & Services, and Single Page Application (SPA) of Angular.
			CO5	Comprehend the uses of Web servers and design the server-side scripts using Servlets.
			CO6	. Design and develop server-side scripts and components using PHP.
	8MC01	Data Mining	CO1	Understand the fundamentals of Data Mining.
			CO2	Understand the techniques used in data preprocessing.
			CO3	Learn insights of Data Mining Primitives and Infer the significance of Concept Description.

			CO4	Apply the algorithms for mining association rules in large databases.	
			CO5	Discuss and apply the models of classification and use those models for the prediction of the new samples.	
			CO6	Apply various clustering techniques available for numerous applications. Identify the optimal clustering technique for a particular application.	
	8MC02	Data Warehousing and Business Intelligence (DW and BI)	CO1	Understand architecture of data warehouse and OLAP operations.	
			CO2	Understand Fundamental concepts of BI and Analytics.	
			CO3	Understand basic reporting and querying and Design of Dashboards.	
			CO4	Learn BI Strategy, Architecture.	
			CO5	Design / Build a BI project plan with best practices.	
			CO6	Understand BI target.	
	8EC05	Data Communication and Networks	CO1	Understand concepts of different networks, network models and transmission medias.	
			CO2	Classify various data conversion techniques and Multiplexing, Demultiplexing techniques.	
			CO3	Summarize the design issues of Datalink layer and solve problems on Error and Flow control.	
			CO4	Infer MAC layer protocols, various connecting devices, IP addressing concepts and design a network(using subnetting and supernetting techniques)	
			CO5	Analyze various routing algorithms and outline the concepts of Internet control protocols and congestion control techniques.	
			CO6	Recognize services and protocols of transport layer, application layer along with network security issues.	
	8HC05	Environmental Science and Ecology	CO1	Understand about ecosystem and energy flow among the organisms.	
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.	
			CO3	Learn the value, use and value of biodiversity.	
			CO4	Understand the causes and effect of pollution and implement measures in control of	Le bi

				pollution.	
			CO5	Understand the sustainable development and implement green technology for sustainable development.	
			CO6	Learn and implement policy to protect the environment.	
	8MC62	Data Mining and DWand BI Lab	CO1	Work with the ETL and Mining tools.	
			CO2	Demonstrate the classification, clustering techniques on the data sets.	
			CO3	Comprehend the results obtained in the clustering, Association and Classification techniques applied on the data sets with varied input parameters.	
			CO4	Ability to apply mining techniques for realistic data.	
	8EC65	Computer Networks Lab	CO1	Implement and analyze framing methods of the data link layer.	
			CO2	Implement and analyze framing methods of the data link layer.	
			CO3	Illustrate and implement error detection & correction techniques.	
			CO4	Implement different Routing Algorithms.	
			CO5	Understand basic Network Commands.	
			CO6	Use of Wireshark and NS-2 tools.	
	8EC67	Web Technologies Lab	CO1	Demonstrate the use of HTML tags and be able to design web pages.Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.	
			CO2	Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.	
			CO3	Implement Angular with Expressions, Filters, Directives, Controller, and Modules.	
			CO4	Develop a Single Page Application with implementation of Scope and Form.	
			CO5	Implement Java servlets using Apache Tomcat Server for User authentications.	
			CO6	Develop an application in PHP with Database connectivity.	
	8M591	Summer Industry Internship -I	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.	
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge	

				courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills.

Year and regulation	Course code	Course name	Co's	
III-II & A20	8ZC19	ENTREPRENEURSHIP PROJECT MANAGEMENTAND STRUCTURED FINANCE (Open Elective –II)	CO1	Students will understand the nature of Entrepreneurship and its importance.
			CO2	Will gain knowledge regarding project, its life cycle and organization.
			CO3	Will gain knowledge relating to project formulation and implementation.
			CO4	Comprehend the components of structured finance.
			CO5	Establish a framework of CMBS.
			CO6	Students will gain knowledge relating to the CRE Servicing.
	8EC15	MOBILE COMPUTING (Professional Elective - II)	CO1	Identify vast application areas for mobile /wireless communications and Understand GSM Architecture, Services.
			CO2	Examine Hidden and exposed terminals, Near and far terminals and Differentiate medium access control methods for wireless communication SDMA, FDMA, TDMA and CDMA.
			CO3	Illustrate mobile IP primitives in Network layer and Demonstrate IP packet delivery, DHCP.
			CO4	Distinguish Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP in Transport layer.
			CO5	Understand applications of MANETs routing algorithms, data hoarding, client server computing along with the data delivery mechanisms.
			CO6	Understand protocols and tools such as WAP, Bluetooth and Identify emerging mobile operating systems.
	8FC07	Automata Theory and Compiler Design	CO1	Design the finite automata different Languages

			CO2	Construct finite Automata for a given regular expressions, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
			CO3	Design the push down automata and Turing Machine for complex languages.
			CO4	Understand LEX tool and relate parsing techniques,
			CO5	Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
			CO6	Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.
	8MC03	Data Visualization Techniques	CO1	Visualize the objects in different dimensions.
			CO2	Design and process the data for Virtualization.
			CO3	Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
			CO4	Apply the virtualization techniques for research projects. (K1, K3).
	8LC01	Introduction Artificial Intelligence	CO1	Learn the distinction between optimal reasoning vs. human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
			CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
			CO3	Learn different knowledge representation techniques.
			CO4	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
			CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks, analyze Supervised Learning vs. Learning Decision Trees.
	8EC17	Machine Learning	CO1	Understand the fundamental concepts of

				ML and Designing a Learning System.
			CO2	Understand the basic concepts of linear models, tree and Probabilistic Models.
			CO3	3. Understand the Probability models namely supervised, unsupervised, basic statistics analyze their analysis of algorithms along with their applications.
			CO4	4. Understand various Dimensionality Reduction Techniques and Apply various Evolutionary Algorithms with models
			CO5	5. Understand the Graphical models and their applications
			CO6	6. Understanding Analytical Learning and Analyze KBANN Algorithm
	8GC49	Intellectual Property Rights	CO1	Demonstrate a breadth of knowledge in Intellectual property .
			CO2	Overview of Patents, Searching, filling and drafting of Patents.
			CO3	Overview of copyright & GI .
			CO4	Overview of Trade Mark & Trade Secret,
			CO5	Overview of Integrated Circuit and Industrial Design.
			CO6	Knowledge about different national and international: Conventions and Treaties Governing the IPRs
	8MC64	Machine Learning Lab	CO1	Understand complexity of Machine Learning algorithms and their limitations;
			CO2	Understand modern notions in data analysis-oriented computing;
			CO3	Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
			CO4	Be capable of performing experiments in Machine Learning using real-world data.
	8MC65	Artificial Intelligence and Compiler Design Lab	CO1	Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
			CO2	Implementation of DFA for a given Language / Regular Expression
			CO3	Usage LEX of tool to implement lexical analyzer in compiler design and implementation of Top-Down Parser.
			CO4	Usage of YACC tools for implementing bottom up parser.

	8M680	Group Project	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
			CO5	Work as an individual and in a team.
	8M692	Comprehensive Viva Voce	CO1	Comprehend the concepts in the Core Courses 1st year.
			CO2	Assess technical knowledge to face interviews.
			CO3	Exhibit life long learning skills to pursue higher studies or professional practice.

SREENIDHI EDUCATIONAL GROUP | SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY SNIST AUTONOMOUS

Course Outcomes of

CSE - (Internet of Things)

Department

Department of Computer Science & Engineering (Internet of Things)
COs for A22-1st Year and 2nd Year, A20-3rd year and 4th Year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	9HC07	Engineering Physics	CO1	Explain semiconductor behaviour, types and their applications
			CO2	Differentiate the wave and particle, and its application for a particle in one dimension box
			CO3	Explain about emission, its types, laser principle and applications of optical fibers (sensors and medical endoscopy)
			CO4	Reveals about the magnetism-its origin and types and its applications
			CO5	Explain the basic concepts of dielectric materials, polarization and its types, their applications (piezo, ferro and Pyro electricity).
			CO6	Summarize nano& bulk concepts, surface to volume ratio and its applications.
	9FC01	Problem Solving using C	CO1	Explain basic fundamentals of Computer Systems , computing environments , Computer Languages – Machine Languages
			CO2	Describe C language Programs, Structure of a C Program
			CO3	Describe write programs using control structures such as Pre-test and post-test loops, while, do while, for, break
			CO4	Write programs implementing application on arrays
			CO5	Write programs using Pointers and string handling functions
			CO6	Write programs using Enumerated, Structure, Union types and files.
	9HC11	MATRIX ALGEBRA AND CALCULUS	CO1	1. Check the consistency or inconsistency of a linear system and can solve the problems.
			CO2	2. Find the Eigen values and Eigen vectors and can solve the problems associated with these concepts.
			CO3	3. Find the nature, index and signature of the quadratic form.
			CO4	4. Verify the applicability of mean value theorems and also can express the givenstandardfunction in series form using Taylor's and Maclaurin series.
			CO5	5. Find the solutions of first order

				first degree differential equations and solve the problems on Newton's law of cooling, Natural growth and decay.
			CO6	6. Solve higher order ordinary differential equations with constant coefficients using some standard methods.
	9HC01	Essential English Language Skills (EELS)	CO1	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
			CO2	· State the definition of nouns, verbs, adjectives, and adverbs.
			CO3	· Identify the differences of each tense and use the tenses accurately.
			CO4	· Identify specialized reading strategies for specific types of texts
			CO5	· Produce written work that is substantive, organized, and grammatically accurate.
			CO6	Demonstrate competence with suitable accuracy in vocabulary, and language fluency.
	9BC01	Engineering Graphics	CO1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			CO2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			CO3	Draw projections of different types of regular solids in various positions wrt principal planes of projection
			CO4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			CO5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
			CO6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software
	9HC61	Oral Communication Lab-I	CO1	Describe people, objects and situations using simple sentences.
			CO2	· Use appropriate tenses and expressions in different contexts of conversations.
			CO3	· Identify major areas of concern in their oral communication and address them.
			CO4	· Create a SMART plan to enhance their communication skills in English
			CO5	Describe people, objects and situations using simple sentences.
			CO6	· Use appropriate tenses and expressions in different contexts of conversations.
	9HC66		CO1	Demonstrate the wave length of monochromatic source of light by using Newton's Rings

		Engineering Physics Lab	CO2	Analyze refractive index of a material prism and Dispersive power of a glass Prism by using spectrometer
			CO3	Determine the wave length of spectral light and laser Source of light by using Diffraction Grating
			CO4	Design and Analyze RC Circuits
			CO5	Analyze RLC Series circuit and parallel circuit
			CO6	Investigate magnetic Circuits
	9FC61	Problem Solving using C Lab	CO1	Explain basic fundamentals of Computer Systems, computing environments, Computer Languages – Machine Languages. Writing/ Drawing simple Algorithms and flowcharts.
			CO2	Formulate the algorithms for simple problems
			CO3	Translate the given algorithms to a working and correct program
			CO4	Correct the syntax errors as reported by the compilers
			CO5	Identify and correct logical errors encountered at run time
			CO6	Write iterative as well as recursive programs
I-I & A22			CO7	Represent data in arrays, strings and structures and manipulate them through a program
			CO8	Declare pointers of different types and use them in defining self referential structures.
			CO9	Create, read and write to and from simple text files.
	9BC61	WORKSHOP/MANUFACTURING PROCESSES LAB	CO1	Use various types of conventional manufacturing Processes
			CO2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
			CO3	manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			CO4	Produce small devices / products /appliances by assembling different components
I-II& A22				

	9HC07	Engineering Physics	CO1	**1.** Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schroedinger's wave concept and its application for a particle in one dimension box.
			CO2	**2.** Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy)
			CO3	**3.** Classify magnetism types, Hysteresis, domain theory, Anti-ferro and ferri-magnetism, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
			CO4	4. Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).
			CO5	5. Elaborate semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
			CO6	6. Summarize nano& bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD, SEM,

				TEM and also to understand the radioactivity, fusion & fission, alpha, beta and gamma rays decay and its applications.
	9EC01	Data Structures	CO1	1 Demonstrate the concepts of Abstract data type and also applications of stack and Queues
			CO2	2 Select the data structure that efficiently model the information in a problem
			CO3	3 Design programs using variety of data structures including Trees, AVL Trees and Graphs and their applications.
			CO4	4 Solve problems and also assess efficiency trade off among searching and sorting using time complexity of each algorithm and also the applications of hashing and hash tables.
			CO5	5 Describe the concepts of OOPs and implement programs using objects, classes, constructors and destructors.
			CO6	6 Apply concepts of OOPs to write program on over loading functions and concepts of inheritance.
	9HC12	ADVANCED CALCULUS	CO1	*1. Find the limits and test for the continuity and differentiability of a function.*
			CO2	*2. Solve the problems on multiple integrals.*
			CO3	*3. Solve linear and nonlinear first order partial differential equations.*
			CO4	*4. Find Series expansion a function defined over the intervals.*
			CO5	*5. Find directional derivative, gradient, divergence and curl of a function.*
			CO6	*6. Solve problems of line, surface and volume integrals.*
	9BC01	ENGINEERING GRAPHICS		1) Get familiar to use the instruments to solve the engineering problem and

				draw various type of curves used in engineering
				2) Understand Orthographic projections and draw projections of simple drawing entities such as points Lines.
				3) Draw projections of different types of regular Planes, solids in various positions wrt principal planes of projection.
				4) Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
				5) Construct Isometric Scale, Isometric Projections and Views.
				6) Convert Isometric to orthographic views and understand basic sketching using computer aided design (CAD) software.
	9AC48	Basic electrical and electronics Engineering	CO1	1. Understand the fundamentals of electrical engineering and DC machines.
			CO2	2. Understand the principles of AC circuits.
			CO3	3. Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	4. Understand the principle and operation of diode.
			CO5	5. Understand the principle and operation of transistor.
			CO6	6. Understand the principles of digital electronics.
	9HC62	Oral Communication Lab - II	CO1	• Understand the nuances of striking a great conversation in formal and informal situations.
			CO2	• Gain experience of facing an audience and speaking in public.
			CO3	• Design a winning presentation and present it with ease.

	9HC66	Engineering Physics Lab	CO1	• Understand the concepts of photo electric effect, importance, photo current, colour filters, optical sensors.
			CO2	• Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
			CO3	• Recognize the difference between the interference and diffraction, grating, laser characteristics.
			CO4	• Analyze the concepts of fiber optics, fundamentals, numerical aperture its importance, attenuation in fiber and applications.
			CO5	• Understand and search to apply the fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law.
			CO6	• Know the difference between AC and DC fundamentals, Magnetostriction, resonance, air column vibrations.
			CO7	• Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance, capacitance and electrical and electronic fundamentals.
			CO8	• Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook's law.
			CO9	• Analyze the concept a semiconductors, types, calculation of energy gap of a semiconductor diode and importance.
			CO10	• Analyze the difference

				between normal diode, LED, forward bias, reverse bias, I-V characteristics, direct and indirect band gap semiconductors.
			CO11	• Characterize the RC network, time constant, capacitor functioning and its application.
			CO12	• Understand the concept of radiation, ionizing radiation, radiological protection and inverse square law.
	9EC61	DATA STRUCTURES Using C Lab	CO1	1 Implement Stacks, Queues and circularqueues.
			CO2	2 Write programs using tree traversals. In-order, preorder and post-order.
			CO3	3 Program searching, sorting and hashing operations.
			CO4	4 Write programs on Binarytrees
			CO5	5 Implement classes and operatoroverloading.

Year and regulation	Course code	Course name	Co's	
	9HC16	Probability and Statistics	CO1	1. Solve the random variable problems and probability distributions.
			CO2	2. Estimate the parameters and solve the problems using central limit theorem.
			CO3	3. Test the hypothesis related to samples concerning to the means and proportions of large size samples.
			CO4	4. Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.
			CO5	5. Solve the problems on measures of central tendency, Correlation

			CO6	Classify and differentiate various regression models
II-I & A22	9AC48	ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING	CO1	1. Understand the fundamentals of electrical engineering and DC machines.
			CO2	2. Understand the principles of AC circuits.
			CO3	3. Understand the principle and operation of three phase induction motor and measuring instruments.
			CO4	4. Understand the principle and operation of diode.
			CO5	5. Understand the principle and operation of transistor.
			CO6	6. Understand the principles of digital electronics.
II-I & A22	9EC02	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	CO1	1 Understand and comprehend the fundamentals of JAVA, its Classes, and Objects and write simple programs using constructors.
			CO2	2 Write programs using inheritance, interface and packages.
			CO3	3 Implement programs using Packages, I/O Stream and collections.
			CO4	4 Implement Exception handling and Multithreading.
			CO5	5 Design programs using AWT, Swings and develop applications using event handling.
			CO6	6 Develop applications using Applets and develop client server programs using networking concepts.
	9F303	Discrete Mathematics	CO1	Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
			CO2	Reason about arguments represented in Predicate logic.
			CO3	Perform operations on discrete structures such as sets, functions, relations, and sequences.
			CO4	Solve discrete mathematics problems

				that involve: computing permutations and combinations of a set.
			CO5	Analyze and deduce problems involving recurrence relations and generating functions.
			CO6	Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling
	9DC10	Computer Organization and Architecture	CO1	1. Perceive basic operational concept of computer and data processing.
			CO2	2. Use data types with instruction set of specified architecture
			CO3	3. Justify different control unit design and algorithms for various operations.
			CO4	4. Elaborate basic architecture of 8086 processor
			CO5	5. Write assembly language programming and debug to 8086
			CO6	6. Interface devices to 8086 processor.
	9D310	Software Engineering	CO1	*(i) Apply process models in real world software products.*
			CO2	*(ii) Classify software requirement specification document.*
			CO3	*(iii)Design system models and user interface.*
			CO4	*(iv)Evaluate test strategies for various softwares.*
			CO5	*(v) Describe product metrics,risks.*
			CO6	*(vi)Understand the quality management.*
II-I & A22	9HC17	Universal Human values	CO1	Recognizing the significance of value education and Understand the way to have continuous happiness and prosperity
			CO2	Distinguish between the Self and the body to realize the meaning of harmony for co-existence of Self and body

			CO3	Appreciating the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human- human Relationship
			CO4	Recognize the need of harmony in nature and existence, and work out their mutually fulfilling participation in the nature with
			CO5	Practice natural acceptance and implement and collaborate ethical human conduct
			CO6	Understand and Apply harmony in professional ethics
	9EC62	Object oriented Programming through Java Lab	CO1	1 Write programs to generate Prime numbers, Roots of quadratic equation and Fibonacci series.
			CO2	2 Write small application such as banking system.
			CO3	3 Write programs on operator, function overloading and dynamic method dispatch.
			CO4	4 Write programs to implement interface and packages.
			CO5	5 Explain and write programs to implement threads.
			CO6	6 Write programs to implement applets and event handling.
	9EC77	Software Engineering and Computer Organization Lab	CO1	Identify software process and software engineering practices to select and justify approaches for a given project and its constraints and distinguish life cycles for developing software product. Appraise the importance and principles of Unified Modeling Language, its building blocks and to relate UML paradigm for problem solving. Define and design models for the requirements stated in the software project. Design

				class, object and interactive diagrams and know their significance. Design advanced behavioral and architectural modeling and work on case studies.
II-I & A22			CO2	Appraise the architecture of 8086 processor, assembling language programming and interfacing with various modules. Experiment with Arithmetic operations of binary number system. Simulate any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.
II-I& A22				
	9AC77	Elements of Electrical and Electronics Engineering Lab	CO1	Understand the working of single-phase transformer under different conditions, the performance of three phase induction motor, different speed control methods of DC motor with and without loading with its performance.
			CO2	Understand the applications of Thevenin's Theorem in circuit analysis.
			CO3	Identify, Specify and test R, L, C Components (Colour Codes), Potentiometers, Switches, Coils, Relays.
			CO4	Identify, Specify and test Active Devices, Diodes, BJTs, Low power JFETs.
			CO5	Explain and demonstrate working of PN Junction and Zener diode.
			CO6	Explain and demonstrate working Half and Full wave Rectifier without filters.
			CO7	Demonstrate working of CE characteristics and its application as an amplifier.
II-I& A22	9I378	Comprehensive Test and Viva- Voce - III	CO1	1. Comprehend the concepts in the Core Courses 1st yearand 2nd year 1st Semester.
			CO2	2. Assess technical

				knowledge to face interviews.
			CO3	3. Exhibit lifelong learning skills to pursue higher studies or professional practice.
	9I386	Technical Seminar – III	CO1	Identifycurrentgeneral, political and technologyrelatedtopics.
			CO2	Arrange and presentseminar in a effective manner
			CO3	Collect, survey and organize content in presentablemanner
			CO4	Demonstrateoratoryskillswith the aid of Power Point Presentations
			CO5	Exhibit interview facingskills and team leadingqualities
II-II& A22	9E445	Introduction to IOT	CO1	Understand the concepts of Internet of Things
			CO2	• Analyze basic protocols in wireless sensor network
			CO3	• Design IoT applications in different domain and be able to analyze their performance
			CO4	• Implement basic IoT applications on embedded platform
			CO5	Understand the concepts of Internet of Things
			CO6	• Analyze basic protocols in wireless sensor network
	9EC05	Data Communications and Networks	CO1	Identify the different types of network topologies and protocols useful for real time applications and transmission medias.
			CO2	Discuss design issues of data link layer and solve problems on Checksum and flow control.
			CO3	Describe Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN.

			CO4	Discuss network layer design issues, routing algorithms and Internetworking concepts.
			CO5	Discuss network layer sub netting concepts, its protocols of control and congestion and QOS.
			CO6	Describe concepts and services and protocols of transport, Application layers
II-II& A22	9EC03	Database Management Systems	CO1	1. Comprehend importance, significance, models, Database languages, architecture and design of DataBaseSystems.
			CO2	2. Design Relational Models and apply Integrity Constraints, Querying fundamentals, Logical data base Design and Views of databases along with application of Relational Algebra.
			CO3	3. Apply queries in SQL Query using Nested Queries Set, Comparison Operators, Aggregative Operators, Logical connectivity's with Joins statements and develop applications.
			CO4	4. Eliminate data redundancy through normalforms.
			CO5	5. Ensure ACID properties and Serializability in Transaction management and Database Recovery.
			CO6	6. Use different External Storage Organization techniques and apply Indexing in databases to enhance systemperformance.
	9EC06	Operating Systems	CO1	1. Describe the basic functionalities and structure of the Operating System
			CO2	2. Explain the concepts and implementations of: Processes, Process Scheduling. Describe, contrast and compare various types of Operating systems like Windows and Linux.
			CO3	3. Comprehend the concepts of Synchronization and Deadlocks in

				the Operating System
			CO4	4. Discuss the concepts of Memory Management(Physical and Virtual memory)
			CO5	5. Explain the concepts of File System with regard to directory and disk management algorithms.
			CO6	6. Students understand the concepts of I/O systems, protection and security
II-II& A22	9CC55	Digital Electronics	CO1	1. Apply the rules of Boolean algebra to simplify Boolean expressions.
			CO2	2. Simplify of Boolean expressions using K-map.
			CO3	3. Design MSI combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters.
			CO4	4. Design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers
			CO5	5. Create digital design using PLD's such as ROM's, PLA's, PAL s.
			CO6	6. Design the digital controllers using Algorithmic State Machine Charts.
	9ZC01	Economics, Accountancy and Management Science	CO1	1. Acquire the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular.
			CO2	2. Gain exposure on Cost concept, Revenues and Market structure and describe the concepts.
			CO3	3. Comprehend the basic concepts of Accounting, Double entry system and Bookkeeping.
			CO4	4. Interpret the concepts of Capital expenditure, Revenue expenditure and Final accounts ad their significance.
			CO5	5. Gain knowledge and elaborate the basics of Management, its principles and various functions performed in organization.
			CO6	6. Recognize various personality traits, perception, attitudes of individuals working in

				organization.
			CO6	Learn and implement policy to protect the environment
	9EC63	DATABASE MANAGEMENT SYSTEMS LAB	CO1	• Create tables for a database and apply Queries using ANY, ALL, IN, EXISTS,
			CO2	• NOTEXISTS, UNION, INTERSET, Constraints.
			CO3	• Write Queries using Aggregate functions such as [COUNT, SUM, AVG, MAX, MIN,
			CO4	• GROUP BY, HAVING], Conversion functions and use string functions for a given
			CO5	• application.
			CO6	• Explain and write programs using PL/SQL programs using exceptions, COMMIT,
II-II& A22			CO7	• ROLLBACK and SAVEPOINT in PL/SQL block.
			CO8	• Develop programs using WHILE LOOPS, FOR LOOPS, nested loops using BUILT–
			CO9	• IN Exceptions and write Procedures.
			CO10	• Write Programs for stored functions invoke functions in SQL Statement and write
			CO11	• Programs for packages specification.
			CO612	• Describe and write programs using features of CURSORs and its variables.
			CO13	Develop Programs implementing Triggers
		OPERATING SYSTEMS AND COMPUTER NETWORKS LAB	CO1	Simulate and implement operating system concepts such as scheduling, deadlock management, page replacement techniques, file management and memory management

		Computer Networks Lab	CO1	1. Implement and analyze framing methods of the data link layer.
			CO1	2. Implement and analyze framing methods of the data link layer.
			CO2	Illustrate and implement error detection & correction techniques.
			CO3	Implement different Routing Algorithms.
			CO4	3. Understand basic Network Commands.
			CO5	4. Demonstrate the features of NS2 tool
			CO6	5. Implement and analyze framing methods of the data link layer.
II-II& A22	9I479	Comprehensive Test and Viva Voce - IV	CO1	After completing this course, the student will be able to Comprehend the concepts in the Core Courses 1 st year and 2 nd year.
			CO2	Assess technical knowledge to face interviews.
			CO3	Exhibit life long learning skills to pursue higher studies or professional practice.
	9I487	Technical Seminar – IV	CO1	Deliver lecture on emerging technologies.
			CO2	Explain domain knowledge to resolve real time technical issues
			CO3	3Demonstrate ability to lead and explain concepts and innovative ideas.
			CO4	Demonstrate team leading qualities.
			CO5	Demonstrate public speaking and lifelong learning skills for higher studies and to pursue
			CO6	Exchange new information that would not have been available otherwise.
				Develop debating and interview skills.
III-I& A20	8FC06	Information Security	CO1	Understand the fundamental concepts of Security Attacks and security standards with the model for network Security.
			CO2	Review and analyze conventional cryptographic techniques and authentication
			CO3	Review and analyze public cryptographic techniques and outline the concepts of

				Kerberos and email privacy
			CO4	Recognize architecture, key management and header formats of Ipsec
			CO5	Outline the various web security threats and protocols
			CO6	Understand Intrusion Detection System and Design principles of Firewalls
	8I506	INTRODUCTION TO EMBEDDED SYSTEMS	CO1	Classify embedded systems and their applications
			CO2	Write ALP for 8051 architecture
			CO3	3. Implement interfaces for Embedded System using various protocols and hardware modules.
			CO4	Understand the principles of Communication Interface, Wireless and Mobile Systems Protocols
			CO5	Design the interrupt routines for variois OS concepts and Memory Management techniques in an RTOS Environment
			CO6	Recognize the issues and design of basic Real-Time Operating System principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations.
	8EC07	WEB TECHNOLOGIES	CO1	Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap. a. Develop dynamic programs using Javascript and Typescript. b. Develop scripts using XML and validate using parsers, Design a data-interchange format using JSON.
			CO2	Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
			CO3	Design responsive web applications with Forms, Scope, Dependency Injection & Services, and Single Page Application (SPA) of Angular.
			CO4	Comprehend the uses of Web servers and design the server-side scripts using Servlets.
			CO5	6. Design and develop server-side scripts and components using PHP.
			CO6	
	8EC16	INTRODUCTION TO DATA SCIENCE	CO1	Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as

				foundations for statistical modeling. Fit a model to data
			CO2	Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA
			CO3	Apply basic machine learning algorithms and to identify common approaches used for Feature Generation
			CO4	Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components
	8HC05	Environmental Science and Ecology	CO1	Understand about ecosystem and energy flow among the organisms.
			CO2	Know the resources available, use of them and overexploitation of the resources in the nature.
			CO3	Learn the value, use and value of biodiversity.
			CO4	Understand the causes and effect of pollution and implement measures in control of pollution.
			CO5	Understand the sustainable development and implement green technology for sustainable development.
			CO6	Implement policy to protect the environment.
	8EC67	WEB TECHNOLOGIES LAB	CO1	Demonstrate the use of HTML tags and be able to design web pages. Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.
			CO2	Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
			CO3	Implement Angular with Expressions,

				Filters, Directives, Controller, and Modules.
			CO4	Develop a Single Page Application with implementation of Scope and Form.
			CO5	Implement Java servlets using Apache Tomcat Server for User authentications
			CO6	Develop an application in PHP with Database connectivity.
III-I-&A20	8FC65	Information Security Lab		Understanding ofSymmetric Encryption Algorithms, Asymmetric Encryption Algorithms, Hash and Key Exchange, Digital Signature and Digital Envelope, Demonstration of NS3 Tool
	8I595	SUMMER INDUSTRY INTERNSHIP-I	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects
			CO2	. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
III-II-&A20			CO3	Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills.
	8I510	IOT Security	CO1	Describe IOT features and discuss IOT related protocols
			CO2	Classify IOT attacks and recommend counter measures
			CO3	Implement IOT Lifecycle for a project
			CO4	Examine various cryptographic protocols
			CO5	Access Privacy challenges and mitigate
			CO6	Examine compliance standards for IOT infrastructures
	8DC05	Microprocessors and Microcontrollers	CO1	Understanding the concepts of 8086 Architecture
			CO2	Understanding the concepts of Instruction set & developing skills in writing assembly language programs.
			CO3	Ability to interface keyboard, stepper motor ADC, DAC to 8086 using 8255
			CO4	Understanding the concepts of 8051 Architecture
			CO5	Exploring the concepts of instruction set of 8051

			CO6	Ability to interface LED, LCD, Keyboard DAC, ADC with 8051
	8IC07	Introduction to Linux Programming	CO1	List and demonstrate the basic Linux utilities
			CO2	Recite and solve problems using Shell Scripting
			CO3	Understand and elaborate File System structure and kernel support for files in Linux.
			CO4	4. Summarize the fundamentals of process control primitives and signal handling.
			CO5	Classify the techniques of Inter process communication and apply them to real world problems.
			CO6	Demonstrate the significance of Semaphores for Kernel support and simulate program using the same.
	8LC01	Introduction to Artificial Intelligence	CO1	Ability to formulate an efficient problem space for a problem expressed in natural language.
			CO2	Select a search algorithm for a problem and estimate its time and space complexities.
			CO3	Possess the skill for representing knowledge using the appropriate technique for a given □ problem.
			CO4	Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.
	8FC07	Automata Theory and Compiler Design	CO1	Design the finite automata different Languages
			CO2	Construct finite Automata for a given regular expressions, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.
			CO3	Design the push down automata and Turing Machine for complex languages.
			CO4	Understand LEX tool and relate parsing techniques,
			CO5	Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.
			CO6	Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.

	8GC49	INTELLECTUAL PROPERTY RIGHTS	CO1	Demonstrate a breadth of knowledge in Intellectual property
			CO2	Overview of Patents, Searching, filling and drafting of Patents
			CO3	Overview of copyright & GI .
			CO4	Overview of Trade Mark & Trade Secret,
			CO5	Overview of Integrated Circuit and Industrial Design.
			CO6	Knowledge about different national and international: Conventions and Treaties Governing the IPRs
	8IC61	Programming Using Linux - Lab	CO1	To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
			CO2	To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
			CO3	To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
			CO4	. To gain knowledge in implementing processes aspects, mastering the process APIs.
			CO5	To understand how to implement pipes, FIFO, how to use for communication purpose in IPC. .
			CO6	To understand the significance of Semaphores for Kernel support and simulate program using the same
	8DC66	MICROPROCESSORS AND MICROCONTROLLERS LAB(MPMC)	CO1	Analyze and apply working of 8086.
			CO2	Compare the various interface techniques. Analyze and apply the working of 8255, 8279,8259, 8251, 8257 ICs and design and develop the programs
			CO3	Learning the Communication Standards
	8I680	COMPREHENSIVE VIVA VOCE	CO1	Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.
	8I691	GROUP PROJECT	CO1	Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
			CO2	Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond

				the curriculum, and hence developing the software.
			CO3	3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
			CO4	Improve their communicative skills and team skills largely improve.
III-II-A20			CO5	Work as an individual and in a team.
	8I612	Introduction To Ethical Hacking	CO1	1. Discuss Ethical hacking primitives
			CO2	Use ethical hacking to deal with foot printing and social engineering
			CO3	Justify Network Scanning and system security
			CO4	Apply Rootkits and sniffers to gather information from the network and develop a Security model
			CO5	Apply techniques to counter Web Hacking and Vulnerabilities.
			CO6	Justify Wireless Network Hacking and physical site security

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Course Outcomes of MBA Department

Department of MBA - Master of Business Administration
COs for A22-1st Year and 2nd year courses/subjects

Year and regulation	Course code	Course name	Co's	
I-I & A22	8Z101	MANAGEMENT AND ORGANIZATIONALBEHAVIOUR	CO1	Exposure to evolution of management and managerial role and responsibilities
			CO2	Acquire the process of planning and decision making
			CO3	Acquire and gain the art of organizing and controlling the organization
			CO4	Exposure on organization behavior, groups, teams and building teams
			CO5	Identify different styles of leadership and different theories of motivation.
			CO6	Infer personality theories and stress Management
	8Z102	FINANCIAL ACCOUNTING AND ANALYSIS	CO1	Outline the objectives of accounting, its importance
			CO2	Apply the concepts of accounting for the preparation financial statements.
			CO3	Apply various methods for valuation of inventory and fixed assets
			CO4	Analyze the financial statements using cash flow and funds flow analysis statement’s
			CO5	Analyze the financial statements using comparative, common size and ratios
			CO6	Explain the basic

				computerized accounting concepts and its applications using Tally Software
	8Z103	MANAGERIAL ECONOMICS	CO1	Acquire the knowledge relating to Managerial economics and its importance
			CO2	Outline meaning of demand and how it can be forecasted
			CO3	Acquire knowledge regarding production function and returns to scale
			CO4	Infer meaning of cost and its determinants
			CO5	Examine market structures and pricing strategies for firms
			CO6	Outline profit theory and measurement
	8Z104	LEGAL AND ECONOMIC ENVIRONMENT OF BUSINESS	CO1	Explain the nature of contract and the essential elements of contract
			CO2	understanding Indian companies act
			CO3	Identify and understand the utility of different negotiable instruments alongside sales goods act and Central Excise act,
			CO4	Analyze the implications of business environment using the appropriate methods
			CO5	Infer and interpret the components of balance of payments and the recent trends
			CO6	Discover the WTO its structure and functions in governing and administering policy decisions
	8Z105	RESEARCH METHODOLOGY AND STATISTICAL ANALYSIS	CO1	Explain basic process of research and measurement

				of variables
			CO2	Explain the research design and types of research design
			CO3	Examine the types of data and evaluate using the sample tests
			CO4	Evaluate the variances using parametric and nonparametric tests
			CO5	Explain the applications of time series analysis
			CO6	Equip with the art of research report writing
	8Z106	PROJECT MANAGEMENT	CO1	Exposure to process of project management
			CO2	Acquire and Discover the project formulation, project rating preliminary report and feasibility report
			CO3	Equip the techniques of project appraisal methods
			CO4	Discover project finance and project evaluation techniques
			CO5	Exposure on project control and techniques
			CO6	Discover the organization behavior in project management
	8Z107	SUSTAINABILITY MANAGEMENT	CO1	Acquire knowledge on sustainability management and sustainable business practices
			CO2	Discover planning methods for sustainability
			CO3	Equipping the method of integrating sustainability
			CO4	Gain knowledge on sustainability in functional areas
			CO5	Gain exposure on creating eco system for change and sustainability
			CO6	Discover sustainable entrepreneurship
	8Z108	BUSINESS COMMUNICATION	CO1	Gain knowledge on basic

				communication skills
			CO2	Equipping with presentation skills and chairing meetings
			CO3	Acquire the skills in writing skills
			CO4	Articulate the method of writing business reports
			CO5	Gain exposure on employability skills
			CO6	Discover the contemporary aspects in communication
	8Z109	STATISTICAL DATA ANALYSIS LAB	CO1	Outline the basic functions and features of Microsoft-Office.
			CO2	Infer the knowledge on functions of Excel Data Processing
			CO3	Equip with data analysis chart and graphs for data analysis
			CO4	Gain knowledge on frequency descriptive analysis using spss
			CO5	Acquire knowledge on parametric tests using spss
			CO6	Acquire knowledge on non-parametric using spss
I-II & A22	8Z210	FINANCIAL MANAGEMENT	CO1	Gain the knowledge relating to profit & wealth maximization, time value of money
			CO2	Evaluate investment decisions
			CO3	Solve problems relating to capital structure and cost of capital
			CO4	Acquire knowledge relating to working capital
			CO5	Appraise about cash, receivables and inventory management
			CO6	Know about dividend decisions and theories relating to dividends
	8Z211	HUMAN RESOURCE	CO1	Understand and Inculcate knowledge on Human Resource Planning and its

		MANAGEMENT		functions and policies
			CO2	Understand the basic knowledge about the Job analysis
			CO3	Develop the skills required for Recruitment process at the work place
			CO4	Excel the skill required for effective training and Appraisal of the employee at the work place
			CO5	Understand the concept of Compensation and its influence on job evaluation system
			CO6	Develop negotiation skills for handling Industrial Disputes and grievances
	8Z212	MARKETING MANAGEMENT	CO1	Gain exposure on Marketing functions and process
			CO2	Disseminate and apply STP analysis
			CO3	Discover different types of product decisions
			CO4	Exposure on various types of pricing decisions
			CO5	Equip with the strategies of distribution and promotion
			CO6	Discover the rising growth of digital marketing and it tools
	8Z213	ENTREPRENEURSHIP AND DESIGN THINKING	CO1	Outline the Nature of Entrepreneurship
			CO2	Explore customer analysis and finding opportunities
			CO3	Discover and evaluate different business models and validation
			CO4	Identify MVP using economic and financial analysis
			CO5	Discover the process and types of Innovation
			CO6	outline the process of design thinking

	8Z214	QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS	CO1	Acquire knowledge relating to operations research and areas of its application
			CO2	Gain knowledge relating to linear programming and its application
			CO3	Solve problems relating to transportation and assignment
			CO4	Acquire knowledge relating to decision theory and its applications
			CO5	Solve problems relating to game theory
			CO6	Solve problems relating to queuing theory
	8Z215	OPERATIONS MANAGEMENT	CO1	Inculcate knowledge on industry operations with respect to production
			CO2	Develop in-depth knowledge on optimum utilization of resources in Operations
			CO3	Outline the concepts of global procedures with respect to scheduling
			CO4	Summarize the importance of materials & stores management with respect to production
			CO5	Inculcate and enlighten on quality management techniques and create
			CO6	Explain the project management techniques
	8Z216	BUSINESS ETHICS & CORPORATE GOVERNANCE	CO1	Acquire knowledge relating to Business and professional ethics
			CO2	Outline Legal & environmental aspects of ethics
			CO3	Outline the ethical practices in Business Management
			CO4	Acquire knowledge relating to corporate governance
			CO5	Gain exposure in code of

				corporate governance
			CO6	Explore and gain knowledge relating to legal position of IPR
	8Z217	INTERNATIONAL BUSINESS	CO1	Gain exposure on Drivers of globalization WTO and its implications
			CO2	Outline the international trade theory
			CO3	Acquire knowledge on entering in international business strategy and management
			CO4	Equipping with global marketing strategies and R & D
			CO5	Outline the concept of financial management in international business
			CO6	Enlighten in the area of FDI and its importance in India
	8Z218	TOTAL QUALITY MANAGEMENT	CO1	Identify the need for Quality Management in a business organization.
			CO2	Develop proficiency in various quality control techniques and methods to ensure customer satisfaction
			CO3	Acquire knowledge on TQM methodologies and benchmarking
			CO4	Discover the cost of quality and the role of business process reengineering
			CO5	Apply the principles of TQM in service sector
			CO6	Examine the need for ISO standards and their benefits
II-I(A22)	8Z321	STRATEGIC MANAGEMENT	CO1	Explain the key concepts and process of Strategic management.
			CO2	Analyze different models and techniques of strategic formulation
			CO3	Outline various levels of strategic analysis and different types of strategies

			CO4	Evaluate the relationship between strategy, organization structure, leadership, organizational values in a global perspective
			CO5	Explore strategies for operational zing and institutionalizing strategy
			CO6	Assess strategic performance and control mechanisms
	8Z322	**COST MANAGEMENT ACCOUNTING**	CO1	Acquire the knowledge relating to Management accounting and cost analysis
			CO2	Prepare students to analyze cost sheet
			CO3	Acquire knowledge regarding Marginal costing
			CO4	Apply knowledge of marginal costing to solve business problems
			CO5	Appraise about budget preparation and budgetary control.
			CO6	Know about standard costing and its application
	8Z323	LEGAL AND ECONOMIC ENVIRONMENT OF BUSINESS	CO1	Explain the nature of contract and the essential elements of contract
			CO2	understanding Indian companies act
			CO3	Identify and understand the utility of different negotiable instruments alongside sales goods act and Central Excise act,
			CO4	Analyze the implications of business environment using the appropriate methods
			CO5	Infer and interpret the components of balance of payments and the recent trends
			CO6	Discover the WTO its

				structure and functions in governing and administering policy decisions
	8Z324	QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS	CO1	Acquire knowledge relating to operations research and areas of its application
			CO2	Gain knowledge relating to linear programming and its application
			CO3	Solve problems relating to transportation and assignment
			CO4	Acquire knowledge relating to decision theory and its applications
			CO5	Solve problems relating to game theory
			CO6	Solve problems relating to queuing theory
	8Z325	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	CO1	Acquire knowledge relating to investments and about securities market
			CO2	Analyze investments based on fundamentals and calculate intrinsic value
			CO3	Analyze and value the bond
			CO4	Understand equity valuation models
			CO5	Acquire knowledge relating to Portfolio management
			CO6	Evaluate Portfolio performance and revision
	8Z326	CONSUMER BEHAVIOUR	CO1	Identify the basic concepts of consumer behavior
			CO2	Explore the process of formation of consumer attitude, learning and perception
			CO3	Examine the environmental influences on consumer behavior
			CO4	Examine the consumer decision making
			CO5	Analyze the consumer behavior models

			CO6	Identify the need of studying consumer protection laws
	8Z327	**PERFORMANCE MANAGEMENT AND** COUNSELING	CO1	Identify the basic concepts of performance management
			CO2	Examine the process of employee appraisal and feedback mechanism
			CO3	Analyzing the methods of performance appraisal and understanding benchmarking
			CO4	Apply the performance metrics and models
			CO5	Outline the counseling process
			CO6	Analyze the relation between counseling and performance management
	8Z328	BUSINESS PLAN PREPARATION AND MODELS IN ENTREPRENEURSHIP	CO1	Identify and understand the need of preparing business plan and feasibility
			CO2	Create a marketing plan for appropriate launch of the business in the market
			CO3	Infer and acquire the knowledge pertaining to production and operations management
			CO4	Identify the importance of social entrepreneurship
			CO5	Create business models and lean canvas models
			CO6	Analyze the business conditions in selection of business structure
	8Z329	FINANCIAL INSTITUTIONS, MARKETS ANDSERVICES	CO1	Understand the structure of financial system
			CO2	Identify various banking institutions and their policies
			CO3	Exploring the NBFC and their functions
			CO4	Understand the financial and securities market
			CO5	Outline the asset and fund

				based financial services
			CO6	Learn the investment and merchant banking
	8Z330	SERVICES MARKETING	CO1	Explore the basic concepts related to services marketing
			CO2	evaluate service quality
			CO3	Create a Service Design
			CO4	develop blueprint and decide on appropriate pricing
			CO5	Identify the various distribution
			CO6	Identify various promotion of services
	8Z331	TRAINING AND DEVELOPMENT	CO1	Outline the concept of Training and its implementation in organizations
			CO2	Inspect the Training needs and developing the Training process
			CO3	Build Training designs and Explain various methods of Training
			CO4	Explain the Measuring of a training program
			CO5	Explain various areas of organizational training
			CO6	Examine the Strategic training
	8Z332	STARTUP MANAGEMENT AND SUSTAINABILITY	CO1	Explore the various business models
			CO2	Identify the resources in helping in the formation of a startup
			CO3	Analyze the lean startup method
			CO4	Explore growth strategies
			CO5	Identify the various startup sustainable strategies
			CO6	Identify startup sustainable strategies
	8Z333	STRATEGIC INVESTMENT AND	CO1	Identify and understand the

		FINANCING DECISIONS		different means of investment and disinvestment
			CO2	Assessing the risk components by applying the capital budgeting techniques
			CO3	Assessing the risk related to investment decisions
			CO4	Examining the critical analysis of project appraisal techniques
			CO5	Exploring investment decisions under capital constraints
			CO6	Asses and understand the management of risk
	8Z334	RETAILING MANAGEMENT	CO1	Identify the basic concepts of Retailing Management
			CO2	Analyze the consumer behavior in retailing malls and their experiences
			CO3	Create value through various formats of Retailing
			CO4	Evaluate the linkages between supply chain management and Retailing
			CO5	Explore the various types of retail layouts and arrangement of merchandize
			CO6	Identify the role of technology and FDI in Retailing
	8Z335	LEADERSHIP AND CHANGE MANAGEMENT	CO1	Acquire the process of Managing strategic change process
			CO2	Implement the change and assessing the results thereof
			CO3	Identify methods of change management
			CO4	Acquire the theories of leadership
			CO5	Examine the leadership transformation process
			CO6	Explore and analyze the traits required for development of good leadership

	8Z336	TECHNOLOGY FOR ENTREPRENEURSHIP AND INTELLECTUAL PROPERTY RIGHTS	CO1	Explore the various business models helping in the formation of a startup
			CO2	Analyzing the process of starting an enterprise and its environment
			CO3	Analyze the lean startup method and its limitations
			CO4	Explore the various opportunities for the growth and development of a startup
			CO5	Infer the importance of sustainability and guiding principles of sustainability
			CO6	Identify the various startup sustainable strategies
	8Z338	QUANTITATIVE APTITUDE AND LOGICAL REASONING	CO1	Outline series completion and direction sense test and puzzle test
			CO2	Learn data sufficiency and venn diagrams
			CO3	Understanding HCF and LCM
			CO4	Understand ratios and proportions
			CO5	Explore the simple interest and compound interest computation
			CO6	Understanding area of plane figures
II-II & A22	8Z439	BUSINESS ANALYTICS	CO1	Acquire the concept of business intelligence and its evolution
			CO2	Analyze the significance of business analytics and its relations with organization decision making methods
			CO3	Acquire the knowledge related to data warehousing and its architecture
			CO4	Outline the importance of data mining and its applications
			CO5	Analyze the descriptive models through R software
			CO6	Make use of big data in

				measuring the business performance
	8Z440	MANAGEMENT OF DERIVATIVES	CO1	Understanding the fundamentals of derivatives
			CO2	Learn Futures and Forward Markets
			CO3	Explore the differences between options and futures
			CO4	Learn basic option strategies
			CO5	Understand commodity market derivatives
			CO6	Explore on swaps and credit risk
	8Z441	PRODUCT AND BRAND MANAGEMENT	CO1	Learn the basic product concepts
			CO2	Explore the strategies of Product Positioning
			CO3	Outline the strategies of Packaging and support service
			CO4	Understanding Brands and its significance
			CO5	Exploring the concept of Brand Awareness
			CO6	Understanding Brand Equity
	8Z442	MANAGEMENT OF INDUSTRIAL RELATIONS	CO1	Understanding the concept of industrial relations and trade union act 1926
			CO2	Exploring the framework of collective bargaining
			CO3	Learn the labor legislation and factories act 1948
			CO4	Understand the labor legislation and wage regulation
			CO5	Learn employee empowerment and quality of work life
			CO6	Exploring the contemporary issues in industrial relations
	8Z443	ENTREPRENEURIAL FINANCE	CO1	Explore the various avenues of entrepreneurial financing sources and types of entrepreneurship
			CO2	Explain and outline methods

				and principles of financial forecasting
			CO3	Develop and create a financial model with reference to certain assumptions
			CO4	Evaluation of new business ventures using different valuation techniques
			CO5	Assess and measure the current condition of venture and identify future financial needs
			CO6	Identify different methods of harvesting from venture financing
	8Z444	BEHAVIORAL FINANCE	CO1	Understanding the structure of behavioral finance
			CO2	Learning the history of behavioral finance and incorporating behavior into the asset allocation process
			CO3	Identify the investor biases
			CO4	Learning different types of Investor biases
			CO5	Exploring the different types of bias and diagnosis testing
			CO6	Exploring the concept of neuroeconomics
	8Z445	CUSTOMER RELATIONSHIP MANAGEMENT	CO1	Exploring the process of CRM
			CO2	Learning the application of CRM in Marketing
			CO3	Exploring the need of sales force automation
			CO4	Understanding the concept of analytical CRM
			CO5	Learning the CRM implementation
			CO6	Understand the process Managing customer relationships.
	8Z446	TALENT AND KNOWLEDGE MANAGEMENT	CO1	Outline the Evolution and importance of Talent Management
			CO2	Relate Talent management

				and employee engagement
			CO3	Explain the role of HR to Talent management
			CO4	Explain the concept and types of Knowledge management
			CO5	Summarize the Knowledge management framework
			CO6	Analyze the implementation of Knowledge management
	8Z447	ENTREPRENEURIAL MARKETING	CO1	Identify the reasons of understanding the entrepreneurial marketing
			CO2	Identify business opportunities methods of understanding customer problems
			CO3	Develop a communication strategy to reach the appropriate target audience
			CO4	Analyze the Cost, production cost to reach a minimum viable product through corresponding revenue analysis
			CO5	Explore the various alternatives available for a proper distribution network
			CO6	Identify the need of maintaining customer relationship using the relevant methods
	8Z448	INTERNATIONAL FINANCIAL MANAGEMENT	CO1	Identify the nature and scope of International Financial Management and its recent trends in the growth of the Indian economy
			CO2	Examine the application of exchange rate system by following FEDAI regulations and role of RBI
			CO3	Provide awareness on the utility of currency derivatives and their impact on cash management
			CO4	Identify the importance of

				hedging as a risk management tool in foreign currency payables.
			CO5	Know the benefits of Interest Rate Parity and Purchasing Power Parity in real exchange rate.
			CO6	Examine the capital structure of International Financial Management
	8Z449	DIGITAL MARKETING	CO1	Identify the various trends in digital marketing strategies
			CO2	Evaluate the appropriate means of digital marketing channel
			CO3	Explore the various segments to reach the customers and retain the customers
			CO4	Create digital marketing plan to execute the marketing objectives
			CO5	Analyze the search engine optimization and online advertising
			CO6	Infer the strength of social media and its role in marketing
	8Z450	Organizational Development	CO1	Outline HRD mechanisms, processes and interventions and understand the significant role played by HRD professionals
			CO2	Design HRD programs and evaluate the effectiveness of designed HRD programs
			CO3	Understand recent HRD trends and applications
			CO4	Explain insights on concepts of Organizational development and role of top management in defining OD
			CO5	Develop intense knowledge related to various organizational interventions
			CO6	Analyze the interface

				between HRD and OD
	8Z451	SOCIAL ENTREPRENEURSHIP	CO1	Explore the forms of social entrepreneurship and basic traits of social entrepreneurship
			CO2	Identify different types and forms of social entrepreneurship
			CO3	Create new business ventures and considering acquisition and franchising
			CO4	Discover the importance of sustainable development and its factors
			CO5	Analyze critical factors for new venture development
			CO6	Analyze and monitor the challenges of social entrepreneurship