LIST OF COURSE OUTCOMES REV-2019 'C' SCHEME for AY 2021-22 (All Departments)

YEAR / SEMESTER	Course Code	Course Title	COURSE COUTCOMES	Course Outcome Statements
	FEC101	Engineering Mathematics-I	CO1	Apply and Demonstrate the concepts of Complex Number, Successive Differentiation, Partial Differentiation, Applications of Partial Differentiation, Expansion of Functions, Numerical Methods to the problems arising in engineering formulation.
			CO2	Analyze and interpret the problems arising in engineering formulation using Complex Number, Matrices, Partial Differentiation, Expansion of Functions
			CO3	Apply the techniques of SciLab Programming to solve Linear, Non linear, transcendental equations and Extrimize the functions of two variables
			CO4	Express graphically, Mathematically and through writing the concept of Complex Number, Successive Differentiation, Partial Differentiation, Applications of Partial Differentiation, Expansion of Functions, Numerical Methods in Engineering and Technology.
	FEC102	Engineering Physics-I	CO1	Illustrate and apply the basic concepts of Semiconductor physics, Crystallography and engineering materials to solve basic engineering problems.
			CO2	Illustrate and apply the basic concepts of Interference, Quantum mechanics, Superconductors and Supercapacitors to solve basic engineering problems.
			CO3	Analysis different crystal structures using X-ray diffraction technique.
			CO4	Comprehend the concept of semiconductor physics and its applications in electronic devices.
			CO5	compare the properties of engineering materials for their current and future frontierapplications.
			CO1	Analysis the results obtained by performing the experimets based on interference.
			CO2	Demonstrate the concept of crystallography.

	FEL102	Engineering Physics-I Lab	CO3	Analysis the charaecteristics of various semiconductor devices.
			CO4	Express verbally, graphically and through writing the concept of Interference, Semiconductor physics and crystallography.
			CO5	Demonstrate management principles and apply it to one's own work, as a member and leader in a team, to manage projects.
	FEC103	Engineering Chemistry-I	CO1	Explain the concept of atomic and molecular orbital theory, Aromaticity of compound, Phase rule and solve basic engineering problems.
			CO2	Explain the concept of, chemistry of polymer and their application, methods of purification of water, intermolecular forces and critical phenomenon and solve basic engineering problems.
			CO3	Comprehend the concepts of atomic and molecular structure, polymer and water.
			CO4	Express graphically the concept of atom and molecular structure, phase rule, polymers and water
FIRST YEAR SEMESTER-1	FEL103	Engineering Chemistry-I Lab	CO1	Determine the hardness, chloride content, COD of sewage water, pH of the solution, viscosity of oil and metal ion concentration.
			CO2	Identify formulate and calculate the hardness, chloride content, COD of water, molecular weight of polymer.
			CO3	Perform experimentations using the safety techniques and skills necessary for engineering practices.
			CO4	Express verbally, graphically through writing the concepts of water, pH of the solutions, Sewage and metal ion concentration.
	FEC104	Engineering Mecahics	CO1	Illustrate the concept of force, momentum, different types of motion and its application with the help of free body diagram and kinematic relation.
			CO2	Demonstrate concept of friction and motion of particle and rigid body.
			CO3	Locate centroid of the body and correlate real life application to specific type of friction to estimate required force so as to overcome the friction.
			CO4	Analyze particles in motion using principle of velocity, acceleration force, work-energy and impulse momentum by plotting the relation.

FEL104	Engineering Mecahics Lab	CO1	Verify equations of equilibrium of coplanar force system
		CO2	Verify law of moments
		CO3	Evaluate co-efficient of friction between the different surfaces in contact
		CO4	Demonstrate the types of collision/impact
FEC105	Basic Electrical Engineering	CO1	Explain the construnctional features, operation of single phase transformer and appl various network theorem to determine circuit response behaviour.
		CO2	Comprehend and analyze single and three phase circuit.
		CO3	Illustrate working principle of single and three pahse machine and basic knowledge of AC circuit
		CO4	Comprehend the basic concepts of DC circuits, Transformer and electrical motor
		CO5	Express graphically the concepts of AC and DC
FEL105	Basic Electrical Engineering Lab	CO1	Interpret and analyse the behaviour of DC circuit using network theorems.
		CO2	To determine basic electrical parameter by performing experiment on single phase AC Circuit
		CO3	Infer experimentally various electrical parameters of three phase citcuit.
		CO4	Verify and demonstrate the performance of single phase transformer and machine
		CO5	Apply electrical safety measures while performing experiment in lab
FEL106	Basic Workshop Practice-I	CO1	Demonstrate the handling of different fitting tools.
		CO2	Explain installation of operating system and system device.
		CO3	Apply the knowledge of hardware maintenance to solve maintenance related problems.
		CO4	Identify the network components and perform basic networking and crimping.
		CO5	Demonstrate the turning operation with the help of a simple job.
		CO1	Apply and Demonstrate the concepts of Differential Equations, Linear Differential Equations with constant coefficients, Numerical techniques, DUIS, Rectification, Beta & Gamma Functions, Multiple Integrals to the problems arising in engineering formulation.

FEC201	Engineering Mathematics-II	CO2	Analyze and interpret the problems arising in engineering formulation using Differential Equations, Rectification, Numerical techniques, Multiple Integrals.
		CO3	Write the program in SciLab to solve Ordinary Differential Equations and to evaluate Definite Integrals.
		CO4	Express graphically, Mathematically and through writing the concept of Rectification, Beta & Gamma Functions, Multiple Integrals.
FEC202	Engineering Physics-I	CO1	Illustrate and apply the basic concepts of Diffraction, LASER, Optical Fiber and Nanotechnology to solve basic engineering problems.
		CO2	Illustrate and apply the basic concepts of Electrodynamic, Relativity and sensor physics to solve basic engineering problems.
		CO3	Relate the basic of electrodynamics to satellite communication and antenna theory.
		CO4	Interpret and explore basic sensing techniques for physical measurements in modern instrumentation.
		CO5	comprehend the concepts of relativity, LASER and optical fiber.
FEL201	Engineering Physics-I Lab	CO1	Analysis the results obtained by performing the experimets based on diffraction.
		CO2	Measure and verify various properties of optical fiber and LASER.
		CO3	Analysis the charaecteristics of various sensors.
		CO4	Express verbally, graphically and through writing the concept of Diffraction, LASER, Optical fiber and sensors.
		CO5	Demonstrate management principles and apply it to one's own work, as a member and leader in a team, to manage projects.
FEC203	Engineering Chemistry-I	CO1	Explain the concept of fuels, Green chemistry and solve basic engineering problems.
		CO2	Explain the concept of, Spectroscopy, Electrochemistry, Corrosion, and solve basic engineering problems.
		CO3	Comprehend the concepts of Corrosion, fuels
		CO4	Express graphically the concept of Spectroscopy, electrochemistry, corrosion and fuels

FIRST YEAR SEMESTER-2	FEL202	Engineering Chemistry-I Lab	CO1	Determine the moisture content, ash content, acid value, Saponification, flash point of lubricant, emf of the Cu-Zn system by potentiometer
			CO2	Identify formulate and calculate the moisture, acid value and Saponification value, ash content
			CO3	Synthesize a drug and biofuel.
			CO4	Perform experimentations using the safety techniques and skills necessary for engineering practices.
			CO5	Express verbally, graphically through writing the concepts of fuel, lubricant, drug, and biofuel.
	FEC204	Engineering Graphics	CO1	Apply the basic principle of projections in projection of lines, planes, curves and solids.
			CO2	Apply the basic principles of projections in converting 3D view into 2D view.
			CO3	Apply the basic principle of sectional view in section of solids and orthographic projection.
			CO4	Visualise an object from the given two views and read a given drawing.
			CO5	Express graphically projection of various engineering components
	FEL203	Engineering Graphics Lab	CO1	Express graphically projection of various engineering components.
			CO2	Apply basic AUTO CAD skill to draw different views of 3D object and isometric views from the given two views
			CO3	Create annotate, edit and plot drawing using basic AUTO CAD commands and features components.
			CO4	Apply the basic principles of projections in 2D drawing using a CAD software
	FEC206	Professional Communication and Ethics-I	CO1	Illustrate the knowledge of Communication theory, vocabulary building and grammar, reading and writing skills, basic business correspondence, technical writing, personality development and social etiquettes.
			CO2	Use reading and writing skills for effective comprehension, summarization, paraphrasing and evaluation of texts
			CO3	Express verbally in effective business letters by applying rules of style, principles, structure, blocks in business organization and hard skills like technical writing.

			CO4	Apply the knowledge of interacting in all kinds of settings, displaying refined grooming and social skills.
	FEL205	Professional Communication and Ethics-I	CO1	Understand the knowledge of spoken discourse, professional presentation and academic essays.
			CO2	Apply the communication theory knowledge to compare it with results obtained by performing practicals of spoken discourse, professional presentation and academic essays individually and in groups and use soft skills techniques necessary for engineering practice.
	FEL206	Basic Workshop Practice-II	CO1	Understand the basic knowledge such as interpretation of job drawing, application of processes and operations to produce components from raw materials along with safety precautions to be taken during working.
			CO2	Use and perform the setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood turning and modern wood turning methods.
			CO3	Carry out edge preparation for welding jobs and perform arc welding operations.
			CO4	Use different plumbing tools like spanners, wrenches, threading dies and demonstrate the preparation of a domestic pipe line.

COMPUTER ENGINEERING

YEAR / SEMESTER	Course Code	Course Title	COURSE COUTCOMES	Course Outcome Statements
			CO1	Demonstrate & Apply the concepts of Laplace & Inverse Laplace Transform to evaluate definite integrals, Fourier series to expand the periodic functions.
			CO2	Demonstrate & Apply the concepts of Analytic function to find orthogonal trajectories, harmonic conjugate, the concepts of correlation & regressions, Bayes theorem & various probability distributions in the real life problems.

CSC301	Engineering Mathematics-III	CO3	Analyze and interpret the problems arising in engineering formulation using Laplace & Inverse Laplace Transform, Fourier series, Complex Variables, Correlation & Regression, Various probability distributions.
		CO4	Express graphically, mathematically functions of one domain into another domain using Laplace & Inverse Laplace Transform, periodic functions into sinusoidal components, statistical data using regression methods, various distribution into Moment generating function.
CSC302	Discrete Structures and Graph Theory	CO1	1 Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
		CO2	2 Ability to reason logically.
		CO3	3 Ability to understand relations, functions, Diagraph and Lattice.
		CO4	4 Ability to understand and apply concepts of graph theory in solving real world problems.
		CO5	5 Understand use of groups and codes in Encoding-Decoding
		CO6	6 Analyze a complex computing problem and apply principles of discrete mathematics to identify solutions
CSC303	Data Structure	CO1	Describe various techniques for representation of the data in the real world.
		CO2	Choose & apply appropriate data structure as applied to specified problem definition
		CO3	implement various linear and nonlinear data structures.
		CO4	Implement various sorting and searching techniques.
CSC304	Digital Logic & Computer Architecture	CO1	To learn different number systems and basic structure of computer system.
		CO2	To demonstrate the arithmetic algorithms.
		CO3	To understand the basic concepts of digital components and processor organization.
		CO4	To understand the generation of control signals of computer

SECOND YEAR / THIRD SEMESTER			CO5	To demonstrate the memory organization & to describe the concepts of parallel processing and different Buses.
	CSC305	Computer Graphics	CO1	
			CO2	
			CO3	Apply geometric transformations, viewing and clipping on graphical objects.
			CO4	Explore 3-D geometric transformations, curve representation techniques and projections methods
			CO5	Explain visible surface detection techniques and Animation
	CSL301	Data Structure Lab	CO1	Students will be able to implement linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
			CO2	Students will be able to implement nonlinear data structures & be able to handle operations like insertion, deletion, searching and traversing on them
			CO3	Students will be able to choose appropriate data structure and apply it in various problems
			CO4	Students will be able to select appropriate searching techniques for given problems.
	CSL302	Digital Logic & Computer Architecture Lab	CO1	To understand the basics of digital components
			CO2	Design the basic building blocks of a computer: ALU, registers, CPU and memory
			CO3	To recognize the importance of digital systems in computer architecture
			CO4	To implement various algorithms for arithmetic operations
	CSL303	Computer Graphics Lab	CO1	Implement various output and filled area primitive algorithms
			CO2	Apply transformation, projection and clipping algorithms on graphical objects.
			CO3	Perform curve and fractal generation methods.
			CO4	Develop a Graphical application/Animation based on learned concept
	CSL304	Skill base Lab course:Object Oriented	CO1	To apply fundamental programming constructs.
			CO2	To illustrate & elaborate the concept of packages, classes, objects, strings and arrays.

	CSL304	Oriented Programming with Java	CO3	To implement the concept of inheritance, interfaces, exception handling and multithreading.
			CO4	To develop GUI based application.
	CSM301	Mini Project – 1 A	CO1	Identify Social and reserach needs and apply knwledge to give solutionsn in a group
			CO2	Develope interpersonal, skills aling with written and oral communication
			CO3	Use standard norms of engineering practices
			CO4	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
			CO5	Demonstrate project management principles during project work.
	CSC401	Applied Mathematics-IV	CO1	Demonstrate & Apply the concepts of Matrix Algebra to calculate the eigenvalues, eigenvectors, function of square matrix, inverse of matrix, Cauchy's theorems to evaluate various contour integrals, z-transform to convert sequences into rational function.
			CO2	Demonstrate & Apply the concepts of probability distributions & sampling techniques in the real life problems, Simplex, dual simplex methods, big M method to optimize linear functions and NLPP techniques to optimize non linear function with constraints.
			CO3	Analyze and interpret the problems arising in engineering formulation using matrices, z-transform, Linear & Non-linear Programming Problems, Probability distributions & sampling theory.
			CO4	Express graphically, mathematically functions of one domain into another domain using z & Inverse z-transform, the functions in terms of Laurent's & Taylor's series, matrix into diagonal form & function of matrix, real life problems using LPP, NLPP techniques & sampling techniques
			CO1	1 Analyze the running time and space complexity of algorithms.

SECOND YEAR / FORTH SEMESTER	CSC402	Analysis of Algorithm	CO2	2 Describe, apply and analyze the complexity of divide and conquer strategy.
			CO3	3 Describe, apply and analyze the complexity of greedy strategy.
			CO4	4 Describe, apply and analyze the complexity of dynamic programming strategy.
			CO5	5 Explain and apply backtracking, branch and bound.
			CO6	6 Explain and apply string matching techniques
	CSC403	Database Management System	CO1	Understand different data models & schema in DBMS to design normalized database.
			CO2	Solve problem statement by using SQL with considering Integrity ,Security and Query processing in database.
			CO3	Understand the concept of transaction, Concurrency and recovery
	CSC404	Operating System	CO1	Understand the objectives, functions and structure of OS
			CO2	Analyze the concept of process management and evaluate performance of processscheduling algorithms.
			CO3	Understand and apply the concepts of synchronization and deadlocks
			CO4	Evaluate performance of Memory allocation and replacement policies
			CO5	Understand the concepts of file management.
	CSC405	Microprocessor	CO1	Describe core concepts of 8086 microprocessor
			CO2	Interpret the instructions of 8086 and write assembly and Mixed language programs.
			CO3	Design 8086 based system using memory and peripheral chips.
			CO4	Appraise the architecture of advanced processors and understand hyperthreading technology

CSL401	Analysis of Algorithm Lab	CO1	Implement the algorithms using different approaches.
		CO2	2 Analyze the complexities of various algorithms.
		CO3	3 Compare the complexity of the algorithms for specific problem.
CSL402	Database Management System Lab	CO1	Understand different data models & schema in DBMS to design normalized database.
		CO2	Solve problem statement by using SQL with considering Integrity ,Security and Query processing in database.
		CO3	Understand the concept of transaction, Concurrency and recovery
CSL403	Operating System Lab	CO1	Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux
		CO2	Implement various process scheduling algorithms and evaluate their performance.
CSL404	Microprocessor Lab	CO1	Describe core concepts of 8086 microprocessor
		CO2	Interpret the instructions of 8086 and write assembly and Mixed language programs.
		CO3	Design 8086 based system using memory and peripheral chips.
		CO4	Appraise the architecture of advanced processors and understand hyperthreading technology
CSL405	Skill Base Lab Course: Python Programming	CO1	Describe syntax and semantics in Python
		CO2	Illustrate different file handling operations
		CO3	Interpret object oriented programming in Python
		CO4	Design GUI Applications in Python
		CO5	Express proficiency in the handling Python libraries for data science
CSM401	Mini Project 1-B	CO1	Identify Social and reserach needs and apply knwledge to give solutionsn in a group
		CO2	Develope interpersonal, skills aling with written and oral communication
		CO3	Use standard norms of engineering practices

			CO4	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.	
			CO5	Demonstrate project management principles during project work.	
	CSC301	Applied Mathematics -III	CO1	Demonstrate & Apply the concepts of Laplace & Inverse Laplace Transform to evaluate definite integrals, Fourier series to expand the periodic functions.	
			CO2	Demonstrate & Apply the concepts of Analytic function to find orthogonal trajectories, harmonic conjugate, the concepts of correlation & regressions, Bayes theorem & various probability distributions in the real life problems.	
			CO3	Analyze and interpret the problems arising in engineering formulation using Laplace & Inverse Laplace Transform, Fourier series, Complex Variables, Correlation & Regression, Various probability distributions.	
			CO4	Express graphically, mathematically functions of one domain into another domain using Laplace & Inverse Laplace Transform, periodic functions into sinusoidal components, statistical data using regression methods, various distribution into Moment generating function.	
	CSC302	Digital Logic Design and Analysis	CO1	To learn different number systems and basic structure of computer system.	
			CO2	To demonstrate the arithmetic algorithms.	
			CO3	To understand the basic concepts of digital components and processor organization.	
			CO4	To understand the generation of control signals of computer	
			CO5	To demonstrate the memory organization & to describe the concepts of parallel processing and different Buses.	
			CO1	1 Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.	
			CO2	2 Ability to reason logically.	

SECOND YEAR / THIRD SEMESTER	CSC303	Discrete Mathematics	CO3	3 Ability to understand relations, functions, Diagraph and Lattice.	
			CO4	4 Ability to understand and apply concepts of graph theory in solving real world problems.	
			CO5	5 Understand use of groups and codes in Encoding-Decoding	
			CO6	6 Analyze a complex computing problem and apply principles of discrete mathematics to identify solutions	
	CSC304	Electronic Circuits and Communication Fundamentals	CO1	To understand the use of semiconductor devices in circuits and analyze them.	
			CO2	To understand importance of oscillators and power amplifiers in communication system.	
			CO3	To understand basic concepts of operational amplifier and their applications.	
			CO4	To understand the fundamental concepts of electronic communication	
			CO5	To apply knowledge of electronic devices and circuits to communication applications.	
	CSC305	Data Structures	CO1	Describe various techniques for representation of the data in the real world.	
			CO2	Choose & apply appropriate data structure as applied to specified problem definition	
			CO3	implement various linear and nonlinear data structures.	
			CO4	Implement various sorting and searching techniques.	
	CSL301	Digital System Lab	CO1	To understand the basics of digital components	
			CO2	Design the basic building blocks of a computer: ALU, registers, CPU and memory	
			CO3	To recognize the importance of digital systems in computer architecture	
			CO4	To implement various algorithms for arithmetic operations	
	CSL302	Basic Electronics Lab	CO1	To understand the use of semiconductor devices in circuits and analyze them.	
			CO2	To understand importance of oscillators and power amplifiers in communication system.	
			CO3	To understand basic concepts of operational amplifier and their applications.	
			CO4	To understand the fundamental concepts of electronic communication	

			CO5	To apply knowledge of electronic devices and circuits to communication applications.
	CSL303	Data structure Lab	CO1	Students will be able to implement linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
			CO2	Students will be able to implement nonlinear data structures & be able to handle operations like insertion, deletion, searching and traversing on them
			CO3	Students will be able to choose appropriate data structure and apply it in various problems
			CO4	Students will be able to select appropriate searching techniques for given problems.
	CSL304	OOPM(Java) Lab	CO1	To apply fundamental programming constructs.
			CO2	To illustrate & elaborate the concept of packages, classes, objects, strings and arrays.
			CO3	To implement the concept of inheritance, interfaces, exception handling and multithreading.
			CO4	To develop GUI based application.
	CSC401	Engineering Mathematics- IV	CO1	Demonstrate & Apply the concepts of Matrix Algebra to calculate the eigenvalues, eigenvectors, function of square matrix, inverse of matrix, Cauchy's theorems to evaluate various contour integrals, z-transform to convert sequences into rational function.
			CO2	Demonstrate & Apply the concepts of probability distributions & sampling techniques in the real life problems, Simplex, dual simplex methods, big M method to optimize linear functions and NLPP techniques to optimize non linear function with constraints.
			CO3	Analyze and interpret the problems arising in engineering formulation using matrices, z-transform, Linear & Non-linear Programming Problems, Probability distributions & sampling theory.

			CO4	Express graphically, mathematically functions of one domain into another domain using z & Inverse z-transform, the functions in terms of Laurent's & Taylor's series, matrix into diagonal form & function of matrix, real life problems using LPP, NLPP techniques & sampling techniques
	CSC402	Analysis of Algorithms	CO1	Analyze the running time and space complexity of algorithms.
			CO2	Describe, apply and analyze the complexity of divide and conquer strategy.
			CO3	Describe, apply and analyze the complexity of greedy strategy.
			CO4	Describe, apply and analyze the complexity of dynamic programming strategy.
			CO5	Explain and apply backtracking, branch and bound.
			CO6	Explain and apply string matching techniques
SECOND YEAR / FORTH SEMESTER	CSC403	Computer Organization and Architecture	CO1	To describe basic structure of the computer system.
			CO2	To demonstrate the arithmetic algorithms for solving ALU operations.
			CO3	To describe instruction level parallelism and hazards in typical processor pipelines.
			CO4	To describe superscalar architectures, multi-core architecture and their advantages
			CO5	To demonstrate the memory mapping techniques.
	CSC404	Computer Graphics	CO3	Apply geometric transformations, viewing and clipping on graphical objects.
			CO4	Explore 3-D geometric transformations, curve representation techniques and projections methods
			CO5	Explain visible surface detection techniques and Animation
			CO1	Understand the objectives, functions and structure of OS

CSC405	Operating System	CO2	Analyze the concept of process management and evaluate performance of processscheduling algorithms.	
		CO3	Understand and apply the concepts of synchronization and deadlocks	
		CO4	Evaluate performance of Memory allocation and replacement policies	
		CO5	Understand the concepts of file management.	
CSL401	Analysis of Algorithms Lab	CO1	Analyze the complexities of various problems in different domains.	
		CO2	Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.	
		CO3	Develop the efficient algorithms for the new problem with suitable designing techniques.	
		CO4	Implement the algorithms using different strategies.	
CSL402	Computer Graphics Lab	CO1	Implement various output and filled area primitive algorithms	
		CO2	Apply transformation, projection and clipping algorithms on graphical objects.	
		CO3	Perform curve and fractal generation methods.	
		CO4	Develop a Graphical application/Animation based on learned concept	
CSL403	Processor Architecture Lab	CO1	Assemble personal computer	
		CO2	Design the basic building blocks of a computer: arithmetic-logic unit, registers, central processing unit, and memory.	
		CO3	Implement various algorithms like Booth"s algorithm for arithmetic operations	
		CO4	Describe various I/O buses with merits and demerits.	
CSL404	Operating System Lab	CO1	Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux	
		CO2	Implement various process scheduling algorithms and evaluate their performance.	
CSL405	Open Source Tech Lab	CO1	Describe syntax and semantics in Python	
		CO2	Illustrate different file handling operations	
		CO3	Interpret object oriented programming in Python	
		CO4	Design GUI Applications in Python	
		CO5	Express proficiency in the handling Python libraries for data science	
	Theoretical Computer	CO1	Describe the Power and Limitations of theoretical	

	CSC501	Theoretical Computer Science	CO2	Design DFA,NFA,Regular Expression,CFG,PDA and TM to recognize the languages.
	CSC502	Software Engineering	CO1	Identify requirements & assess the process models.
			CO2	Plan, schedule and track the progress of the projects.
			CO3	Design the software projects.
			CO4	Do testing of software project.
			CO5	Identify risks, manage the change to assure quality in software projects.
	CSC503	Computer Network	CO1	Demonstrate the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.
			CO2	Explore different design issues at data link layer.
			CO3	Design the network using IP addressing and sub netting / supernetting schemes.
			CO4	Analyze transport layer protocols and congestion control algorithms.
			CO5	Explore protocols at application layer
THIRD YEAR / V SEMESTER	CSC504	Data Warehousing & Mining	CO1	Understand data warehouse fundamentals and design data warehouse with dimensional modelling and apply OLAP operations.
			CO2	Understand data mining principles and perform Data preprocessing and Visualization.
			CO3	Identify appropriate data mining algorithms to solve real world problems.
			CO4	Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
			CO5	Describe complex information and social networks with respect to web mining.
	CSDO501	Department Level Optional Course- 1- Internet Programming	CO1	Implement interactive web page(s) using HTML and CSS.
			CO2	Design a responsive web site using JavaScript
			CO3	Demonstrate database connectivity using JDBC
			CO4	Demonstrate Rich Internet Application using Ajax
			CO5	Demonstrate and differentiate various Web Extensions.
			CO6	Demonstrate web application using Reactive Js
	CSL501	Software Engineering Lab	CO1	Identify requirements and apply software process
			CO2	Develop architectural models for the selected case study
			CO3	Use computer-aided software engineering (CASE) tools.
	CSL502	Computer Network Lab	CO1	Design and setup networking environment in Linux.
			CO2	Use Network tools and simulators such as NS2, Wireshark etc. to explore networking algorithms and protocols.

			CO3	Implement programs using core programming APIs for understanding networking concepts.
CSL503	Data Warehousing & Mining Lab		CO1	Implement data mining algorithms like classification.
			CO2	Design data warehouse and perform various OLAP operations.
			CO3	Implement clustering algorithms on a given set of data sample.
			CO4	Implement Association rule mining & web mining algorithm.
CSL504	Business Comm. & Ethics II		CO1	plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.
			CO2	strategize their personal and professional skills to build a professional image and meet the demands of the industry.
			CO3	emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
			CO4	deliver persuasive and professional presentations.
			CO5	develop creative thinking and interpersonal skills required for effective professional communication.
CSM501	Mini Project: 2 A		CO1	Identify societal/research/innovation/entrepreneurship problems through appropriate literature surveys
			CO2	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
			CO3	Validate, Verify the results using test cases/benchmark data/theoretical/ inferences/experiments/simulations
			CO4	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
			CO5	Use standard norms of engineering practices and project management principles during project work
		System Programming	CO 01	Understand the role and functionality of various
			CO 02	Understand basic concepts, structure and design of assemblers, macro processors, linkers and loaders.

Course Code	Course Name	CO	Description
CSC601	& Compiler Construction	CO 03	Understand the basic principles of compiler design, its various constituent parts, algorithms and data structures required to be used in the compiler.
		CO 04	demonstrate the working of System software
CSC602	tography & System Sec	CO1	Understand system security goals and concepts, classical encryption techniques and acquire fundamental knowledge on the concepts of modular arithmetic and number theory
		CO2	Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
		CO3	Apply different message digest and digital signature algorithms to verify integrity and achieve authentication and design secure applications
		CO4	Understand network security basics, analyse different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP
		CO5	Analyse and apply system security concept to recognize malicious code
CSC603	Mobile Computing	CO1	To identify basic concepts and principles in computing, cellular architecture.
		CO2	To describe the components and functioning of mobile networking.
		CO3	To classify variety of security techniques in mobile network.
		CO4	To apply the concepts of WLAN for local as well as remote applications.
CSC604	Artificial Intelligence	CO1	Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
		CO2	Ability to choose an appropriate problem solving method and knowledge representation technique.
		CO3	Ability to analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.
		CO4	Ability to design models for reasoning with uncertainty as well as the use of unreliable information.
		CO5	Ability to design and develop AI applications in real world scenarios
		CO1	Understand the concepts of IoT and the Things in IoT.

THIRD YEAR / VI SEMESTER	CSDO601	Department Level Optional Course -2- Internet of Things	CO2	Emphasize core IoT functional Stack and understand application protocols for IoT.
			CO3	Apply IoT knowledge to key industries that IoT is revolutionizing.
			CO4	Examines various IoT hardware items and software platforms used in projects.
	CSL601	System Programming & Compiler Construction Lab	CO 01	Generate machine code by implementing two pass
			CO 02	Implement Two pass macro processor.
			CO 03	Parse the given input string by constructing Top down/Bottom-up parser.
			CO 04	Identify and Validate tokens for given high level language and Implement synthesis phase of compiler.
			CO 05	Explore LEX & YACC tools.
	CSL602	Cryptography & System Security Lab	CO 01	apply the knowledge of symmetric and asymmetric cryptography to implement simple ciphers
			CO 02	explore the different network reconnaissance tools to gather information about networks.
			CO 03	explore and use tools like sniffers, port scanners and other related tools for analysing packets in a Network.
			CO 04	set up firewalls and intrusion detection systems using open-source technologies and to explore email security.
			CO 05	explore various attacks like buffer-overflow and web application attack.
	CSL603	Mobile Computing Lab	CO 01	develop and demonstrate mobile applications using various tools
			CO 02	articulate the knowledge of GSM, CDMA & Bluetooth technologies and demonstrate it.
			CO 03	Students will able to carry out simulation of frequency reuse, hidden/exposed terminal problem
			CO 04	implement security algorithms for mobile communication network
			CO 05	demonstrate simulation and compare the performance of Wireless LAN
	CSL604	Artificial Intelligence La	CO 01	Identify languages and technologies for Artificial Intelligence
			CO 02	Understand and implement uninformed and informed searching techniques for real world problems.
			CO 03	Create a knowledge base using any AI language.
			CO 04	Design and implement expert systems for real world problems.

			CO 01	Implement different types of virtualization techniques.
CSL605	Skill base Lab Course: Cloud Computing		CO 02	Analyze various cloud computing service models and implement them to solve the given problems.
			CO 03	Design and develop real world web applications and deploy them on commercial cloud(s).
			CO 04	Explain major security issues in the cloud and mechanisms to address them.
CSM601	Mini Project Lab: 2B		CO 01	Identify societal/research/innovation/entrepreneurship problems through appropriate literature surveys
			CO 02	Identify Methodology for solving above problem and apply engineering knowledge and skills to solve it
			CO 03	Validate, Verify the results using test cases/benchmark data/theoretical/ inferences/experiments/simulations
			CO 04	Analyze and evaluate the impact of solution/product/research/innovation /entrepreneurship towards societal/environmental/sustainable development
			CO 05	Use standard norms of engineering practices and project management principles during project work

CIVIL ENGINEERING

			CO1	Apply the concept of Laplace transform to solve the real integrals in engineering problems.
	CEC 301 Engineering Mathematics-III		CO2	Apply the concept of inverse Laplace transform of various functions in engineering problems.
			CO3	Expand the periodic function by using Fourier series for real life problems and complex engineering problems.
			CO4	Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.
			CO5	Apply Matrix algebra to solve the engineering problems.
			CO6	Solve Partial differential equations by applying numerical solution and analytical methods for one dimensional heat and wave equations.
			CO1	Evaluate stress - strain behavior of elastic members and thin cylinders subjected to internal pressure.

SE / 3rd SEMESTER	CEC 302 Mechanics of Solids	CO2	Draw variation of axial force, shear force and bending moment diagram for statically determinate beams and frames.
		CO3	Calculate Moment of Inertia for cross sections and analyse the material response under the action of shear and the effect of flexure (bending).
		CO4	Predict the angle of twist and shear stress developed in torsion and compute direct and bending stresses developed in the cross section of centrally and eccentrically loaded columns.
		CO5	Locate principal planes in members and calculate principal stresses using analytical and graphical method and to calculate strain energy stored in members due to elastic deformation
		CO6	Evaluate slope and deflection of beams supported and loaded in different ways.
	CEC 303 Engineering Geology	CO1	Explain the concepts of Geology and its application for safe, stable and economic design of any civil engineering structure.
		CO2	Interpret the lithological characters of the rock specimen and distinguish them on the basis of studied parameters
		CO3	Describe the structural elements of the rocks and implement the knowledge for collection and analysis of the geological data.
		CO4	Interpret the geological conditions for the dam site and calculate RQD for the assessment of rock masses.
		CO5	Analyze the given data and suggest rock mass rating for assessment of tunnelling conditions
		CO6	Interpret the causes of geological hazards and implement the knowledge for their prevention
	CEC304 Architectural Planning & Design of Buildings	CO1	Remember and recall the intricate details of building design and drawing.
		CO2	Understand the basic concepts of building design and drawing.
		CO3	Learn how to apply professional ethics and act responsibly pertaining to the norms of building design and drawing practices.
		CO4	Identify, analyze, research literate and solve complex building design and drawing problems.
		CO5	Have new solutions for complex building design and drawing problems
		CO6	Effectively communicate ideas, related to building design and drawing, both orally as well as in written format like reports & drawings

	CEC305 Fluid Mechanics - I	CO1	Describe various properties of fluids and types of flow
		CO2	Determine the pressure difference in pipe flows, application of Continuity equation and Bernoulli's theorem to determine velocity and discharge
		CO3	Apply hydrostatic and dynamic solutions for fluid flow applications
		CO4	Analyse the stability of floating bodies
		CO5	Apply the working concepts of various devices to measure the flow through pipes and channels
		CO6	Explain the compressible flow, propagation of pressure waves and stagnation properties
	CEL305 Skill Based Lab Course-I Computer Aided Drafting & Building Information Modelling	CO1	Transfer the plan from a drawing sheet to a 2-D drafting software
		CO2	Visualize the various elements in the software like points, lines, polygons, etc. as objects of the real world and relate it with civil engineering components
		CO3	Apply civil engineering concepts to draft efficient civil engineering plans in accordance to various building bye laws and forms
		CO4	Conceptualize the space, logistic and statutory constraints in the real world to draw an efficient plan so that optimization is achieved
		CO5	Attach and retrieve information pertaining to various civil engineering components through 3-D modelling software
		CO6	Demonstrate a virtual walkthrough of buildings
SE / 4TH SEMESTER	CEC 401 Engineering Mathematics-IV	CO1	Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem
		CO2	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
		CO3	Apply the concept of Correlation, Regression and curve fitting to the engineering problems in data science
		CO4	Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
		CO5	Apply the concept of probability distribution to engineering problems& Testing hypothesis of small samples using sampling theory

	CO6	Apply the concepts of parametric and nonparametric tests for analysing practical problems
CEC402 Structural Analysis	CO1	Calculate axial forces in the Coplanartrusses by using Method of joints and method of sections and also calculate radial shear, normal thrust and bending moment in parabolic 3- Hinged arches
	CO2	Draw Influence Line Diagrams for axial forces in trusses, Reactions, SF and B M in beams and find their values when rolling loads are passing over them..
	CO3	Evaluate rotation and displacement at a joint of frames and deflection at any joint of truss and will be able to compute static and kinematic indeterminacy of structure.
	CO4	Apply Flexibility methods and make use of Clapeyron's Theorem to analyze the indeterminate structures
	CO5	Analyse the indeterminate structures such as beams & simple rigid jointed frames using direct stiffness method.
	CO6	Analyse the indeterminate structures using Moment Distribution as Stiffness method and make plastic analysis.
CEC403 Surveying	CO1	Apply the principles of surveying and field procedures to conduct the various surveys
	CO2	Use various methods for taking linear and angular measurements
	CO3	Collect, record and analyse the field data for preparing drawings
	CO4	Explain the advancements in instruments and methods
	CO5	.Calculate the area of land and volume of earthwork
	CO6	Set out curves
CEC 404 Building Materials & Concrete Technology	CO1	To develop and implement the conceptual knowledge of building materials in the construction industry.
	CO2	Assess the properties of building stones and their classifications. Understand the concept of various methods of manufacturing of bricks and different types of concrete blocks.
	CO3	To expose students to various quality control aspects of civil engineering materials by performing different lab tests on materials.
	CO4	Identify the ingredients and properties of fresh and hardened concrete.

			CO5	To interpret and design concrete mix for various grades for various exposure conditions.
			CO6	To study the new technology for manufacturing, testing and quality of concrete.
	CEC405 Fluid Mechanics - II		CO1	Analyze flow through pipes, various losses through pipes, pipe network and power transmission through nozzle
			CO2	Explain the concept of Laminar flow and velocity distribution through parallel plates and pipes
			CO3	Explain the concept of Turbulent flow and velocity distribution in pipes
			CO4	Describe boundary layer concept , boundary layer separation and flow around submerged bodies
			CO5	Apply Moment of Momentum Principle
			CO6	Explain the importance of dimensionless numbers, dimensional analysis and similarity behavior of model and prototype
		Theory of Reinforced Concrete Structures	CO1	Understand the fundamentals of WSM and LSM.
			CO2	Apply various clauses specified in IS: 456-2000 for designing structural members with safety and economy.
			CO3	Understand the use of readymade design charts and curves from Special Publications of Bureau of Indian Standards.
	CEC501		CO4	Analyze and design various reinforced concrete elements such as beam, slab, column, footings using the concept of Limit State Method.
		Applied Hydraulics	CO1	Describe impact of jet on stationary, moving, hinged and series of plates also solve the numerical based on forces acting on it.
			CO2	Distinguish various types of turbines, Characteristic curves and its components.
			CO3	Analyze Centrifugal pumps by incorporating velocity triangle diagrams
			CO4	Know the working mechanism of various Hydraulic machines
	CEC502		CO5	Identify the hydraulic behaviour of open channel flow and design the most economical section of channels.
			CO6	Explain mathematical relationships for hydraulic jumps, surges, and critical, uniform, and gradually-varying flows.

CEC503	Geotechnical Engineering-I	CO1	Explain the basic concepts of the physical and engineering properties of soil and derive the relationships among various unit weights & other parameters.	
		CO2	Comprehend clay mineralogy and plasticity behavior of clay.	
		CO3	Analyze grain size distribution of soil and classify the soil as per IS code.	
		CO4	Evaluate the coefficient of permeability of different types of soils and draw the flow net diagram to estimate seepage discharge	
		CO5	Compute the effective stress and pore water pressure inside the soil mass under different geotechnical conditions.	
CEC504	Transportation Engine	CO1	Compare various modes of transportation and understand basic technical aspects of railways, airways and waterways.	
		CO2	Understand different road plans, requirements of alignments and Design horizontal and vertical geometrical elements of highways.	
		CO3	Carry out different traffic studies and analyze basic parameters of traffic engineering for efficient planning and control of traffic	
		CO4	Design the flexible and rigid pavement as per relevant IRC codes.	
		CO5	Construct different types of pavements, use of soil stabilization and planning of highway drainage.	
		CO6	Carry out structural and functional evaluation of pavement, identify the failures and design the overlay.	
CEC505	Department Level Optional Course-1 Advanced Concrete Technology	CO1	To use the various concrete materials and demonstrate the fresh properties of concrete.	
		CO2	To perform different testing methods of concrete.	
		CO3	To describe the durability of concrete and apply the knowledge of durability in extreme weather concreting.	
		CO4	To design the concrete mix for field application by different methods.	
		CO5	To explain the various properties of special concrete.	
		CO6	To discuss the quality of concrete and explain the acceptance criteria.	
		CO1	Understand the fundamentals of WSM and LSM.	

Third YEAR SEMESTER-V 2021-22	CEL501	Theory of Reinforced Concrete Structures	CO2	Apply various clauses specified in IS: 456-2000 for designing structural members with safety and economy
			CO3	Understand the use of readymade design charts and curves from Special Publications of Bureau of Indian Standards.
			CO4	Analyze and design various reinforced concrete elements such as beam, slab, column, footings using the concept of Limit State Method.
	CEL502	Applied Hydraulics	CO1	Evaluate the efficiencies and discuss the working of various pumps and turbines.
			CO2	Apply impulse momentum principle to hydraulic machines.
			CO3	Determine the rate of flow through open channel.
			CO4	Generate and evaluate Gradually varied flow (GVF) and Rapid varied Flow (RVF) in open channel flow
			CO5	Compute the Chezy's Constant through tilting flume.
	CEL503	Geotechnical Engineer	CO1	Determine the physical and engineering properties of soil
			CO2	Determine the plasticity characteristics of soil
			CO3	Carry out sieve analysis of soil, plot grain size distribution curve and determine the IS classification of soil
			CO4	Determine coefficient of permeability of soils
			CO5	Determine the compaction characteristics of soils
	CEL504	Transportation Engineering	CO1	Classify Bitumen on basis of Penetration and Viscosity grade
			CO2	Select Bitumen as per suitability on basis of Softening point and Ductility value.
			CO3	Determine suitability of aggregate on basis of Impact value, Abrasion value and Crushing value.
			CO4	Differentiate Elongated and Flaky aggregates on basis of Shape test
			CO5	Carry out Classified volume study at mid-block section of road.
			CO6	Plot speed profile curve (S-Curve) at mid-block section.
			CO1	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.
			CO2	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.

CEL505	Professional Communication and Ethics-II	CO3	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
		CO4	Deliver persuasive and professional presentations.
		CO5	Develop creative thinking and interpersonal skills required for effective professional communication.
		CO6	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour
CEM501	Mini Project – 2A		
		CO1	Identify problems based on societal /research needs and formulate a solution strategy.
		CO2	Apply fundamentals to develop solutions to solve societal problems in a group
		CO3	Analyze the specific need, formulate the problem and deduce the interdisciplinary approaches, software-based solutions and computer applications.
		CO4	Develop systematic flow chart, evaluate inter disciplinary practices, devices, available software, estimate and recommend possible solutions.
		CO5	Draw the proper inferences from available results through theoretical/ experimental/ simulations and assemble physical systems
		CO6	Create devises or design a computer program or develop computer application.
CEC601	Design and Drawing of Steel Structures	CO1	Use the knowledge of Limit State Design philosophy as applied to steel structures. IS 800 code clauses
		CO2	Design bolted and welded connections.
		CO3	Design members subjected to axial tension
		CO4	Design compression members, Built-up columns and column bases
		CO5	Design members subjected to bending moment, shear force etc.
		CO6	Estimate design loads as per IS 875 for roof truss and design the Steel roof truss.
		CO1	Describe National water Policy, Calculate Crop water requirement and Classify various types and methods of
		CO2	Estimate flood discharge and Runoff by traditional and modern usage tools for planning and management of water resources projects.

CEC602	Water Resources Engineering	CO3	Apply knowledge on ground water, well hydraulics to estimate the safe yield and ground water potential
		CO4	Analyze and design gravity dams and earthen dams with spillways for sustainable development
		CO5	Compare different silt theories related to irrigation channel and design the same.
		CO6	Classify and Explain various canal structures and suggest remedial measures for water logging to save fertile irrigation
CEC603	Geotechnical Engineering-II	CO1	Evaluate the consolidation parameters for the soil.
		CO2	Calculate the shear strength parameters for the soil
		CO3	Calculate the factors of safety of different types of slopes under various soil condition, analyze the stability of slopes
		CO4	Calculate lateral earth pressure under various soil condition.
		CO5	Calculate bearing capacity of shallow foundations using theoretical and field methods
		CO6	Calculate load carrying capacity of individual as well as group of pile foundation using theoretical and field methods and pile settlement.
CEC604	Environmental Engineering	CO1	Analyse the quality of water and make outline of water Supply scheme.
		CO2	Design the various units of water treatment plant and apply the advanced, miscellaneous treatments whenever necessary.
		CO3	Build service connection of water supply from main and building drainage system at construction site along with rain water harvesting layout.
		CO4	Analyse and plan sewerage system along with test for sewer line.
		CO5	Design the units of sewage treatment plant. Also, able to apply the knowledge of lowcost treatment and stream sanitation.
		CO6	Understand air pollution, noise pollution and functional elements of solid waste management
		CO1	Understand the use/applications of various conventional construction equipments and select the best out of them for a particular site requirement.

Third YEAR SEMESTER-VI 2021-22	CEDLO6013	Department Level Optional Course-2 Construction Equipment & Techniques	CO2	Know modern methods/equipments used for underground as well as underwater tunnelling.
			CO3	Compare conventional and modern methods of formwork and get acquainted with techniques used on sites with restricted space.
			CO4	Understand the techniques involved and the equipments required thereof for laying of utility lines, bridge construction and installation of structural steel members
			CO5	Gain knowledge about the setting up of different kinds of the power generating structures.
			CO6	Get acquainted with the equipments/ techniques for construction of transporting facilities.
	CEL601	Design and Drawing of Steel Structures (Lab)	CO1	Calculate dead, live and wind loads on the structure.
			CO2	Analyze the structure by analytical/graphical method.
			CO3	Use steel table for selecting appropriate section.
			CO4	Design the members for various load combinations.
			CO5	Design the bolted and welded connection.
			CO6	Read and Prepare the detailed fabrication drawing and design report.
	CEL602	Water Resources Engineering (Lab)	CO1	Classify various techniques of water distribution and compute water requirement of crops.
			CO2	Discuss in detail about hydrological process and interpret plotting of hydrographs.
			CO3	Apply their knowledge on well hydraulics and compute discharge from an aquifer.
			CO4	Classify and describe various hydraulic structures such as dams and carry out its analysis for structural stability.
			CO5	Compare different silt theories related to irrigation channel and design the same.
			CO6	Identify and classify different canal head works - its distribution system and canal structures.
	CEL603	Geotechnical Engineering-II Lab	CO1	Determine consolidation parameters such as coefficient of compressibility, coefficient of volume change, coefficient of consolidation.
			CO2	Determine cohesion and angle of shearing resistance for various soil types.
			CO3	Determine the CBR value of soil for pavement design.
			CO4	Determine swelling pressure of soil.

		CO5	Understand the concept of stress distribution in soils due to vertically applied load
		CO6	Solve design problems using geotechnical software.
CEL604	Environmental Engineering (Lab)	CO1	Impart the knowledge on quality or characteristic of water and wastewater sample.
		CO2	Interpret the required treatment for water and wastewater based on standards and norms.
		CO3	Impart the knowledge on quality of solid waste.
		CO4	Measure the concentration of particulate matters, dust and dispersed pollutants in air
		CO5	Inspect the levels of noise and interpret the results.
CEL605	Skill Based Lab Course-III	CO1	To understand the functions involved various softwares related to civil engineering field
		CO2	To perform different functions of the software related to analysing modelling and designing the structure, creation of database and its analysis.
		CO3	To describe and represent the data obtained from site, experimental work in various formats as per industrial requirements
		CO4	To import road geometric design into the software as well as relate with the design standards applied into the software.
		CO5	To design the effective distribution network system for the distribution of water resources.
		CO6	To apply the knowledge to create the programme in excel and various computer languages for solving problems pertaining to civil engineering field.
CEM601	Mini Project -2B	CO1	Identify problems based on societal /research needs and formulate a solution strategy.
		CO2	Apply fundamentals to develop solutions to solve societal problems in a group.
		CO3	Analyze the specific need, formulate the problem and deduce the interdisciplinary approaches, software-based solutions and computer applications.
		CO4	Develop systematic flow chart, evaluate inter disciplinary practices, devices, available software, estimate and recommend possible solutions.
		CO5	Draw the proper inferences from available results through theoretical/experimental/simulations and assemble physical systems.

			CO6	Create devises or design a computer program or develop computer application.

ELECTRONICS & TELECOMMUNICATION ENGINEERING

			CO1	Demonstrate and Apply the concepts of Laplace & Inverse Laplace Transform to evaluate definite integrals, Fourier series to expand the periodic functions.
ECC301	Engineering Mathematics- III		CO2	Demonstrate and Apply the concepts of Analytic function to find orthogonal trajectories, harmonic conjugate, Matrix Algebra to calculate the eigenvalues, eigenvectors, function of square matrix, inverse of matrix and Vector Calculus to find normal to the surface, directional derivative, Scalar potential, line & surface integrals
			CO3	Analyze and interpret the problems arising in engineering formulation using Laplace & Inverse Laplace Transform, Fourier series, Complex Variables, Matrices & Vector Calculus.
			CO4	Express graphically, mathematically functions of one domain into another domain using Laplace & Inverse Laplace Transform, periodic functions into sinusoidal components, matrix into diagonal form, function of matrix and line integrals & surface integrals using Green's & Stoke's theorem.
ECC302	Electronic Devices and Circuits		CO1	Know functionality and applications of various electronic devices.
			CO2	Explain working of various electronics devices with the help of V-I characteristics.
			CO3	Derive expressions for performance parameters of BJT
			CO4	Evaluate performance of Electronic circuits (BJT and MOSFET based).
			CO5	Select appropriate circuit for given application.
			CO6	Design electronic circuit (BJT, MOSFET based) circuits for given specifications.
ECC303	Digital System Design		CO1	Understand types of digital logic, digital circuits and logic families
			CO2	Analyze, design and implement combinational logic circuits
			CO3	Analyze, design and implement sequential logic circuits
			CO4	Develop a digital logic and apply it to solve real life problems
			CO5	Classify different types of memories and PLDs

			CO6	Simulate and implement basic combinational and sequential circuits using VHDL
	ECC304	Network Theory	CO1	Apply their knowledge in analyzing Circuits by using network theorems.
			CO2	Apply the time and frequency method of analysis.
			CO3	Evaluate circuit using graph theory.
			CO4	Find the various parameters of two port network.
			CO5	Apply network topology for analyzing the circuit.
			CO6	Synthesize the network using passive elements
SECOND YEAR SEMESTER- III R-19	ECC305	Electronic Instrumentation and Control	CO1	Understand the principle of working of generalised measurement system and their applications in industry.
			CO2	Able to derive the models of different physical systems and obtain its transfer functions for analysis and design of control systems.
			CO3	Understand the analysis of systems in both time and frequency domain to examine the stability of the system using appropriate criteria.
			CO4	Predict stability of given system using appropriate criteria.
	ECL301	Electronic Devices and Circuits Laboratory	CO1	Know various equipments, electronics devices and components, and measuring instruments used to perform laboratory work.
			CO2	Students will be able to explain functionality of various equipments, electronics devices and components and neasu6 instruments used to perform laboratory work.
			CO3	Students will be able connect various equipments, devices, components and measuring devices using bread board as per the circuit diagram for experiment
			CO4	Students will able to perform experiment to gather appropriate data.
			CO5	Students will able to analyze data obtained from experiment to relate theory with experiment results.
			CO6	Students will able to prepare laboratory report (Journal) to summarise the outcome each experiment.
	ECL302	Digital System Design Laboratory	CO1	Identify various Digital ICs and basic building blocks of digital system design
			CO2	Design and implement combinational circuits and sequential circuits

		CO3	Acquire basic knowledge of VHDL basic programming
ECL304	Skill Lab C++ and JAVA Programming	CO1	Describe the basic principles of OOP.
		CO2	Design and apply OOP principles for effective programming.
		CO3	Develop programming applications using OOP language.
		CO4	Implement different programming applications using packaging and analyze the strength of OOP.
		CO5	Percept the Utility and applicability of OOP.
ECL 303	Electronic Instrumentation and Control Lab	CO1	Plot and validate the performance characteristics of various transducers and sensors.
		CO2	To plot response in both time and frequency of first-order and second-order electrical system and calculate the steady-state error.
		CO3	Validate the effect of damping factor on the response of second order system.
		CO4	Inspect the frequency response specifications of systems by using bode-plot, Polar plot and comment on
ECM301	Mini Project 1A	CO1	Create the electronics circuit for particular application/experiment
		CO2	Design and simulate the circuits by putting together the analog and digital components
		CO3	Learn the technique of soldering and circuit implementation on general purpose printed circuit
		CO4	Realize the PCB design process and gain up-to-date knowledge of PCB design software.
		CO5	Utilize the basic electronic tools and equipment's (like DMM, CRO, DSO etc.)
		CO6	Analysis of hardware fault (Fault detection and correction)
ECC401		CO1	Demonstrate and Apply the Cauchy's theorems to evaluate varous contour integrals, the concepts of correlation & regressions, Bayes theorem & various probability distributions in the real life problems.
		CO2	Understand and Apply the concepts of Vector Spaces & subspaces, Gram Schmidt Method to find orthonormal basis, Congruent & orthonormal transformations to reduce the quadratic form into normal form, Calculus of variations to find extremals.

		CO3	Analyze and interpret the problems arising in engineering formulation using Correlation & Regression, Various probability distributions, Vector spaces and calculus of variations.
	Engineering Mathematics- IV	CO4	Express graphically, mathematically the functions in terms of Laurent's & Taylor's series, statistical data using regression methods, vectors as linear combination of orthogonal or orthonormal basis, Quadratic forms/
ECC402		CO1	Understand Computer and its memory System
		CO2	Understand the detailed architecture of 8051 and ARM7 Core.
		CO3	Write programs for 8051 microcontrollers.
	Microcontroller	CO4	Design an applications using microcontroller.
ECC403		CO1	Understand the fundamentals and areas of applications for the integrated circuits.
		CO2	Analyze important types of integrated circuits.
	Linear Integrated Circuits	CO3	Demonstrate the ability to design practical circuits that perform the desired operations
ECC404		CO1	Classify and Analyze different types of signals and systems
		CO2	Analyze continuous-time LTI signals and systems in the transform domain
		CO3	Analyze and realize discrete-time LTI signals and systems in the transform domain
	Signals & Systems	CO4	Represent signals using Fourier Series and Analyze the systems using the Fourier Transform.
ECC405		CO1	To illustrate the fundamentals of basic communication system
		CO2	To understand various analog modulation and demodulation techniques
		CO3	To focus on applications of analog modulation and demodulation techniques
	Principles of Communication Engineering	CO4	To explain the key concepts of analog and digital pulse modulation and demodulation techniques
		CO1	Understand different development tools required to develop microcontroller based systems.
		CO2	Write assembly language programs for arithmetic and logical operations, code conversion & data transfer operations.

	ECL401	Microcontroller Lab	CO3	Write assembly language programs for general purpose I/O, Timers & Interrupts.
			CO4	Interface & write programs for Input and Output devices
			CO5	Develop microcontroller based Applications.
	ECL402	Linear Integrated Circuits Laboratory	CO1	Connect and analyse important types of integrated circuits
			CO2	Implement the appropriate integrated circuit modules to build a given application
	ECL403	Principles of Communication Engineering Laboratory	CO1	Analyze analog modulation techniques
			CO2	Implement analog pulse modulation and demodulation
			CO3	Verify the concepts of TDM and FDM
	ECM401	Mini Project 1B	CO1	Write basic codes for the Arduino board using the IDE for utilizing the onboard resources.
			CO2	Apply the knowledge of interfacing different devices to the Arduino board to accomplish a given task.
			CO3	Design Arduino based projects for a given problem.
			CO4	Write code using python language using IDE for utilizing the onboard resources.
			CO5	Apply the knowledge of interfacing different devices to raspberry Pi board to accomplish a given task.
			CO6	Design Raspberry Pi based projects for a given problem.
SECOND YEAR SEMESTER-IV R-19	ECL404	Skill Lab: Python	CO1	Describe syntax and semantics in Python
			CO2	Illustrate different file handling operations
			CO3	Interpret object oriented programming in Python
			CO4	Design GUI Applications in Python
			CO5	Express proficiency in the handling Python libraries for data science
	ECC501	Digital	CO1	Apply the concepts of information theory in source coding.
			CO2	Compare different error control systems and apply various error detection codes.
			CO3	Analyze different error correction codes.

ECC501	Communication	CO4	Compare various baseband transmission methods for digital signals.
		CO5	Evaluate the performance of optimum baseband detection in the presence of white noise.
		CO6	Compare the performances of different digital modulation techniques
ECC502	Discrete Time Signal Processing	CO1	Recall the system representations and understand the relation between different transforms.
		CO2	Understand the concepts of discrete-time Fourier transform, fast Fourier transform and apply in system analysis.
		CO3	Design digital IIR and FIR filters to satisfy the given specifications and evaluate the frequency response and pole[1]zero representations to choose a particular filter
		CO4	Interpret the different realization structures of Digital IIR and FIR filters.
		CO5	Analyze the impact of hardware limitations on the performance of digital filters.
		CO6	Apply signal processing concepts, algorithms in applications related to the field of biomedical and audio signal processing
ECC503	Digital VLSI	CO1	Know various tools and processes used in VLSI Design.
		CO2	Explain working of various CMOS combinational and sequential circuits used in VLSI Design.
		CO3	Derive expressions for performance parameters of basic building blocks like CMOS inverter.
		CO4	Relate performance parameters with design parameters of VLSI circuits.
		CO5	Select suitable circuit and design style for given application.
		CO6	Design and realize various combinational and sequential circuits for given specifications.
		CO1	Apply theory of probability in identifying and solving relevant problems.
		CO2	Differentiate continuous and discrete random variables and their distributions.

THIRD YEAR SEMESTER-V R-19	ECC504	Random Signal Analysis	CO3	Analyze mean, variance, and distribution function of random variables and functions of random variables.
			CO4	Define a random process, determine the type of the process and find the response of LTI system for WSS process.
			CO5	Explain linear regression algorithms and apply for predictive applications.
	ECCDLO 5012	Data Compression and Cryptography	CO1	Apply various compression techniques for text and understand image compression and its standards.
			CO2	Select suitable compression techniques for specified lossless and lossy audio and video applications.
			CO3	Compare between symmetric and asymmetric cryptography and also describe different symmetric cryptographic techniques and standards.
			CO4	Apply number theory concepts to solve the cryptographic problems.
			CO5	Analyze different public key cryptography algorithms and also describe methods that provide the goals for integrity, confidentiality and authentication.
			CO6	Describe system security facilities designed to protect a computer system from security threats and also appreciate ethical issues related to system security.
	ECL501	Digital Communication Lab	CO1	Compare various source coding schemes
			CO2	Design and implement different error detection codes
			CO3	Design and implement different error correction codes
			CO4	Compare various line coding techniques
			CO5	Illustrate the impulse response of a matched filter for optimum detection
			CO6	Demonstrate various digital modulation techniques
			CO1	Perform basic discrete time signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation, etc. and interpret the

ECL502	Discrete Time Signal Processing Lab	CO2	Demonstrate their ability towards interpreting and performing frequency analysis of different discrete time sequences and systems
		CO3	Design and implement the FIR and IIR Filters for given specifications.
		CO4	Implement and analyse applications related to the field of biomedical signal processing and audio signal processing
ECL503	Digital VLSI Lab	CO1	Write spice code for given combinational and sequential CMOS circuits.
		CO2	Perform various analysis like operating point, dc, transient etc of given CMSO circuits.
		CO3	Evaluate performance of given CMOS circuits.
		CO4	Draw layout of given CMOS circuit and also able extract various parasitic using open source layout tool like Magic
		CO5	Design, simulate, and verify CMOS circuit for given specifications.
ECL504	Business Communication and Ethics Lab	CO1	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles
		CO2	Strategize their personal and professional skills to build a professional image and meet the demands of the industry
		CO3	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations
		CO4	Deliver persuasive and professional presentations.
		CO5	Develop creative thinking and interpersonal skills required for effective professional communication.
		CO6	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.
ECM501	Mini Project 2A[1]Embedded	CO1	Understand the embedded systems with design metrics.
		CO2	Understand microcontrollers and programming in Embedded C.
		CO3	Implementation of Embedded systems with different sensors and peripherals as IoT.

Code	Course	CO	Description
ECM501	2A[1]Embedded System Project	CO4	Implementation of Embedded systems with different communication protocols as IoT.
		CO5	Analyze concepts of Real time operating systems.
		CO6	Design embedded system applications using sensors, peripherals and RTOS
ECC601	Electromagnetics and Antenna	CO1	Students will be able to describe electromagnetics field including static and dynamic in terms of Maxwell's equations.
		CO2	Students will be able to apply Maxwell's equation to solve various electromagnetic phenomenon such as electromagnetic wave propagation in different medium,
		CO3	Students will derive the field equations for the basic radiating elements and describe basic antenna parameters like radiation pattern, directivity, gain etc.
		CO4	Students will be able to implement different types of the antenna structures such as Antenna arrays, Microstrip antenna and reflector antenna etc.
ECC602	Computer Communication Networks	CO1	Analyze network topologies, hardware devices, addressing schemes and the protocol stacks
		CO2	Compare various transmission media and broadband technologies
		CO3	Analyze the flow control, error control and the medium access control techniques
		CO4	Judge network layer addressing and routing schemes
		CO5	Analyze connection oriented and connectionless services
		CO6	Apply the knowledge of application layer protocols
		CO1	Understand fundamentals of image processing and machine vision

ECC603	Image Processing and Machine Vision	CO2	Enhance the quality of image using spatial and frequency domain techniques for image enhancement
		CO3	Learn image morphology and restoration techniques
		CO4	Learn image segmentation techniques based on principle of discontinuity and similarity using various algorithms
		CO5	Represent boundaries and shapes using standard techniques.
		CO6	Classify the object using different classification methods
ECC604	Artificial Neural Network and Fuzzy Logic	CO1	Comprehend the concepts of biological neurons and artificial neurons.
		CO2	Analyze the feed-forward and feedback neural networks and their learning algorithms.
		CO3	Comprehend the neural network training and design concepts
		CO4	Build a simple CNN model and apply in image classification
		CO5	Analyze the application of neural networks and fuzzy logic to real world problems.
ECCDLO6012	Computer Organization and Architecture	CO1	Describe Computer system along with I/O operations and performance measures.
		CO2	Demonstrate data representation and different arithmetic algorithm for solving ALU operations.
		CO3	Categorize memory organization and identify the function of each element of memory hierarchy.

THIRD YEAR SEMESTER-VI R-19			CO4	Demonstrate control unit operations.
			CO5	Articulate design issues in the development of Multiprocessor organization & architecture
	ECL601	Electromagnetics and Antenna Lab	CO1	Students will be able to describe electromagnetics field including static and dynamic in terms of Maxwell's equations.
			CO2	Students will be able to apply Maxwell's equation to solve various electromagnetic phenomenon such as electromagnetic wave propagation in different medium,
			CO3	Students will derive the field equations for the basic radiating elements and describe basic antenna parameters like radiation pattern, directivity, gain etc.
			CO4	Students will be able to implement different types of the antenna structures such as Antenna arrays, Microstrip antenna and reflector antenna etc.
	ECL602	Computer Communication Networks Lab	CO1	Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer's specific needs.
			CO2	Perform configurations on routers and Ethernet switches.
			CO3	Demonstrate knowledge of programming for network communications.
			CO4	Simulate computer networks and analyze the simulation results.
			CO5	Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model.
			CO6	Develop knowledge and skills necessary to gain employment as computer network engineer and network administrator.
	ECL603	Image Processing and	CO1	Perform enhancement of digital images in spatial and frequency domain
			CO2	Perform edge detection and morphological operations on digital images

ECL603	Machine Vision Lab	CO3	Classify patterns using standard Machine vision classification techniques like SVM
		CO4	Apply theoretical knowledge in image processing and machine vision to practical case studies
ECL604	Skill Lab: Linux and Networking and Server Configuration	CO1	Install Linux using different platform and execute standard Linux commands.
		CO2	Describe the basic knowledge of Linux Operating System
		CO3	Deploy the system administrative functionality
		CO4	Solve the problems using shell script programming
		CO5	Develop network based applications
		CO6	Apply the Linux commands using programming skill to deploy different servers like ftp, telnet etc.
ECM601	Mini Project 2B- FPGA based Project	CO1	Understand various FPGA families and method of FPGA synthesis and implementation.
		CO2	Learn the working of basic EDA tools like Xilinx, Modelsim cadence , etc
		CO3	Able to program, simulate and synthesize circuits in Verilog HDL.
		CO4	Learn the technique of interfacing of LED, switches and seven segment with FPGA.
		CO5	Learn the project documentation, designing and handling techniques
		CO6	Analysis of FPAG fault detection and verification principles

CHEMICAL ENGINEERING

	CHC301	Engineering Mathematics-III	CO1	Demonstrate & Apply the concepts of Laplace & Inverse Laplace Transform to evaluate definite integrals, Fourier series to expand the periodic functions.
			CO2	Demonstrate & Apply the concepts of Analytic function to find orthogonal trajectories, harmonic conjugate, the concepts of correlation & regressions, Bayes theorem & various probability distributions in the real life problems.
			CO3	Analyze and interpret the problems arising in engineering formulation using Laplace & Inverse Laplace Transform, Fourier series, Complex Variables, Correlation & Regression, Various probability distributions.
			CO4	Express graphically, mathematically functions of one domain into another domain using Laplace & Inverse Laplace Transform, periodic functions into sinusoidal components, statistical data using regression methods, various distribution into Moment generating function.
	CHC302	Industrial and Engineering Chemistry	CO1	Understand the different theories of chemical bonding, organometallic chemistry and reactive intermediate.
			CO2	Apply knowledge of dyes, fertilizers, analytical techniques of separation, identification and quality of fertilizers.
			CO3	Describe the reaction mechanisms, states of molecules, various types of dyes and reaction pathway in biological process.
			CO4	Justify stability of coordination compounds, kinetics and energy of reactions and importance of organometallic compounds in biological process
			CO5	Express role of biomolecules, elemental constituents in fertilizers, and exchangers in industries.
			CO6	Apply concepts of electrochemistry and its applications quantitatively.
	CHC303		CO1	Acquire basic concepts and pressure measurement methods.
			CO2	Learn kinematics of flow, rheological behavior of fluid and boundary layer conditions.

		Fluid Flow Operations (FFO)	CO3	Learn Bernoulli's equation and apply it in practical applications of various problems in Chemical Engineering.
			CO4	Learn flow equations and evaluate the losses in incompressible flow.
			CO5	Learn the behavior of compressible fluids and Stokes Law and also able to apply these concepts for estimation of stagnation properties.
			CO6	Gain the knowledge of various pumps, choice of pumps, valves and agitators and would be able to calculate power requirement for pumps as well as for agitators.
SECOND YEAR / THIRD SEMESTER	CHC304	Chemical Engineering Thermodynamics I	CO1	To apply the first law of thermodynamics to chemical engineering systems.
			CO2	To apply the second law of thermodynamics to chemical engineering systems
			CO3	To predict the P-V-T behavior of ideal gases and real gases
			CO4	To explain various thermodynamic concepts such as Entropy, Exergy and Fugacity
			CO5	To perform calculations involving the applications of the laws of thermodynamics to flow processes
			CO6	To demonstrate the use of thermodynamic charts and diagrams.
	CHC305	Process Calculations	CO1	Identify the various systems of units and conversion and apply principles of basic chemical calculations
			CO2	Apply the material balance for various unit operations for both steady and unsteady state operations.
			CO3	Compute the material balance of various unit processes
			CO4	Evaluate recycle, bypass and purge operations and its streams
			CO5	Perform energy balance calculations over various processes with and without chemical reactions
			CO6	Assess the material balance and energy load of a binary distillation column.
	CHL301	Industrial and	CO1	Prepare standard solutions, check their accuracy and present results in statistical format to calculate standard deviation
			CO2	Perform titrations and determine contents of solution quantitatively.

		CO3	Apply knowledge of instrumental analysis like Conductometry and Potentiometry.
	Industrial and Engineering Chemistry Lab	CO4	Learn methods of estimation of organic compounds quantitatively.
		CO5	Carry out gravimetric analysis systematically with proper understanding.
		CO6	Carry out synthesis of chemicals in laboratory.
CHL302	Fluid Flow Operation Lab	CO1	Determine viscosity by stokes law.
		CO2	Distinguish different flow patterns and calculations involving Reynolds number.
		CO3	Find coefficient of discharge for various flow measuring devices.
		CO4	Evaluate minor losses and frictional losses for various pipe fittings and network.
		CO5	Calculate power required and efficiency for various pumps.
		CO6	Find power requirement for various impellers in agitated vessel.
CHL303	Basic Chemical Engineering Lab	CO1	To Apply basic principles of chemistry and chemical engineering to solve and analyze complex industrial problems.
		CO2	To Apply mathematical skills to perform calculations on data obtained and use required formulas to do the same
		CO3	Evaluate sampling methods, required sampling size and reduce measurement errors for accurate experimental design
		CO4	To Evaluate experimental data by different data analysis methods on PC using MS Excelfor investigating complex problems
		CO5	To Analyze and interpret the results obtained from experiments
		CO6	Design new laboratory experiments to study industrial problems which will benefit society and environment by following strict ethical standards
	Skilled Based Lab Chemical Tech	CO1	To provide students an insight of different chemical processes and their engineering problems.
		CO2	To enable the students to understand the development of a process from its chemistry.
		CO3	To equip students to draw and illustrate process flow diagrams.
		CO4	To develop laboratory procedures for the preparation of industrially important chemicals and products.

		CO5	To enable students to be skilled in the practical aspects of synthesis of chemicals.	
CHL304		CO6	To present the outcomes of laboratory experiments in the form of reports.	
CHM301	Mini Project 1A	CO1	To acquaint with the process of identifying the needs and converting it into the problem.	
		CO2	To familiarize the process of solving the problem in a group.	
		CO3	To acquaint with the process of applying basic engineering fundamentals to attempt solutions to the problems.	
		CO4	To inculcate the process of self-learning and research.	
CHC401	Engineering Mathematics-IV	CO1	Demonstrate and Apply the Vector Calculus to find normal to the surface, directional derivative, Scalar potential, line & surface integrals, Cauchy's theorems to evaluate various contour integrals, concepts of correlation & regressions	
		CO2	Demonstrate and Apply Apply the concepts of probability distributions & sampling techniques in the real life problems.	
		CO3	Analyze and interpret the problems arising in engineering formulation using Correlation & Regression, Various probability distributions, Vector calculus, sampling techniques.	
		CO4	Express graphically, mathematically the functions in terms of Laurent's & Taylor's series, statistical data using regression methods, real life problems using sampling techniques.	
CHC402	Industrial and Engineering Chemistry II	CO1	Understand the theories of aqueous, non-aqueous solutions, surfactants, and colloids	
		CO2	Differentiate between aromatic and non-aromatic compounds.	
		CO3	Apply different spectroscopic methods and thermal methods for the detection of compounds.	
		CO4	Analyse interpretations of spectral data and analytical techniques.	
		CO5	Understand the reaction mechanism, its applications and synthesis of organic molecules.	
		CO6	Express catalytic reactions and its applications in industry.	
CHC403	Numerical Method in Chemical Engineering	CO1	Solve linear algebraic equations.	
		CO2	Solve nonlinear algebraic equations.	
		CO3	Solve using Curve fitting	
		CO4	solve Ordinary Differential equations	

			CO5	Solve Partial Differential equations
		Chemical Engineering	CO6	solve Chemical engineering problems with numerical analysis techniques.
SECOND YEAR / 4th SEMESTER	CHC404	Solid Fluid Mechanical Operations (SFMO)	CO1	Familiarize particle size distribution.
			CO2	Learn size reduction principles
			CO3	Understand fluidization and filtration
			CO4	To have the knowledge of solid-fluid separation
			CO5	Understand storage and handling of solids
			CO6	Understand solid fluid mixing
	CHC405	Chemical Engineering Thermodynamics II	CO1	Evaluate the thermodynamic properties of ideal and non-ideal solutions and mixtures.
			CO2	Perform calculations related to solution thermodynamics.
			CO3	Analyze and solve the problems of phase equilibria and vapour-liquid equilibria.
			CO4	Apply various methods for estimation of thermodynamic properties.
			CO5	Analyze and solve the problems of chemical reaction equilibria.
			CO6	Describe various types of refrigeration cycles and evaluate their performance.
	CHL401	Industrial and Engineering Chemistry II Lab	CO1	Determine dissociation constant of dibasic acid, strength of solution and quantity of solute pH metrically
			CO2	Perform the titration and find the content in terms of quantity
			CO3	Detect alkali metal ions spectrophtometrically
			CO4	Identify, separate and detect ions present in solvent chromatographically
			CO5	Identify the compound by interpreting the spectral data received from optical method
			CO6	Synthesize chemical compounds in laboratory
	CHL402	Numerical Method in Chemical Engineering Lab	CO1	Solve linear algebraic equations.
			CO2	Solve nonlinear algebraic equations.
			CO3	Solve using Curve fitting
			CO4	solve Ordinary Differential equations
	CHL403	Solid Fluid Mechanical Operation Lab	CO1	Understand the importance of various mechanical operations used in process industry
			CO2	Apply principles of basic sciences and chemical engineering for designing various size reduction and separation equipment.
			CO3	Understand particulate solid characterization, storage and transportation of solids.
			CO4	Familiarize primary and secondary crushers.
			CO5	Acquire knowledge of mixing operation.
			CO6	Understand filtration and sedimentation operation.

			CO1	Students should be able to understand the various units and their conversion factors.
	CHL404	Skilled Based Lab: Design Calculation of Auxiliary Plant Equipment	CO2	They should be able to calculate basic properties of various substances.
			CO3	They should be able to do calculations for designing the pressure vessels subjected to internal and external pressure and properties related to storage tanks of various geometries.
			CO4	They should be able to do calculations to determine sizing of the pipelines and valves.
			CO5	They should be able to calculate power requirement in agitation.
			CO6	They should be able to perform various calculations from basic principles of chemical engineering.
	CHM401	Mini Project 1BB	CO1	To acquaint with the process of identifying the needs and converting it into the problem.
			CO2	To familiarize the process of solving the problem in a group.
			CO3	To acquaint with the process of applying basic engineering fundamentals to attempt solutions to the problems.
			CO4	To inculcate the process of self-learning and research.
	CHC501	Mass transfer Operations-I	CO1	The students will be able to understand the molecular diffusion, classification of various mass transfer operations and their principles.
			CO2	Students will be able to determine mass transfer coefficients.
			CO3	Students will be able to determine interfacial concentrations, overall and individual mass transfer coefficients.
			CO4	Students will be able to select contact pattern/equipment for absorption, drying, humidification and perform calculation for HTU, NTU, HETP.
			CO5	Students will be able calculate number of stages, minimum solvent requirement for gas absorption.
			CO6	Students will be able to determine time of drying and understand the concept efficiency of cooling tower, adiabatic saturation and perform calculations for cooling tower.

CHC502	Heat transfer Operations	CO1	To understand scope of the heat transfer unit operations in chemical industry and basic mode of heat transfer and conduction.
		CO2	To demonstrate the knowledge of various analogies and empirical equation in convective heat transfer system
		CO3	To develop heat transfer system with phase change i.e. condensation & boiling
		CO4	To understand various laws and rate of heat transfer by radiation
		CO5	To study preliminary design, construction, working of heat exchangers.
		CO6	To understand construction and working of evaporators.
CHC503	Chemical Reaction Engineering-I	CO1	Students should be able to understand the different types of reactions
		CO2	Students should be able to formulate rate equation from reaction mechanism
		CO3	Students should be able to analyse kinetic data for various type of reactions and develop Kinetic model for homogeneous reactions
		CO4	Students should be able to design reactors for different kind of reactions
		CO5	Students should be able to analyse different reactor combinations for various type of reactions
		CO6	Students should be able to evaluate the effect of temperature on reactor performance for adiabatic and non adiabatic operation
CHC504	Transport Phenomena	CO1	To apply differential equations, vector tensors in Chemical Engineering Transport Processes.
		CO2	2. To explain the analogies between different transport processes.
		CO3	To apply the equation of continuity, equation of motion and equation of energy in Chemical Engineering processes.
		CO4	To perform momentum transfer analysis for solving various industry oriented problems

			CO5	To analyze various industry oriented problems and solve based on energy transfer principles
			CO6	To perform mass transfer analysis for solving various industry oriented problems
THIRD YEAR / 5th SEMESTER/ C Scheme/ R-2019/2021-22	CHDO5012	Department Optional Course 1-Advanced Material Sciences	CO1	To identify various advanced materials such as conducting polymers, high temperature polymers, stainless steels, composites and ceramics.
			CO2	To evaluate the properties of the advanced materials used in chemical engineering.
			CO3	To outline the engineering applications of the advanced materials
			CO4	To describe the fabrication methods of the advanced materials used in chemical engineering.
			CO5	To explain the properties and applications of nanomaterials.
			CO6	To evaluate the different types of thin film coating methods and outline their applications.
	CHL501	Mass transfer Operations-I Lab	CO1	Students will be able to determine diffusivity of given samples
			CO2	Students will be able to understand diffusion through solids
			CO3	Students will be able to determine mass transfer coefficient for various systems
			CO4	Students will understand various contact patterns and equipment for mass transfer
			CO5	Students will be able to carry out mass and energy balance for gas absorption, Humidification-dehumidification and calculate number of stages, NTU and HTU
			CO6	Students will be able to calculate time of drying, number of stages. Also, they will be able to calculate efficiency and effectiveness of cooling tower.
		Heat transfer	CO1	Determine the thermal conductivity and heat transfer rate by using Fourier's law.
			CO2	Evaluate the heat transfer coefficient for natural and force convection.
			CO3	Estimate the heat transfer coefficient in dropwise and filmwise condensation

CHL502	Operations Lab	CO4	Determine the rate of heat transfer in radiation
		CO5	Analyze heat exchanger performance by using the method of log mean temperature difference.
		CO6	Measure the heat transfer coefficient in agitated vessel and efficiency in evaporator
CHL503	Chemical Reaction Engineering-I Lab	CO1	Students should be able to understand the importance of reaction kinetics
		CO2	Students should be able to analyse effect of temperature on rate of homogeneous reaction
		CO3	Students should be able to select appropriate analysis technique depending on type of homogeneous reaction
		CO4	Students should be able to visualise operation of various reactor types
		CO5	Students should be able to evaluating performance of single and multiple reactors
		CO6	Students should be able to choose appropriate reactor set-up for various type of homogeneous reactions
CHL504	Skilled Based Lab: Professional Communication and Ethics II Lab	CO1	1) Recognize and demonstrate the knowledge of business Communication theory, basic official correspondence, job application and resume etc.
		CO2	2) Apply the communication theory knowledge to compare it with results obtained by performing practicals through group discussion and technical presentation individually and in groups and facing job interviews
		CO3	3) Produce and present technical reports and business documentations by using modern medias
		CO1	Identify problems based on societal /research needs
		CO2	Reproduce, improve and refine technical aspects for engineering projects
		CO3	Draw the proper inferences from available results through theoretical/ experimental / simulation

			CO4	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
	CHM501	Mini Project-2A	CO5	Students will be able to practice acquired knowledge within the chosen area of technology for project development.
			CO6	Work as an individual or in a team in development of technical projects, which leads to lifelong learning.
			CO1	Understand equilibrium in all separation processes.
			CO2	Design the mass transfer equipments for various operations
	CHC601	Mass Transfer Operation II	CO3	Understand principles of different distillation operations.
			CO4	Choose the separation operation which will be economical for the given separation.
			CO5	Design adsorption column and find optimum process parameters.
			CO6	Understand membrane separation processes, their principles and working.
			CO1	Students should be able to understand the concept of Residence Time Distribution (RTD) in case of non ideal flow
			CO2	Students should be able to predict the performance of real reactor based on RTD studies
			CO3	Students should be able to understand the difference between performance of homogeneous and heterogeneous reaction
	CHC602	Chemical Reaction Engineering II	CO4	Students should be able to find the model equation and use this model to design the reactors used for heterogeneous non catalytic reactions
			CO5	Students should be able to develop kinetic model and Design strategy for heterogeneous catalytic reactions
			CO6	Students should be able to apply the knowledge they have gained to develop kinetic model and use this model to design the reactors used for Fluid-Fluid reactions
			CO1	The aim of the course is to provide basic understanding of air and water pollution control, regulations, and standards

CHC603	Pollution Control Technology	CO2	Course will provide basics of water pollution sources, properties, measurement and control techniques.
		CO3	Course will provide air pollutions sources, properties, measurements, control methods, design of pollution control devices and efficiency analysis, as well as their applications.
		CO4	Course will provide understanding of solid waste and noise pollution management.
		CO5	Course will provide understanding of waste management in chemical industries.
		CO6	Course will provide understanding of zero discharge management in chemical industries.
CHC604	Process Engineering and Economics	CO1	Understand the functions of process engineering and various approaches of chemical process design.
		CO2	To calculate different types of interests and annual depreciation costs using different methods.
		CO3	To draw various flow diagrams and carry out process design of piping and various flow moving devices.
		CO4	To carry out process design of multicomponent distillation and absorption columns using various approaches.
		CO5	Evaluate basic design aspects of major process equipments, carry out their quick cost estimation and demonstrate their knowledge of different types of costs and capital cost estimates.
		CO6	Demonstrate their knowledge of cash flow in an industrial operation and perform breakeven and profitability analysis using different methods.
CHDO6023	epartmental Optional Course 2-	CO1	Apply concepts and knowledge of management to excel in their careers.
		CO2	Prepare detailed plans, organization structures and use modern tools for decision making
		CO3	Utilize the knowledge of corporate government structures and government laws to upgrade their skills.

THIRD YEAR / 6th SEMESTER/ C Scheme/ R-2019/2021-22	)	Industrial Organization and Management	CO4	Identify concepts of production and quality management to improve productivity and quality in manufacturing plants.
			CO5	Relate concepts of marketing and sales to improve profitability of business.
			CO6	Analyses the tools of finance and accounting to keep control and improve profitability in the industry.
	CHL601	Mass Transfer Operation II Lab	CO1	1. Students will be able to determine no of stages at total reflux for fractional distillation. They will be able determine experimental and theoretical recovery of separation.
			CO2	Students will be able to calculate recovery for single and multistage extraction.
			CO3	Students will be able to verify isotherms and determine nature of adsorption. Also, they will be able to determine break through and exhaustion time and parameters affecting breakthrough curve
			CO4	Students will be able to find recovery in single and multistage leaching operations.
			CO5	Students will be able to determine recovery in batch crystallization.
			CO6	Students will be able to find number of stages, minimum reflux ratio, no of stages at total reflux for tray columns and NTU, HTU, height of bed for packed columns. They will be able to decide suitable equipment for given separation.
	CHL602	Chemical Reaction Engineering II Lab	CO1	Students should be able to understand techniques to determine residence time distribution studies in different types of reactor
			CO2	Students should be able to apply RTD studies for analysis of Non ideal reactor
			CO3	Students should be able to identify mode of operation in case of Semi batch reactor
			CO4	Students should be able to understand adiabatic mode of reactor operation and predict batch operation time
			CO5	Students should be able to determine the catalyst properties and significance in reactor design

		CO6	Students should be able to develop kinetics of Solid Fluid non catalytic reaction
CHL603	Pollution Control TechnologyLab	CO1	The aim of the course is to provide basic understanding of air and water pollution control, regulations, standards
		CO2	Course will provide basics of water pollution sources, properties, measurement and control techniques.
		CO3	Course will provide air pollutions sources, properties, measurements, control methods, design of pollution control devices and efficiency analysis, as well as their applications.
		CO4	Course will provide understanding of solid waste and noise pollution management
		CO5	Course will provide understanding of waste management in chemical industries.
		CO6	Course will provide understanding of zero discharge management in chemical industries.
CHL604	Skilled Based Lab: Piping Design Engineering Lab	CO1	To apply piping standards in design of complex piping networks
		CO2	To solve complex engineering problem of selection of appropriate material for pipes and fittings for chemical plants
		CO3	To identify, analyze and solve pipe sizing, pump sizing, valve sizing and pipe-valve-pump selection problems
		CO4	To design and draw piping networks, piping layout ,P & ID ,isometric drawings and plot plan by considering legal, environmental, societal and ethical aspects
		CO5	To use modern IT tools such as MS Excel/Libre office Calc/WPS spreadsheets, DWSIM, AutoCAD 2D and 3D,CAE demo and Edraw Fluid flow for design and analysis of piping networks
		CO6	To carry out stress analysis, network analysis, flexibility analysis and surge analysis for chemical plants which will benefit society and environment by following strict ethical standards.
		CO1	Identify problems based on societal /research needs

			CO2	Reproduce, improve and refine technical aspects for engineering projects
	CHM601	Mini Project – 2B	CO3	Draw the proper inferences from available results through theoretical/ experimental / simulation
			CO4	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
			CO5	Students will be able to practice acquired knowledge within the chosen area of technology for project development.
			CO6	Work as an individual or in a team in development of technical projects, which leads to lifelong learning.

MECHANICAL ENGINEERING

			CO1	– Demonstrate and Apply the concepts of Laplace & Inverse Laplace Transform to evaluate definite integrals, Fourier series to expand the periodic functions.
	MEC301	ENGINEERING MATHEMATICS- III	CO2	Demonstrate and Apply the concepts of Analytic function to find orthogonal trajectories, harmonic conjugate, Matrix Algebra to calculate the eigenvalues, eigenvectors, function of square matrix, inverse of matrix and Variable separable & Numerical methods to solve Heat & wave equations
			CO3	Analyze and interpret the problems arising in engineering formulation using Laplace & Inverse Laplace Transform, Fourier series, Complex Variables, Matrices and Partial Differential Equations.
			CO4	Express graphically, mathematically functions of one domain into another domain using Laplace & Inverse Laplace Transform, periodic functions into sinusoidal components, matrix into diagonal form, function of matrix and wave & heat equations into sinusoidal components.
			CO5	
	MEC302	STRENGTH OF MATERIAL	CO1	Demonstrate fundamental knowledge about various types of loading and stresses induced
			CO2	Draw the SFD and BMD for different types of loads and support conditions
			CO3	Analyse the bending and shear stresses induced in beam
			CO4	Analyse the deflection in beams and stresses in shaft

				Analyse the stresses and deflection in beams and Estimate the strain energy in mechanical elements.
SECOND YEAR SEMESTER-3				Analyse buckling phenomenon in columns
	MEC303	PRODUCTION PROCESSES	CO1	Demonstrate the casting process
			CO2	Illustrate principles of forming processes
			CO3	Demonstrate applications of various types of welding processes
			CO4	Differentiate chip forming processes such as turning, milling, drilling, etc
			CO5	Illustrate the concept of producing polymer components.
			CO6	Understand the non-traditional manufacturing processes along with manufacturing technologies enabling Industry 4.0
	MEC304	MATERIALS AND METALLURGY	CO1	Identify the various classes of materials and comprehend their properties
			CO2	Draw phase diagram and apply its concepts to engineering applications
			CO3	Apply particular heat treatment for required property development
			CO4	Identify the probable mode of failure in materials and suggest measures to prevent them
			CO5	Choose or develop new materials for better performance
			CO6	Decide an appropriate method to evaluate different components in service
	MEC305	THERMODYNAMICS	CO1	Understand basic concepts of thermodynamics including basic definitions & units, laws of thermodynamic, properties of steam, property relations, power cycles and compressible fluid flow
			CO2	Differentiate between the thermodynamic properties like work and energy, enthalpy and entropy, gas and vapor power cycles, etc.
			CO3	Analyze various power cycles and energy equations, etc
			CO4	Apply thermodynamics laws & concepts to solve the real system problems, derivations, etc.
			CO1	Identify suitable computer graphics techniques for 3D modeling.
			CO2	Transform, manipulate objects & store and manage data.

	MEC404	CAD/CAM	CO3	Develop 3D model using various types of available biomedical data.
			CO4	Create the CAM Toolpath for specific given operations.
			CO5	Build and create data for 3D printing of any given object using rapid prototyping and tooling processes.
			CO6	Illustrate understanding of various cost effective alternatives for manufacturing products.
SECOND YEAR SEMESTER-4	MESBL401	CNC and 3-D Printing	CO1	Develop and execute part programing for any given specific operation.
			CO2	Build any given object using various CNC operations
			CO3	Demonstrate CAM Tool path and prepare NC- G code
			CO4	Develop 3D model using available biomedical data
			CO5	Build any given real life object using 3D printing process
			CO6	Convert 2D images into 3D model
	MEC401	Engineering Mathematics-IV	CO1	Demonstrate and Apply the Vector Calculus to find normal to the surface, directional derivative, Scalar potential, line & surface integrals, Cauchy's theorems to evaluate various contour integrals, concepts of correlation & regressions.
			CO2	Demonstrate and Apply Apply the concepts of probability distributions & sampling techniques in the real life problems.
			CO3	Analyze and interpret the problems arising in engineering formulation using Correlation & Regression, Various probability distributions, Vector calculus, sampling techniques.
			CO4	Express graphically, mathematically the functions in terms of Laurent's & Taylor's series, statistical data using regression methods, real life problems using sampling techniques.
	MEC403	KOM	CO1	Identify various components of mechanisms
			CO2	Develop mechanisms to provide specific motion
			CO3	Draw velocity and acceleration diagrams of various mechanisms
			CO4	Choose a cam profile for the specific follower motion
			CO5	Predict condition for maximum power transmission in the case of a belt drive

			CO6	Illustrate requirements for an interference-free gear pair
	MEC402	Fluid Mechanics	CO1	Understand the properties of fluid, fluid statics, kinematics, dynamics and different types of fluid flow
			CO2	Derive the basic equations for compressible and incompressible flow by making appropriate assumptions
			CO3	Solve the different problems of compressible, incompressible fluid flow through closed and open conduit
	CHC501	Mass transfer Operations-I	CO1	The students will be able to understand the molecular diffusion, classification of various mass transfer operations and their principles.
			CO2	Students will be able to determine mass transfer coefficients.
			CO3	Students will be able to determine interfacial concentrations, overall and individual mass transfer coefficients.
			CO4	Students will be able to select contact pattern/equipment for absorption, drying, humidification and perform calculation for HTU, NTU, HETP.
			CO5	Students will be able calculate number of stages, minimum solvent requirement for gas absorption.
			CO6	Students will be able to determine time of drying and understand the concept efficiency of cooling tower, adiabatic saturation and perform calculations for cooling tower.
	CHC502	Heat transfer Operations	CO1	To understand scope of the heat transfer unit operations in chemical industry and basic mode of heat transfer and conduction.
			CO2	To demonstrate the knowledge of various analogies and empirical equation in convective heat transfer system
			CO3	To develop heat transfer system with phase change i.e. condensation & boiling
			CO4	To understand various laws and rate of heat transfer by radiation

		CO5	To study preliminary design, construction, working of heat exchangers.
		CO6	To understand construction and working of evaporators.
CHC503	Chemical Reaction Engineering-I	CO1	Students should be able to understand the different types of reactions
		CO2	Students should be able to formulate rate equation from reaction mechanism
		CO3	Students should be able to analyse kinetic data for various type of reactions and develop Kinetic model for homogeneous reactions
		CO4	Students should be able to design reactors for different kind of reactions
		CO5	Students should be able to analyse different reactor combinations for various type of reactions
		CO6	Students should be able to evaluate the effect of temperature on reactor performance for adiabatic and non adiabatic operation
CHC504	Transport Phenomena	CO1	To apply differential equations, vector tensors in Chemical Engineering Transport Processes.
		CO2	2. To explain the analogies between different transport processes.
		CO3	To apply the equation of continuity, equation of motion and equation of energy in Chemical Engineering processes.
		CO4	To perform momentum transfer analysis for solving various industry oriented problems
		CO5	To analyze various industry oriented problems and solve based on energy transfer principles
		CO6	To perform mass transfer analysis for solving various industry oriented problems
		CO1	To identify various advanced materials such as conducting polymers, high temperature polymers, stainless steels, composites and ceramics.
		CO2	To evaluate the properties of the advanced materials used in chemical engineering.

THIRD YEAR / 5th SEMESTER/ C Scheme/ R-2019/2021-22	CHDO5012	Department Optional Course 1- Advanced Material Sciences	CO3	To outline the engineering applications of the advanced materials
			CO4	To describe the fabrication methods of the advanced materials used in chemical engineering.
			CO5	To explain the properties and applications of nanomaterials.
			CO6	To evaluate the different types of thin film coating methods and outline their applications.
	CHL501	Mass transfer Operations-I Lab	CO1	Students will be able to determine diffusivity of given samples
			CO2	Students will be able to understand diffusion through solids
			CO3	Students will be able to determine mass transfer coefficient for various systems
			CO4	Students will understand various contact patterns and equipment for mass transfer
			CO5	Students will be able to carry out mass and energy balance for gas absorption, Humidification-dehumidification and calculate number of stages, NTU and HTU
			CO6	Students will be able to calculate time of drying, number of stages. Also, they will be able to calculate efficiency and effectiveness of cooling tower.
	CHL502	Heat transfer Operations Lab	CO1	Determine the thermal conductivity and heat transfer rate by using Fourier's law.
			CO2	Evaluate the heat transfer coefficient for natural and force convection.
			CO3	Estimate the heat transfer coefficient in dropwise and filmwise condensation
			CO4	Determine the rate of heat transfer in radiation
			CO5	Analyze heat exchanger performance by using the method of log mean temperature difference.
			CO6	Measure the heat transfer coefficient in agitated vessel and efficiency in evaporator
			CO1	Students should be able to understand the importance of reaction kinetics

			CO2	Students should be able to analyse effect of temperature on rate of homogeneous reaction
CHL503	Chemical Reaction Engineering-I Lab		CO3	Students should be able to select appropriate analysis technique depending on type of homogeneous reaction
			CO4	Students should be able to visualise operation of various reactor types
			CO5	Students should be able to evaluating performance of single and multiple reactors
			CO6	Students should be able to choose appropriate reactor set-up for various type of homogeneous reactions
CHL504	Skilled Based Lab: Professional Communication and Ethics II Lab		CO1	1) Recognize and demonstrate the knowledge of business Communication theory, basic official correspondence, job application and resume etc.
			CO2	2) Apply the communication theory knowledge to compare it with results obtained by performing practicals through group discussion and technical presentation individually and in groups and facing job interviews
			CO3	3) Produce and present technical reports and business documentations by using modern medias
CHM501	Mini Project-2A		CO1	Identify problems based on societal /research needs
			CO2	Reproduce, improve and refine technical aspects for engineering projects
			CO3	Draw the proper inferences from available results through theoretical/ experimental / simulation
			CO4	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
			CO5	Students will be able to practice acquired knowledge within the chosen area of technology for project development.
			CO6	Work as an individual or in a team in development of technical projects, which leads to lifelong learning.

			CO1	Understand equilibrium in all separation processes.
	CHC601	Mass Transfer Operation II	CO2	Design the mass transfer equipments for various operations
			CO3	Understand principles of different distillation operations.
			CO4	Choose the separation operation which will be economical for the given separation.
			CO5	Design adsorption column and find optimum process parameters.
			CO6	Understand membrane separation processes, their principles and working.
	CHC602	Chemical Reaction Engineering II	CO1	Students should be able to understand the concept of Residence Time Distribution (RTD) in case of non ideal flow
			CO2	Students should be able to predict the performance of real reactor based on RTD studies
			CO3	Students should be able to understand the difference between performance of homogeneous and heterogeneous reaction
			CO4	Students should be able to find the model equation and use this model to design the reactors used for heterogeneous non catalytic reactions
			CO5	Students should be able to develop kinetic model and Design strategy for heterogeneous catalytic reactions
			CO6	Students should be able to apply the knowledge they have gained to develop kinetic model and use this model to design the reactors used for Fluid-Fluid reactions
	CHC603	Pollution Control Technology	CO1	The aim of the course is to provide basic understanding of air and water pollution control, regulations, and standards
			CO2	Course will provide basics of water pollution sources, properties, measurement and control techniques.
			CO3	Course will provide air pollutions sources, properties, measurements, control methods, design of pollution control devices and efficiency analysis, as well as their applications.

			CO4	Course will provide understanding of solid waste and noise pollution management.
			CO5	Course will provide understanding of waste management in chemical industries.
			CO6	Course will provide understanding of zero discharge management in chemical industries.
	CHC604	Process Engineering and Economics	CO1	Understand the functions of process engineering and various approaches of chemical process design.
			CO2	To calculate different types of interests and annual depreciation costs using different methods.
			CO3	To draw various flow diagrams and carry out process design of piping and various flow moving devices.
			CO4	To carry out process design of multicomponent distillation and absorption columns using various approaches.
			CO5	Evaluate basic design aspects of major process equipments, carry out their quick cost estimation and demonstrate their knowledge of different types of costs and capital cost estimates.
			CO6	Demonstrate their knowledge of cash flow in an industrial operation and perform breakeven and profitability analysis using different methods.
	CHDO6023)	epartmental Optional Course 2- Industrial Organization and Management	CO1	Apply concepts and knowledge of management to excel in their careers.
			CO2	Prepare detailed plans, organization structures and use modern tools for decision making
			CO3	Utilize the knowledge of corporate government structures and government laws to upgrade their skills.
			CO4	Identify concepts of production and quality management to improve productivity and quality in manufacturing plants.
			CO5	Relate concepts of marketing and sales to improve profitability of business.
THIRD			CO6	Analyses the tools of finance and accounting to keep control and improve profitability in the industry.

YEAR / 6th SEMESTER/ C Scheme/ R-2019/2021-22	CHL601	Mass Transfer Operation II Lab	CO1	1. Students will be able to determine no of stages at total reflux for fractional distillation. They will be able determine experimental and theoretical recovery of separation.
			CO2	Students will be able to calculate recovery for single and multistage extraction.
			CO3	Students will be able to verify isotherms and determine nature of adsorption. Also, they will be able to determine break through and exhaustion time and parameters affecting breakthrough curve
			CO4	Students will be able to find recovery in single and multistage leaching operations.
			CO5	Students will be able to determine recovery in batch crystallization.
			CO6	Students will be able to find number of stages, minimum reflux ratio, no of stages at total reflux for tray columns and NTU, HTU, height of bed for packed columns. They will be able to decide suitable equipment for given separation.
	CHL602	Chemical Reaction Engineering II Lab	CO1	Students should be able to understand techniques to determine residence time distribution studies in different types of reactor
			CO2	Students should be able to apply RTD studies for analysis of Non ideal reactor
			CO3	Students should be able to identify mode of operation in case of Semi batch reactor
			CO4	Students should be able to understand adiabatic mode of reactor operation and predict batch operation time
			CO5	Students should be able to determine the catalyst properties and significance in reactor design
			CO6	Students should be able to develop kinetics of Solid Fluid non catalytic reaction
			CO1	The aim of the course is to provide basic understanding of air and water pollution control, regulations, standards
			CO2	Course will provide basics of water pollution sources, properties, measurement and control techniques.

CHL603	Pollution Control TechnologyLab	CO3	Course will provide air pollutions sources, properties, measurements, control methods, design of pollution control devices and efficiency analysis, as well as their applications.
		CO4	Course will provide understanding of solid waste and noise pollution management
		CO5	Course will provide understanding of waste management in chemical industries.
		CO6	Course will provide understanding of zero discharge management in chemical industries.
CHL604	Skilled Based Lab: Piping Design Engineering Lab	CO1	To apply piping standards in design of complex piping networks
		CO2	To solve complex engineering problem of selection of appropriate material for pipes and fittings for chemical plants
		CO3	To identify, analyze and solve pipe sizing, pump sizing, valve sizing and pipe-valve-pump selection problems
		CO4	To design and draw piping networks, piping layout ,P & ID ,isometric drawings and plot plan by considering legal, environmental, societal and ethical aspects
		CO5	To use modern IT tools such as MS Excel/Libre office Calc/WPS spreadsheets, DWSIM, AutoCAD 2D and 3D,CAE demo and Edraw Fluid flow for design and analysis of piping networks
		CO6	To carry out stress analysis, network analysis, flexibility analysis and surge analysis for chemical plants which will benefit society and environment by following strict ethical standards.
CHM601	Mini Project – 2B	CO1	Identify problems based on societal /research needs
		CO2	Reproduce, improve and refine technical aspects for engineering projects
		CO3	Draw the proper inferences from available results through theoretical/ experimental / simulation
		CO4	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach

			CO5	Students will be able to practice acquired knowledge within the chosen area of technology for project development.
			CO6	Work as an individual or in a team in development of technical projects, which leads to lifelong learning.

LIST OF COURSE OUTCOMES REV-2016 for AY 2021-22 (All Branch)
COMPUTER ENGINEERING

CSC701	Digital Signal & Image Processing		CO1	Apply the concept of DT Signal and DT Systems to classify and analyze discrete signals
			CO2	Implement Digital Signal Transform techniques DFT and FFT
			CO3	Use the enhancement techniques for digital Image Processing
			CO4	Apply various filtering concepts on digital image to make it smooth or sharp as per the requirement of application
CSC702	Mobile Communication & Computing		CO1	1 To identify basic concepts and principles in mobile communication and computing, cellular architecture.
			CO2	2 To describe the components and functioning of mobile networking.
			CO3	3 To classify variety of security techniques in mobile network.
			CO4	4 To apply the concepts of WLAN for local as well as remote applications.
			CO5	5 To describe and apply the concepts of mobility management
			CO6	6 To describe Long Term Evolution (LTE) architecture and its interfaces.
			CO1	Identify the various characteristics of Artificial Intelligence and Soft Computing techniques.
			CO2	Choose an appropriate problem solving method for an agent to find a sequence of actions to reach the goal state.

	CSC703	Artificial Intelligence & Soft Computing	CO3	Analyse the strength and weakness of AI approaches to knowledge representation, reasoning and planning.
			CO4	Construct supervised and unsupervised ANN for real world applications.
			CO5	Design fuzzy controller system.
			CO6	Apply Hybrid approach for expert system design.
FINAL YEAR / SEVENTH SEMESTER	CSDLO7032	Big Data & Analytics	CO1	Understand & describes the key issues in big data management and its associated applications for business decisions and strategy.
			CO2	Develop problem solving and critical thinking skills in fundamental enabling techniques like Hadoop, Mapreduce and NoSQL in big data analytics.
			CO3	Collect, manage, store, query and analyze various forms of Big Data.
			CO4	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
	ILO7016	Cyber Security and Laws	CO1	Understand the concept of cybercrime and its effect on outside world
			CO2	Interpret and apply IT law in various legal issues
			CO3	Distinguish different aspects of cyber law
			CO4	Apply Information Security Standards compliance during software design and development
	CSL701	Digital Signal & Image Processing Lab	CO1	Apply the concept of DT Signal and DT Systems to classify and analyze discrete signals
			CO2	Implement Digital Signal Transform techniques DFT and FFT
			CO3	Use the enhancement techniques for digital Image Processing
			CO4	Apply various filtering concepts on digital image to make it smooth or sharp as per the requirement of application
			CO1	1. To develop and demonstrate mobile applications using various tools

			CO2	2. Students will articulate the knowledge of GSM, CDMA & Bluetooth technologies and demonstrate it.
CSL702		Mobile App. Development. Tech. Lab	CO3	3. Students will able to carry out simulation of frequency reuse, hidden terminal problem
			CO4	4. To develop security algorithms for mobile communication network
			CO5	5. To demonstrate simulation and compare the performance of Wireless LAN
			CO6	6. To implement and demonstrate mobile node discovery and route maintains.
CSL703		Artificial Intelligence & Soft Computing Lab	CO1	To realize the basic techniques to build intelligent systems
			CO2	To create knowledge base and apply appropriate search techniques used in problem solving.
			CO3	Apply the supervised/unsupervised learning algorithm.
			CO4	Designfuzzy controller system.
CSL704		Computational Lab-I	CO1	Understand & describes the key issues in big data management and its associated applications for business decisions and strategy.
			CO2	Collect, manage, store, query and analyze various forms of Big Data.
			CO3	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
CSL705		Major Project-I	CO1	1) To promote students to develop further skills and knowledge gained during program.
			CO2	2) To make them able to analyse a specific problem or issue and find the appropriate solution for them
			CO3	3) To demonstrate proficiency in the design of a research project, application of appropriate research methods
			CO4	4) To collect and analyse data and presentation of results

FINAL YEAR / EIGHTH SEMESTER	CSC801	Human Machine Interaction	CO1	Study human characteristics to provide user friendly human machine interaction through easy user interface.
			CO2	Apply interactive design process in real world applications
			CO3	Design application for social and technical task
	CSC802	Distributed Computing	CO1	Demonstrate knowledge of the basic concepts related to distributed system technologies and illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.
			CO2	Analyze and Demonstrate the various techniques used for clock synchronization, mutual exclusion and the concepts of Resource, Process management, synchronization algorithms.
			CO3	Apply and demonstrate the concepts of Consistency, replication Management and the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale distributed applications.
	DLO8012	Natural Language Processing	CO1	Have a broad understanding of the field of natural language processing.
			CO2	Have a sense of the capabilities and limitations of current natural language technologies,
			CO3	Be able to model linguistic phenomena with formal grammars.
			CO4	Be able to Design, implement and test algorithms for NLP problems
			CO5	Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP
			CO6	Be able to apply NLP techniques to design real world NLP applications such as machine translation, text categorization, text summarization, information extraction...etc.
	CSL801	Human Machine	CO1	Study human characteristics to provide user friendly human machine interaction through easy user interface.

CSL801	Interaction Lab	CO2	Apply interactive design process in real world applications
		CO3	Design application for social and technical task
CSL802	Distributed Computing Lab	CO1	Develop, test and debug RPC/RMI based client-server programs.
		CO2	Implement the main underlying components of distributed systems (such as IPC, name resolution, file systems etc.)
		CO3	Implement various techniques of synchronization.
		CO4	Design and implement application programs on distributed systems
CSL803	Cloud Computing Lab	CO1	Adapt different types of virtualization and increase resource utilization.
		CO2	Build a private cloud using open source technologies.
		CO3	Analyze security issues on cloud.
		CO4	Develop real world web applications and deploy on commercial cloud.
		CO5	Demonstrate various service models.
CSL804	Computational Lab-II	CO1	Acquire practical knowledge within the chosen area of technology for project development
		CO2	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CSL805	Major Project-II	CO1	1) To promote students to develop further skills and knowledge gained during program.
		CO2	2) to meet the milestone s formed in the overall project plan decided in Project - I.
		CO3	3) To demonstrate proficiency in the design of a research project, application of appropriate research methods
		CO4	4) To collect and analyse data and presentation of results
		CO5	5) To culminate the production of a thesis by each individual student

CIVIL ENGINEERING

			CO1	Apply the measurement systems to various civil engineering items of work
			CO2	Draft the specifications for various items of work & determine unit rates of items of works

	CE-C 701 Quantity Survey, Estimation & Valuation	CO3	Estimate approximate cost of the structures by using various methods & prepare detailed estimates of various civil engineering structures by referring drawings.
		CO4	Assess the quantities of earthwork &construct mass haul diagrams.
		CO5	Draft tender notice &demonstrate the significance of the tender as well as contract process.
		CO6	Draft tender notice &demonstrate the significance of the tender as well as contract process.
LAST YEAR / 7th SEMESTER / Rev 2016	CE-C 702 Theory of Reinforced Concrete Structures	CO1	Understand the pros and cons of the WSM and LSM.
		CO2	Understand the various clauses specified in IS: 456-2000 for designing structural members with the safety and economy.
		CO3	Carry out analysis and design of various elements of the reinforced concrete structures such as beam, slab, column, footings using the concept of Limit state method.
		CO4	Understand and the use of readymade design curves from Special publications of Bureau of Indian standards.
	CE-C 703 Water Resources Engineering II	CO1	Design the section of gravity dams, earth and rockfill dams, arch dams and buttress dams.
		CO2	Design spillways and energy dissipaters.
		CO3	Apply silt theories to design irrigation canals.
		CO4	Explain various types of canals and its maintenance
		CO5	Explain different cross drainage works of a canal system
	CE-DLO 7042 Department Level Elective: Solid Waste Management	CO1	Explain generation, storage, collection, transfer and transport, processing, recovery and disposal in the management of solid waste.
		CO2	Understand the characteristics of different types of solid waste and the factors affecting variation.
		CO3	Identify the methods of collection, storage and transportation of solid waste.
		CO4	Suggest suitable technical solutions for processing of wastes.

		CO5	Ability to plan waste minimization and disposal of municipal solid waste.
		CO6	Ensure the safe handling and treatment of Hazardous, Electronic and Biomedical waste.
	CE-C ILOC7017 Institute Level Elective: Disaster Management and Mitigation Measures	CO1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
		CO2	Plan of national importance structures based upon the previous history.
		CO3	Get acquainted with government policies, acts and various organizational structure associated with an emergency.
		CO4	
LAST YEAR / 8th SEMESTER / Rev	CE-C 801 Design and Drawing of Reinforced Concrete Structures	CO1	Design independently RCC structure by applying IS code provisions.
		CO2	Design staircase, water tank and retaining wall.
		CO3	Explain principles of PSC and calculate losses.
		CO4	Draw and explain the structural detailing.
		CO5	Explain response of structure during an earthquake and calculate design forces.
	CE-C 802 Construction Management	CO1	Understand & apply the knowledge of management functions like planning, scheduling, executing & controlling the construction projects.
		CO2	Prepare feasible project schedule by using various scheduling techniques.
		CO3	Gain knowledge of managing various resources &recommend best method of allocating the resources to the project.
		CO4	develop optimum relationship between time & cost for construction project
		CO5	Implement quality & safety measures on construction sites during execution of civil engineering projects.
		CO6	Understand the importance of labour legislation
		CO1	Understand the characteristics of industrial wastewater.
		CO2	Identify sampling method and analyze industrial waste.
		CO3	Design facilities for the processing and reclamation of industrial waste water.

CE-C DLO8032 Department Level Elective: Industrial Waste Treatment	CO4	Explain on-site treatment methods and solve Analyze and design wastewater treatment systems. (floatation, vacuum filtration, centrifugation, filter press and membrane filters)
	CO5	Detailed on-site manufacturing processes and treatments of industrial waste water.
	CO6	Analyze proposed development project plans for possible environmental effects and to improve treated effluent quality to confirm standard prescribed by regulatory agencies.
CE-C ILOC8021 Institute Level Elective: Project Management	CO1	Apply selection criteria and select an appropriate project from different options
	CO2	Write work break down structure for a project and develop a schedule based on it.
	CO3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
	CO4	Use Earned value technique and determine & predict status of the project.
	CO5	Capture lessons learned during project phases and document them for future reference
CE-C ILOC8028 Institute level Elective : Environmental Management	CO1	Understand the concept of environmental management
	CO2	Understand ecosystem and interdependence, food chain etc.
	CO3	Understand and interpret environment related legislations

CHEMICAL ENGINEERING

	CHC701	Process Equipment Design. (PED)	CO1	Design heat exchanger and evaporator.
			CO2	Design distillation and absorption columns
			CO3	Design high pressure vessels.
			CO4	Explain different flow sheet presentation and equipment inspection methods.
	CHC702	Process Engineering	CO1	The graduates are expected to have ability to apply knowledge of mathematics, science and engineering.
			CO2	The graduates are expected to have ability to design a system, a component, or a process to meet the desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability.

			CO3	The graduates are expected to possess ability to function on multi disciplinary teams.
			CO4	The graduates are expected to possess ability to identify, formulate and solve engineering problems.
			CO5	The graduates are expected to have an understanding of professional and ethical responsibility.
			CO6	The graduates are expected to engage themselves in lifelong learning.
			CO7	The graduates are expected to posses' ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
	CHC703	Process Dynamics and Control (PDC)	CO1	To model and study the response of steady and dynamic system of chemical engineering process.
			CO2	To design a controllers for chemical process.
	CHDE703.3	Department Elective III Petroleum ref tech	CO1	Characterize crude petroleum and petroleum refinery
			CO2	Fractionate crude petroleum into useful fractions
			CO3	Measure important physical properties of petroleum products
			CO4	Apply refinery processes to maximize desired petro products
			CO5	Use treatment techniques to purify petro products
			CO6	Manufacture widely used petrochemicals
LAST YEAR / 7th SEMESTER / Rev 2016	ILO7018	Institute Elective IEnergy Audit and Management (ILO7018	CO1	To identify and describe present state of energy security and its importance.
			CO2	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
			CO3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
			CO4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities

Code	Course	CO	Course Outcome
		CO5	To analyze the data collected during performance evaluation and recommend energy saving measures
CHP701	Project A	CO1	Identify advanced topic in chemical engineering based on the technology, its application, and its future potential.
		CO2	Demonstrate a sound technical knowledge of the selected project topic focused on solutions to industrial, societal, and environmental problems with the application of sustainable technology.
		CO3	Carry out market study on the product and find demand supply gap for manufacturing projects.
		CO4	Carry out thorough literature survey on the selected topic and identify research gaps for research projects.
		CO5	Carry out profitability analysis for the selected product.
		CO6	Communicate the literature review, proposed work at various platforms for further suggestions, improvement.
CHS701	Seminar	CO1	Students will be able to exhibit their presentation skills
		CO2	Students will be able to discuss topics and express their ideas
		CO3	Stuydent will improve critical thinking
		CO4	Students will undestand new developments in the field domain
		CO5	Students will develop interdisciplinary approach
		CO6	Students will develop their communication and conviencing ability through Q and A session
CHL701	PED Lab	CO1	Students will be able to design heat exchamger
		CO2	Students will be able to design Short Tube vertical Evaporator
		CO3	Students will be able to design Distillation Column
		CO4	Students will be able to understand design aspects of High Pressure vessels

	CHL702	Chemical Engineering Lab X (PDC)	CO1	Analyze the dynamic behaviour of process
			CO2	Evalute control parameters for the given process
	CHC801	Modeling, Simulation & Optimization (MSO)	CO1	Develop the linear and non-linear mass and energy balance equations for individual as well as multiple units.
			CO2	Estimate the sequential and equation oriented simulation of complete flow sheets.
			CO3	Optimize typical chemical processes.
	CHC802	Project Engineering and Enterprenuirship managament	CO1	concepts and knowledge of project management to manage projects in process industries
			CO2	Students should be able to prepare feasibility reports.
			CO3	Students should be able to understand various clearances required to start industry
			CO4	Students should be able to prepare project organization charts and contracts
			CO5	Students should be able to prepare contracts
			CO6	Students should be able to use tools of PM to solve problems and will be motivated to become entrepreneurs
	CHC803	Energy System Design	CO1	The graduates should able to design an energy system to meet the desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability
			CO2	The graduates should able to function on multidisciplinary teams, identify, formulate and solve engineering problems
			CO3	The graduates are expected to have knowledge of professional and ethical responsibility
			CO4	The graduates should able to use the techniques, skills, and modern engineering tools necessary for engineering practice
	CHDE8043	Advanced Separation Technology	CO1	The graduates are expected to have ability to apply knowledge of mathematics, science and engineering.

LAST YEAR / 8th SEMESTER / Rev 2016		(CHDE8043)	CO2	The graduates are expected to have ability to design a system, a component, or a process to meet the desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability.
			CO3	The graduates are expected to possess ability to identify, formulate and solve engineering problems.
			CO4	The graduates are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
	ILO8029	. Environmental Management (ILO8029)	CO1	Learner will be able to understand the concept of environmental management
			CO2	Learner will be able to understand ecosystem and interdependence, food chain etc.
			CO3	Learner will be able to understand and interpret environment related legislations
	CHP801	Project B	CO1	Demonstrate a sound technical knowledge of the selected project topic related to industrial, societal and environmental problems with the application of sustainable technology.
			CO2	Carry out problem formulation and solution.
			CO3	Develop flowsheet and PID diagram for manufacturing projects as applicable.
			CO4	Design and perform experiments and analyze results for research project. In case of manufacturing project, develop complete flow sheet and PID diagram.
			CO5	Apply knowledge of the chemical engineering subjects for interpretation and analysis of experimental results and formulate a model and use suitable software for comparing results and optimize the parameters as and when required.
			CO6	Write research article, project report and present the findings before experts and society at large.
	CHL801	Chemical Engineering Lab XI (MSO	CO1	**Estimate parameters for optimum process**
			CO2	**Design the chemical process flow through mass and energy balance**

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Code	Subject	CO	Course Outcome
ECC701	Microwave Engineering	CO1	Able to characterize devices at higher frequencies.
		CO2	Able to design and analyze microwave circuits.
		CO3	Able to design and analyze amplifiers and oscillators at microwave frequencies.
		CO4	Able to demonstrate skills of planning, design and deployment of microwave networks
ECC702	Mobile Communication System	CO1	Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems
		CO2	Classify different types of propagation models and analyse the link budget
		CO3	Apply the concepts of 3G technologies of UMTS and CDMA 2000.
ECC703	Optical Communication	CO1	List, write and explain fundamentals and transmission characteristics of optical fiber communication
		CO2	List, write and explain principles and characteristics of various sources, detectors.
		CO3	Conduct experiments as well as analyze and interpret data using various fiber optic components
		CO4	Calculate parameters for optical link budgeting and analyze the link
ECCDLO 7035	Embedded System	CO1	Understand the detailed processor design techniques and methods of communication.
		CO2	Study the in-depth program modelling concepts.
		CO3	Study the concepts of Real time operating systems and write programs
		CO4	Design embedded system applications using RTOS
		CO1	Explain the operation of the components of a router including, DHCP, NAT/PAT, Routing function, Switching function
		CO2	Describe how DNS works in the global Internet including caching and root servers.

ECCDLO7033	Internet of Communication Engineering	CO3	Understand the current state-of-the-art developments in Internet technologies for multimedia communications
		CO4	Understand the security protocol and services In the Internet
		CO5	Appreciate the principles used in designing multimedia protocols, and so understand why standard protocols are designed the way that they are
		CO6	Understand the system design principles of multimedia communications systems.
		CO7	Solve problems and design simple networked multimedia systems.
ILO7013	Management Information System	CO1	Able to demonstrate the impact information systems have on an organization
		CO2	Study IT infrastructure and its components and its current trends
		CO3	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making
ECL701	Microwave Engineering Lab -	CO1	Able to characterize devices at higher frequencies.
		CO2	Able to design and analyze microwave circuits.
		CO3	Able to design and analyze amplifiers and oscillators at microwave frequencies.
		CO4	Able to demonstrate skills of planning, design and deployment of microwave networks

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ECL702	Mobile Communication System Lab	CO1	Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems
		CO2	Classify different types of propagation models and analyse the link budget
		CO3	Apply the concepts of 3G technologies of UMTS and CDMA 2000.
ECL703	Optical Communication Lab -	CO1	Understand the function of various optical components and their performance.
		CO2	Realize optical system and study important parameters like NA .
		CO3	To understand operation of optical source and detectors.
ECLDLO7035	Embedded System Lab	CO1	Understand the detailed processor design techniques and methods of communication.
		CO2	Study the concepts of Real time operating systems and write programs
		CO3	Design embedded system applications using RTOS
ECLDLO703X	Internet of Communication Engineering	CO1	Explain the operation of the components of a router including, DHCP, NAT/PAT, Routing function, Switching function.
		CO2	Describe how DNS works in the global Internet including caching and root servers.
		CO3	Understand the current state-of-the-art developments in Internet technologies for multimedia communications.
		CO4	Understand the security protocol and services In the Internet
		CO5	Appreciate the principles used in designing multimedia protocols, and so understand why standard protocols are designed the way that they are.
		CO6	Understand the system design principles of multimedia communications systems.

Course Code	Course Name	CO	Course Outcome
		CO7	Solve problems and design simple networked multimedia systems.
ECL704	Project-I	CO1	Identify problems based on societal /research needs.
		CO2	Apply Knowledge and skill to solve societal problems in a group.
		CO3	Develop interpersonal skills to work as member of a group or leader.
		CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations using standard norms of Engineering practices
		CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
		CO6	Demonstrate project management principles during project work.
		CO7	Excel in written and oral communication.
ECC801	RF Design	CO1	Design impedance matching networks and passive RF filters.
		CO2	Design and appraise RF amplifiers and oscillators.
		CO3	Analyze EMI and EMC in RF circuits.
ECC802	Wireless Networks	CO1	Explain the working of different wireless technologies like Bluetooth and zigbee
		CO2	Understand the working of wireless LAN, PAN & MAN
		CO3	Analyze the different types of Wireless Networks like LAN,PAN & MAN
ECCDLO8043	Satellite Communication	CO1	Explain basics of satellite communication, space segment and earth segment
		CO2	Understand different satellite orbits and orbital parameters
		CO3	Explain and analyse link budget of satellite signal for proper communication
		CO4	Understand various applications of satellite communication
		CO1	Understand the concept of environmental management

LAST YEAR/ SEM-VIII R-2016	ECCILO8029	Environment Management	CO2	Understand ecosystem and interdependence, food chain etc.
			CO3	Understand and interpret environment related legislations
	ECL801	RF Design Lab	CO1	Design impedance matching networks and passive RF filters.
			CO2	Design and appraise RF amplifiers and oscillators.
			CO3	Analyze EMI and EMC in RF circuits.
	ECL802	Wireless Networks Lab	CO1	Explain the working of different wireless technologies like Bluetooth and zigbee
			CO2	Understand the working of wireless LAN, PAN & MAN
			CO3	Analyze the different types of Wireless Networks like LAN,PAN & MAN
	ECLDLO8043	Satellite Communication	CO1	Explain basics of satellite communication, space segment and earth segment
			CO2	Understand different satellite orbits and orbital parameters
			CO3	Explain and analyse link budget of satellite signal for proper communication
			CO4	Understand various applications of satellite communication
	ECL803	Project-II	CO1	Identify problems based on societal /research needs.
			CO2	Apply Knowledge and skill to solve societal problems in a group.
			CO3	Develop interpersonal skills to work as member of a group or leader.
			CO4	Draw the proper inferences from available results through theoretical/ experimental/simulations using standard norms of Engineering practices
			CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
			CO6	Demonstrate project management principles during project work.
			CO7	Excel in written and oral communication.

MECHANICAL ENGINEERING

			CO1	Select appropriate gears for power transmission on the basis of given load and speed
			CO2	Design gears based on the given conditions.

MEC701	Machine Design – II	CO3	Select bearings for a given applications from the manufacturers catalogue.
		CO4	Select and/or design belts and flywheel for given applications
		CO5	Design cam and follower mechanisms.
		CO6	Design clutches and brakes
MEC702	CAD/CAM/CAE	CO1	Identify proper computer graphics techniques for geometric modelling.
		CO2	Transform, manipulate objects & store and manage data.
		CO3	CAM Toolpath Creation and NC- G code output.
		CO4	Use rapid prototyping and tooling concepts in any real life applications.
		CO5	Identify the tools for Analysis of a complex engineering component
MEC703	Production Planning and Control	CO1	Illustrate production planning functions and manage manufacturing functions in a better way
		CO2	Develop competency in scheduling and sequencing of manufacturing operations
		CO3	Forecast the demand of the product and prepare an aggregate plan
		CO4	Develop the skills of Inventory Management and cost effectiveness
		CO5	Create a logical approach to Line Balancing in various production systems
		CO6	Implement techniques of manufacturing planning and control
MEDLO7031	MECHANICAL VIBRATION	CO1	Develop mathematical model to represent dynamic system.
		CO2	Estimate natural frequency of mechanical element / system.
		CO3	Analyse vibratory response of mechanical element / system.
		CO4	Estimate the parameters of vibration isolation system and
		CO5	Control the vibrations to the acceptable level using basic vibration principles
		CO6	Handle the vibration measuring instruments
MEDLO7032	AUTOMOBILE ENGINEERING	CO1	Illustrate the types and working of clutch and transmission system.
		CO2	Demonstrate the working of different types of final drives, steering gears and braking systems
		CO3	Illustrate the constructional features of wheels, tyres and suspension systems
		CO4	Demonstrate the understanding of types of storage, charging and starting systems
		CO5	Identify the type of body and chassis of an automobile
		CO6	Comprehend the different technological advances in automobile
		CO1	Select suitable Pump
		CO2	Design a reciprocating pump and analyse its performance

	MEDLO7033	Pumps, Compressors and Fans	CO3	Design a centrifugal pump and analyse its performance
			CO4	Demonstrate basic principles of fans and blowers
			CO5	Design fan/blower and analyse its performance
			CO6	Design a compressor and analyse its performance
	MEDLO7034	Computational Fluid Dynamics	CO1	Demonstrate methodology to work with CFD
			CO2	Illustrate principles of grid generation and discritisation methods
			CO3	Identify and apply specific boundary conditions relevant to specific application
			CO4	Decide solution parameters relevant to specific application
			CO5	Analyze the results and draw the appropriate inferences
			CO6	Demonstrate basic principles of FVM
LAST YEAR / 7th SEMESTER/ Rev 2016	ILO 7011	Product Life Cycle Management	CO1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
			CO2	Illustrate various approaches and techniques for designing and developing products.
			CO3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
			CO4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
	ILO 7012	Reliability Engineering	CO1	Understand and apply the concept of Probability to engineering problems
			CO2	Apply various reliability concepts to calculate different reliability parameters
			CO3	Estimate the system reliability of simple and complex systems
			CO4	Carry out a Failure Mode Effect and Criticality Analysis
	ILO 7013	Management Information System	CO1	Explain how information systems Transform Business
			CO2	Identify the impact information systems have on an organization
			CO3	Describe IT infrastructure and its components and its current trends
			CO4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making
			CO5	Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses
	ILO 7014	Design of Experiments	CO1	Plan data collection, to turn data into information and to make decisions that lead to appropriate action
			CO2	Apply the methods taught to real life situations
			CO3	Plan, analyze, and interpret the results of experiments

ILO 7015	Operations Research	CO1	Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
		CO2	Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
		CO3	Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
		CO4	Understand the applications of integer programming and a queuing model and compute important performance measures
ILO 7016	Cyber Security and Laws	CO1	Understand the concept of cybercrime and its effect on outside world
		CO2	Interpret and apply IT law in various legal issues
		CO3	Distinguish different aspects of cyber law
		CO4	Apply Information Security Standards compliance during software design and development
ILO 7017	Disaster Management and Mitigation Measures	CO1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
		CO2	Plan of national importance structures based upon the previous history.
		CO3	Get acquainted with government policies, acts and various organizational structure associated with an emergency.
		CO4	Get to know the simple do's and don'ts in such extreme events and act accordingly.
ILO 7018	Energy Audit and Management	CO1	To identify and describe present state of energy security and its importance.
		CO2	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
		CO3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
		CO4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
		CO5	To analyze the data collected during performance evaluation and recommend energy saving measures
ILO7019	Development Engineering	CO1	Apply knowledge for Rural Development.
		CO2	Apply knowledge for Management Issues.
		CO3	Apply knowledge for Initiatives and Strategies
		CO4	Develop acumen for higher education and research.
		CO5	Master the art of working in group of different nature.
		CO6	Develop confidence to take up rural project activities independently
		CO1	Design gears based on the given conditions
		CO2	Design gearbox for a given application
		CO3	Design cam & followers for a given condition

			CO	
	MEL701	Machine Design –II	CO4	Design clutches for a given application
			CO5	Design brakes for given condition
			CO6	Select bearings for a given applications from the manufacturers catalogue
	MEL702	CAD/CAM/CAE	CO1	Identify proper computer graphics techniques for geometric modelling.
			CO2	Transform, manipulate objects as well as store and manage data.
			CO3	Create CAM Toolpath and prepare NC- G code
			CO4	Apply rapid prototyping and tooling concepts in any real life applications.
			CO5	Identify the tools for Analysis of a complex engineering component.
	MEL703	Production Planning and Control	CO1	Prepare a process sheet
			CO2	Prepare a Gantt Chart
			CO3	Forecast the demand of the product and prepare an aggregate plan.
			CO4	Perform ABC analysis of a given problem
			CO5	Develop the skills of Inventory Management and cost effectiveness.
			CO6	Create a logical approach to Line Balancing for various production systems.
	MEC801	Design of Mechanical Systems	CO1	Apply the concept of system design.
			CO2	Design material handling systems such as hoisting mechanism of EOT crane,
			CO3	Design belt conveyor systems
			CO4	Design engine components such as cylinder, piston, connecting rod and crankshaft
			CO5	Design pumps for the given applications
			CO6	Prepare layout of machine tool gear box and select number of teeth on each gear
	MEC802	Industrial Engineering and Management	CO1	Illustrate the need for optimization of resources and its significance
			CO2	Develop ability in integrating knowledge of design along with other aspects of value addition in the conceptualization and manufacturing stage of various products.
			CO3	Demonstrate the concept of value analysis and its relevance.
			CO4	Manage and implement different concepts involved in method study and understanding of work content in different situations.
			CO5	Describe different aspects of work system design and facilities design pertinent to manufacturing industries.
			CO6	Illustrate concepts of Agile manufacturing, Lean manufacturing and Flexible manufacturing
			CO1	Compute heat interactions in combustion of reactive mixtures
			CO2	Differentiate boilers, boiler mountings and accessories

	MEC803	Power Engineering	CO3	Calculate boiler efficiency and assess boiler performance	
			CO4	Demonstrare working cycles ofgas turbines	
			CO5	Draw velocity triangles of impulse/reaction turbines and calculate performance parameters/efficiency	
			CO6	Demonstrate basic working of pumps	
	MEDLO8041	Power Plant Engineering	CO1	Comprehend various equipment/systems utilized in power plants	
			CO2	Demonstrate site selection methodology, construction and operation of Hydro Electric Power Plants	
			CO3	Discuss working, site selection, advantages, disadvantages of steam power plants	
			CO4	Discuss operation of Combined Cycle Power Plants	
			CO5	Discuss types of reactors, waste disposal issues in nuclear power plants	
			CO6	Illustrate power plant economics	
	MEDLO8042	Rapid Prototyping	CO1	Select the feasible RP process	
			CO2	Selct the feasible RP material	
			CO3	Gauge and Hybridize the ever-evolving Protoyping Technologies	
			CO4	Contribute towards the Product Development at the respective domain in the industry	
			CO5	Apply RP to build working prototypes	
			CO6	Demonstrate basics of virtual reality	
	MEDLO8043	Renewable Energy Sources	CO1	Demonstrate need of different renewable energy sources	
			CO2	Discuss importance of renewable energy sources	
			CO3	Discuss various renewable energy sourses in Indian context	
			CO4	Calculate and analyse utilization of solar and wind energy	
			CO5	Illustrate design of biogas plant	
			CO6	Demonstrate basics of hydrogen energy	
	MEDLO8044	Energy Management in Utility Systems	CO1	Demonstrate general aspects of energy management	
			CO2	Summarize and explain need for energy management, economics and auditing	
			CO3	Illustrate basics of energy economics and financial analysis techniques	
			CO4	Describe importance of thermal and electrical utilitie's maintenance	
			CO5	Assess potential and summarise benefits of waste heat recovery and cogeneration	
			CO6	Illustrate waste heat recovery and cogeneration methods	
LAST YEAR / 8th SEMESTE	ILO 8021	Project Management	CO1	Apply selection criteria and select an appropriate project from different options.	
			CO2	Write work break down structure for a project and develop a schedule based on it.	
			CO3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.	

R/ Rev 2016			CO4	Use Earned value technique and determine & predict status of the project.
			CO5	Capture lessons learned during project phases and document them for future reference
	ILO 8022	Finance Management	CO1	Understand Indian finance system and corporate finance
			CO2	Take investment, finance as well as dividend decisions
	ILO8023	Entrepreneurship Development and Management	CO1	Understand the concept of business plan and ownerships
			CO2	Interpret key regulations and legal aspects of entrepreneurship in India
			CO3	Understand government policies for entrepreneurs
	ILO8024	Human Resource Management	CO1	Understand the concepts, aspects, techniques and practices of the human resource management.
			CO2	Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
			CO3	Gain knowledge about the latest developments and trends in HRM.
			CO4	Apply the knowledge of behavioural skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.
	ILO8025	Professional Ethics and Corporate Social Responsibility (CSR)	CO1	Understand rights and duties of business
			CO2	Distinguish different aspects of corporate social responsibility
			CO3	Demonstrate professional ethics
			CO4	Understand legal aspects of corporate social responsibility
	ILO8026	Research Methodology	CO1	Prepare a preliminary research design for projects in their subject matter areas
			CO2	Accurately collect, analyze and report data
			CO3	Present complex data or situations clearly
			CO4	Review and analyze research findings
	ILO8027	IPR and Patenting	CO1	understand Intellectual Property assets
			CO2	assist individuals and organizations in capacity building
			CO3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting
	ILO 8028	Digital Business Management	CO1	Identify drivers of digital business
			CO2	Illustrate various approaches and techniques for E-business and management
			CO3	Prepare E-business plan
	ILO8029	Environmental Management	CO1	Understand the concept of environmental management
			CO2	Understand ecosystem and interdependence, food chain etc.
			CO3	Understand and interpret environment related legislations

MEL801	Design of Mechanical Systems	CO1	Apply the concept of system design.
		CO2	Design of hoisting mechanism of EOT crane,
		CO3	Design belt conveyor systems
		CO4	Design pumps for the given applications
		CO5	Design engine components such as cylinder, piston, connecting rod and crankshaft
		CO6	Design of machine tool gearbox
MEL 802	Power Engineering	CO1	Differentiate boilers
		CO2	Differentiate boiler mountings and accessories
		CO3	Conduct a trial on impilse turbine and analyse its performance
		CO4	Conduct a trail on reaction turbine and analyse its performance
		CO5	Conduct a trial on Centrifugal pump and analyse its perfromance
		CO6	Conduct a trial on Reciprocating pump and analyse its perfromance
MEP701/ MEP801	Project (I and II)	CO1	Do literature survey/industrial visit and identify the problem
		CO2	Apply basic engineering fundamental in the domain of practical applications
		CO3	Cultivate the habit of working in a team
		CO4	Attempt a problem solution in a right approach
		CO5	Correlate the theoretical and experimental/simulations results and draw the proper inferences
		CO6	Prepare report as per the standard guidelines.