2.6.1

PROGRAMME AND COURSE OUTCOMES FOR ALL PROGRAMMES

DEPARTMENT OF CIVIL ENGINEERING

2.6.2	PROGRAMME EDUCATIONAL OBJECTIVES
	PROGRAMME OUTCOMES (POs)
	PROGRAM SPECIFIC OUT COMES OF CIVIL ENGINEERING
	COURSE OUTCOMES
	CO,PO&PSO ATTAINMENT LEVEL

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1	To prepare students for successful careers in Civil Engineering field that meets the needsof Indian and multinational companies
PEO 2	To develop the confidence and ability among students to synthesize data and technical concepts and thereby apply it in real world problems.
PEO 3	To develop students to use modern techniques, skill and mathematical engineering tools for solving problems in Civil Engineering.
PEO 4	To provide students with a sound foundation in mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyse engineering problems and to prepare them for graduate studies.
PEO 5	To promote students to work collaboratively on multi-disciplinary projects and make them engage in life-long learning process throughout their professional life.

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PROGRAMME OUTCOMES (POs)

PO1	**Graduates will demonstrate knowledge of mathematics, science and engineering.**
PO2	**Graduates will demonstrate an ability to identify, formulate and solve engineering problems.**
PO3	**Graduate will demonstrate an ability to design and conduct experiments, analyze and interpret data.**
PO4	**Graduates will demonstrate an ability to design a system, component or process as per needs and specifications.**
PO5	**Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks**
PO6	**Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.**
PO7	**Graduates will demonstrate knowledge of professional and ethical responsibilities.**
PO8	**Graduate will be able to communicate effectively in both verbal and written form.**
PO9	**Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.**
PO10	**Graduate will develop confidence for self education and ability for life-long learning.**

PROGRAM SPECIFIC OUT COMES OF CIVIL ENGINEERING

PSO 1	Analyze, design, construct, manage, maintain and operate infrastructure and development projects.
PSO 2	Evaluate the environmental collision of various projects and take required measures to control environmental issues.

COURSE OUTCOMES

CE8301- STRENGTH OF MATERIALS I	
CO1	Understand the concepts of stress and strain, principal stresses and principal planes.
CO2	Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
CO3	Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
CO4	Apply basic equation of torsion in design of circular shafts and helical springs, .
CO5	Analyze the pin jointed plane and space trusses

CE8302- FLUID MECHANICS	
CO1	Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
CO2	Understand and solve the problems related to equation of motion.
CO3	Gain knowledge about dimensional and model analysis.
CO4	Learn types of flow and losses of flow in pipes.
CO5	Understand and solve the boundary layer problems.

CE8401- CONSTRUCTION TECHNIQUES AND PRACTICES	
CO1	know the different construction techniques and structural systems
CO2	Understand various techniques and practices on masonry construction, flooring, and roofing.
CO3	Plan the requirements for substructure construction.
CO4	Know the methods and techniques involved in the construction of various types of super structures
CO5	Select, maintain and operate hand and power tools and equipment used in the building construction sites.

CE8403- APPLIED HYDRAULIC ENGINEERING	
CO1	Apply their knowledge of fluid mechanics in addressing problems in open channels.
CO2	Able to identify a effective section for flow in different cross sections.
CO3	To solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
CO4	Understand the principles, working and application of turbines.
CO5	Understand the principles, working and application of pumps.

CE8403- APPLIED HYDRAULIC ENGINEERING	
CO1	Apply their knowledge of fluid mechanics in addressing problems in open channels.
CO2	Able to identify a effective section for flow in different cross sections.

CO3	To solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
CO4	Understand the principles, working and application of turbines.
CO5	Understand the principles, working and application of pumps.

CE8501-DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS	
CO1	Understand the various design methodologies for the design of RC elements.
CO2	Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
CO3	design the various types of slabs and staircase by limit state method.
CO4	Design columns for axial, uniaxial and biaxial eccentric loadings.
CO5	Design of footing by limit state method.

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CO4	Design columns for axial, uniaxial and biaxial eccentric loadings.

CO5	Design of footing by limit state method.

CE8602-STRUCTURAL ANALYSIS II	
CO1	Draw influence lines for statically determinate structures and calculate critical stress resultants.
CO2	Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.
CO3	Analyse of three hinged, two hinged and fixed arches.
CO4	Analyse the suspension bridges with stiffening girders
CO5	Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames

CE8701- ESTIMATION, COSTING AND VALUATION ENGINEERING	
CO1	Estimate the quantities for buildings,
CO2	Rate Analysis for all Building works, canals, and Roads and Cost Estimate
CO3	Understand types of specifications, principles for report preparation, tender notices types.
CO4	Gain knowledge on types of contracts
CO5	Evaluate valuation for building and land.

CE8020- MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES	
CO1	Understand the importance of maintenance and assessment method of distressed structures.
CO2	Gain knowledge on strength and durability properties, their effects due to climate and temperature.
CO3	Recent development in concrete

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CO4	Techniques for repair rand protection methods	
CO5	Repair, rehabilitation and retrofitting of structures and demolition methods.	

CO,PO&PSO ATTAINMENT LEVEL

1. CE8301- FLUID MECHANICS

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design / development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

2. CE8401- APPLIED HYDRAULICS ENGINEERING

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design / development of solutions	2	2	2	3	3	2
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	2	1	1	1	1
PO6	Engineer and Society	2	2	2	2	2	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	2	2	2	2	2	2
PO10	Communication	1	1	1	1	1	1

PO/PSO							
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	3	3	3	3	3	3
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	2	2	3	3	3	3

3. CE8591- FOUNDATION ENGINEERING

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	2	2	2	3	3	2
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design / development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	1	2	2
PO7	Environment and Sustainability	1	2	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	2	2	2	2
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	2	3	3	3	3	3
PSO3	Conceptualization and evaluation of Engineering solutions to Civil engineering issues	3	2	2	3	3	3

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CRITERION 2	COURSE OUTCOMES AND PROGRAM OUTCOMES	120

Establish the correlation between the courses and the Program Outcomes (POs)and Program Specific Outcomes (PSOs) (20)

(Program Outcomes as mentioned in Annexure I and Program specific Outcomes as defined by the program)

Note: KL – Knowledge Level

Table 2.1: Program Outcomes

S.No	Description	KL
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	K2
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	K2
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	K5
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	K5
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	K6
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	K6
PO7	**Environment and sustainability:** Understand the impact of the professional	K3

	engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	**K3**
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings**.**	**K2**
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**K2**
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	**K3**
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	**K2**

List of Program Specific Outcome (PSOs)

S.NO	DESCRIPTION	KL
PSO1	Ability to learn and effectively implement mechanical engineering concepts in effective manner to enhance through put	**K2**
PSO2	Ability to analyze the existing systems and implement the recent trends on mechanical engineering systems	**K2**

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Course Outcomes (COs)

(SAR should include course outcomes of one course from each semester of study, however, should be prepared for all courses and made available as evidence, if asked)   (05)

Note: RCX0Z.I

R – Regulation (2017- 17)

X- Semester

Z – Course Order

I – Order of CO

Course outcomes of all courses under regulation 2017

At the end of the course, the students will be able to:

Code	Subject code	Subject name	CO	Course outcome	Knowledge level
SEMESTER - I					
17M101	HS8151	COMMUNICATIVE ENGLISH	CO1	Read articles of a general kind in magazines and newspapers.	K1
			CO2	Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.	K3
			CO3	Comprehend conversations and short talks delivered in English.	K2

			CO4	Write short essays of a general kind and personal letters and emails in English.	K1
			CO5	Develop vocabulary skills of the learners via reading	K3
17M102	MA8151	ENGINEERING MATHEMATICS – I	CO1	Use both the limit definition and rules of differentiation to differentiate functions.	K3
			CO2	Apply differentiation to solve maxima and minima problems.	K3
			CO3	Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.	K3
			CO4	Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.	K3
			CO5	Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.	K3
17M103	PH8151	ENGINEERING PHYSICS	CO1	Discuss the basics of properties of matter and its applications.	K2
			CO2	Intrepret the concepts of waves and optical devices and their applications in fibre optics	K3
			CO3	Outline the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers	K2
			CO4	Review on advanced physics concepts of quantum theory and its applications in tunneling microscopes	K2
			CO5	Summarize the basics of crystals, their structures and different crystal growth techniques.	K3
17M104	CY8151	ENGINEERING CHEMISTRY	CO1	The basics concepts on engineering materials, fuels, energy sources and water treatment techniques.	K4
			CO2	Learners will be facilitated with the better understanding of engineering processes.	K4
			CO3	Applications of engineering processes lead to further learning.	K3

			CO4	Students can increase their skill by learning on the Types of fuels, calorific value calculations, and manufacture of solid, liquid and gaseous fuels.	K2
			CO5	Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.	K4
17M105	GE8151	PROBLEM SOLVING AND PYTHON PROGRAMMING	CO1	Develop algorithmic solutions to simple computational problems	K5
			CO2	Construct and execute by hand simple Python programs.	K2
			CO3	Structure simple Python programs for solving problems.	K5
			CO4	Decompose a Python program into functions.	K4
			CO5	Represent compound data using Python lists, tuples, and dictionaries.	K3
17M106	GE8152	ENGINEERING GRAPHICS	CO1	Express the fundamentals and standards of Engineering graphics	K2
			CO2	Perform freehand sketching of basic geometrical constructions and multiple views of objects.	K2
			CO3	Summarize the Orthographic projections of lines and plane surfaces.	K2
			CO4	Develop the projections of solids and surfaces.	K3
			CO5	Construct to project isometric and perspective sections of simple solids.	K3
17M107	GE8161	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	CO1	Illustrate the Write, test, and debug simple Python programs.	K2
			CO2	Implement Python programs with conditionals and loops.	K3

			CO3	Develop Python programs step-wise by defining functions and calling them.	K5
			CO4	Use Python lists, tuples, dictionaries for representing compound data.	K3
			CO5	Develop the Read and write data from/to files in Python.	K3
17M108	BS8161	PHYSICS AND CHEMISTRY LABORATORY	CO1	Apply principles of elasticity, optics and thermal properties for engineering applications	K3
			CO2	Express with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.	K2
			CO3	Students can acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.	K3
			CO4	Students can deal with the determination of molecular weight of a polymer by viscometer.	K6
			CO5	Students can accumulate on the concept of air wedges, Spectrometer, and Conductors.	K3

SEMESTER II

17M201	HS8251	TECHNICAL ENGLISH	CO1	Read technical texts and write area- specific texts effortlessly.	K1
			CO2	Listen and comprehend lectures and talks in their area of specialization successfully	K1
			CO3	Speak appropriately and effectively in varied formal and informal contexts.	K1
			CO4	Write reports and winning job applications.	K3
			CO5	Learners can be able to improve their skills through LSRW.	K3
17M202	MA8251	ENGINE ERING MATHE	CO1	Illustrate the concept of Eigen values and Eigen vectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.	K2
			CO2	Identify and construct analytic function and application of conformal mapping Gradient,	K3

				divergence and curl of a vector point function and related identities.	
			CO3	Analyze the surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.	K4
			CO4	Apply analytic functions, conformal mapping to complex integration.	K3
			CO5	Solve systems of Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.	K3
17M203	**PH8251**	**MATERIALS SCIENCE**	CO1	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.	K2
			CO2	Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.	K2
			CO3	Clarify the effect of alloying elements on ferrous and non-ferrous metals	K3
			CO4	Summarize the properties and applications of non metallic materials.	K2
			CO5	Explain the testing of mechanical properties. .	K2
17M204	**BE8253**	**BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING**	CO1	Explain the characteristics of electrical machines.	K2
			CO2	Develop electronics components and use of them to design circuits	K4
			CO3	Choose suitable instruments for electrical measurement for a specific application	K3
			CO4	Principles of electrical machines and its functions	K2
			CO5	Concepts of instrumentation over electronics	K2
17M205	**GE8291**	**ENVIRONMENTAL SCIENCE**	CO1	Explain about Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.	K2
			CO2	Demonstrate the importance of interdisciplinary nature of environmental and health risk	K2

				assessment, Public awareness of environmental is at infant stage.	
			CO3	Ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk.	K3
			CO4	Illustrate to improvement of living has lead to serious environmental disasters.	K2
			CO5	Examine all sides of environmental issues, aware of pollutions and to get rid of it	K4
17M206	GE8292	ENGINEERING MECHANICS	CO1	Illustrate the vectorial and scalar representation of forces and moments	K2
			CO2	Analyse the rigid body in equilibrium	K4
			CO3	Evaluate the properties of surfaces and solids	K3
			CO4	Calculate dynamic forces exerted in rigid body	K3
			CO5	Determine the friction and the effects by the laws of friction	K2
17M207	GE8261	ENGINEERING PRACTICES LABORATORY	CO1	Build Fabricate carpentry components and pipe connections including plumbing works.	K3
			CO2	Build welding equipments to join the structures.	K3
			CO3	Analyzing the basic machining operations	K4
			CO4	Construct models using sheet metal works	K4
			CO5	Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings	K2
17M208	BE8261	BASIC ELEC	CO1	Explain the characteristics of electrical machines.	K2

			CO2	Develop electronics components and use of them to design circuits	K4
			CO3	Choose suitable instruments for electrical measurement for a specific application	K3
			CO4	Principles of electrical machines and its functions	K2
			CO5	Concepts of instrumentation over electronics	K2
SEMESTER III					
17M301	MA8353	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	CO1	Able to Solve the given standard partial differential equations.	K3
			CO2	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	K3
			CO3	Apply Fourier series techniques to solve one and two dimensional heat flow problems and one dimensional wave equations.	K3
			CO4	Use the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.	K3
			CO5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.	K3
17M302	ME8391	ENGINEERING THERMODYNAMICS	CO1	Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.	K3
			CO2	Apply second law of thermodynamics to open and closed systems and calculate entropy and availability.	K3
			CO3	Apply Rankine cycle to steam power plant and compare few cycle improvement methods	K3
			CO4	Discuss simple thermodynamic relations of ideal and real gases	K2
			CO5	Calculate the properties of gas mixtures and moist air and its use in psychometric processes	K3

17M303	**CE8394**	**FLUID MECHANICS AND MACHINERY**	CO1	Apply mathematical knowledge to predict the properties and characteristics of a fluid.	K3
			CO2	Analyze and calculate major and minor losses associated with pipe flow in piping networks.	K3
			CO3	Can Mathematically predict the nature of physical quantities	K3
			CO4	Analyze the performance of pump	K3
			CO5	Analyze the performance of turbines	K3
17M304	**ME8351**	**MANUFACTURING TECHNOLOGY – I**	CO1	Explain different metal casting processes, associated defects, merits and demerits	K2
			CO2	Compare different metal joining processes	K2
			CO3	Summarize various hot working and cold working methods of metals.	K2
			CO4	Explain various sheet metal making processes.	K2
			CO5	Distinguish various methods of manufacturing plastic components	K2
17M305	**EE8353**	**ELECTRICAL DRIVES AND CONTROLS**	CO1	Select the rating and classes of duty of machines for particular application electrical drive and draw the heating and cooling curves	K2
			CO2	Explain the mechanical and braking characteristics of dc and ac machines for particular application of electrical drive.	K2
			CO3	Construct and understand the different types of braking method used in DC and AC machines	K2
			CO4	Clarify conventional and solid state speed control of dc drives	K2
			CO5	Enlighten the speed control of dc and ac drive by conventional and solid state methods.	K3
17M	**ME8**	**MA**	CO1	Demonstrate the safety precautions exercised in the mechanical workshop.	K3

			CO2	Make the workpiece as per given shape and size using Lathe.	K3
			CO3	Join two metals using arc welding.	K3
			CO4	Use sheet metal fabrication tools and make simple tray and funnel.	K3
			CO5	Use different moulding tools, patterns and prepare sand moulds.	K3
17M307	ME8381	COMPUTER AIDED MACHINE DRAWING	CO1	Follow the drawing standards, Fits and Tolerances	K1
			CO2	Re-create part drawings, sectional views and assembly drawings as per standards	K2
			CO3	Ability to use interpret drawings of machine components	K3
			CO4	Ability to draw 2D sketches using standard CAD packages	K3
			CO5	Ability to handle 3D modeling softwares	K3
17M308	EE8361	ELECTRICAL ENGINEERING LABORATORY	CO1	Perform the load test, OCC, load characteristics and speed control ofDC shunt and DC series motor	K3
			CO2	Perform the load test, OC and SC test on a single phase transformer	K3
			CO3	Examine the regulation of an alternator by EMF and MMF methods	K3
			CO4	Conduct the load test, speed control on various phase of induction motor	K3
			CO5	Explore the DC and AC starters	K2
17M309	HS8381	INTER PERS	CO1	Listen and respond appropriately.	K1

			CO2	Participate in group discussions	K2
			CO3	Make effective presentations	K2
			CO4	Participate confidently and appropriately in conversations both formal and informal	K2
			CO5	improve general and academic listening skills	K2
SEMESTER IV					
17M401	MA8452	STATISTICS AND NUMERICAL METHODS	CO1	Apply the concept of testing of hypothesis for small and large samples in real life problem	K3
			CO2	Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K3
			CO3	Apply the numerical techniques of interpolation in various intervals on differentiation and integration for engineering problems.	K3
			CO4	Describe the various techniques and methods for solving first and second order ordinary differential equations.	K3
			CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications	K3
17M402	ME8492	KINEMATICS OF MACHINERY	CO1	Discuss the basics of mechanism	K2
			CO2	Calculate velocity and acceleration in simple mechanisms	K3
			CO3	Develop CAM profiles	K3
			CO4	Solve problems on gears and gear trains	K3
			CO5	Examine friction in machine elements	K3
17M	ME8451	MANUFA	CO1	Explain the mechanism of material removal processes.	K2

			CO2	Describe the constructional and operational features of centre lathe and other special purpose lathes.	K2
			CO3	Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines.	K2
			CO4	Explain the types of grinding and other super finishing processes apart from gear manufacturing processes.	K2
			CO5	Summarize numerical control of machine tools and write a part program.	K3
17M404	ME8491	ENGINEERING METALLURGY	CO1	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.	K2
			CO2	Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.	K2
			CO3	Clarify the effect of alloying elements on ferrous and non-ferrous metals	K3
			CO4	Summarize the properties and applications of non metallic materials.	K2
			CO5	Explain the testing of mechanical properties. .	K2
17M405	CE8395	STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS	CO1	Explain the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.	K3
			CO2	Evaluate the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.	K3
			CO3	Apply basic equation of simple torsion in designing of shafts and helical spring	K3
			CO4	Calculate the slope and deflection in beams using different methods.	K3
			CO5	Analyze and design thin and thick shells for the applied internal and external pressures.	K4

			CO1	Apply thermodynamic concepts to different air standard cycles and solve problems.	K3
			CO2	Solve problems in single stage and multistage air compressors	K3
			CO3	Explain the functioning and features of IC engines, components and auxiliaries.	K2
			CO4	Calculate performance parameters of IC Engines.	K3
			CO5	Explain the flow in Gas turbines and solve problems.	K3
17M407	ME8462	MANUFACTURING TECHNOLOGY LABORATORY – II	CO1	use different machine tools to manufacturing gears	K2
			CO2	Ability to use different machine tools to manufacturing gears.	K2
			CO3	Ability to use different machine tools for finishing operations	K2
			CO4	Ability to manufacture tools using cutter grinder	K2
			CO5	Develop CNC part programming	K4
17M408	CE8381	STRENGTH OF MATERIALS & FLUID MECHANICS & MACHINERY LABORATORY	CO1	Ability to perform tension, torsion and hardness test on Solid materials.	K3
			CO2	Ability to perform compression and deformation test on Solid materials.	K3
			CO3	Able to handle equipments for flow measurements	K3
			CO4	Analyze the perfomance on Pumps	K3
			CO5	Analyze the perfomance on turbines	K3

17M409	**HS8461**	**ADVANCED READING AND WRITING**	CO1	Write different types of essays.	K1
			CO2	Write winning job applications.	K1
			CO3	Read and evaluate texts critically.	K2
			CO4	Display critical thinking in various professional contexts.	K2
			CO5	Ability to develop their project and proposal writing skills.	K2
SEMESTER V					
17M501	**ME8595**	**THERMAL ENGINEERING – II**	CO1	Solve problems in Steam Nozzle	K3
			CO2	Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters.	K3
			CO3	Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solve problems.	K3
			CO4	Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers	K3
			CO5	Solve problems using refrigerant table / charts and psychrometric charts	K3
17M502	**ME8593**	**DESIGN OF MACHINE ELEMENTS**	CO1	Explain the influence of steady and variable stresses in machine component design.	K3
			CO2	Apply the concepts of design to shafts, keys and couplings.	K3
			CO3	Apply the concepts of design to temporary and permanent joints.	K3
			CO4	Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.	K3

			CO5	Apply the concepts of design to bearings	K3
17M503	**ME8501**	**METROLOGY AND MEASUREMENTS**	CO1	Describe the concepts of measurements to apply in various metrological instruments	K2
			CO2	Outline the principles of linear and angular measurement tools used for industrial applications	K2
			CO3	Explain the procedure for conducting computer aided inspection	K2
			CO4	Demonstrate the techniques of form measurement used for industrial components applications	K3
			CO5	Discuss various measuring techniques of mechanical properties in industrial	K2
17M504	**ME8594**	**DYNAMICS OF MACHINES**	CO1	Calculate static and dynamic forces of mechanisms.	K3
			CO2	Calculate the balancing masses and their locations of reciprocating and rotating masses.	K3
			CO3	Compute the frequency of free vibration.	K3
			CO4	Compute the frequency of forced vibration and damping coefficient.	K3
			CO5	Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes.	K3
17M505	**ME8091**	**AUTOMOBILE ENGINEERING**	CO1	Recognize the various parts of the automobile and their functions and materials.	K2
			CO2	Discuss the engine auxiliary systems and engine emission control.	K2
			CO3	Distinguish the working of different types of transmission systems.	K4
			CO4	Explain the Steering, Brakes and Suspension Systems.	K2
			CO5	Predict possible alternate sources of energy for IC Engines.	K2

17M506	**ME8511**	**KINEMATICS AND DYNAMICS LABORATORY**	CO1	Calculate velocity ratios of various gear trains	K3
			CO2	Describe kinematic mechanisms and gyroscopic effects	K2
			CO3	Determine the natural frequency and damping coefficient, torsional frequency	K3
			CO4	Determine mass moment of inertia of mechanical element, governor effort and range sensitivity. , and transmissibility ratio	K3
			CO5	Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments.	K3
17M507	**ME8512**	**THERMAL ENGINEERING LABORATORY**	CO1	conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials.	K3
			CO2	conduct tests on natural and forced convective heat transfer apparatus and evaluate heat transfer coefficient.	K3
			CO3	conduct tests on radiative heat transfer apparatus and evaluate Stefan Boltzmann constant and emissivity.	K3
			CO4	conduct tests to evaluate the performance of parallel/counter flow heat exchanger apparatus and reciprocating air compressor	K3
			CO5	conduct tests to evaluate the performance of refrigeration and air conditioning test rigs.	K3
17M508	**ME8513**	**METROLOGY AND MEASUREMENTS LABORATORY**	CO1	Calibrate the vernier, micrometer and slip gauges and setting up the comparator for the inspection.	K3
			CO2	Measure the gear tooth dimensions, angle using sine bar	K3
			CO3	Inspect straightness flatness and thread parameters	K3
			CO4	Calculate the temperature using thermocouple	K3
			CO5	Calculate the force displacement, torque and vibration	K3

					SEMESTER VI	
17M601	ME8651	DESIGN OF TRANSMISSION SYSTEMS	CO1	Apply the concepts of design to belts, chains and rope drives.		K3
			CO2	Apply the concepts of design to spur, helical gears.		K3
			CO3	Apply the concepts of design to worm and bevel gears.		K3
			CO4	Apply the concepts of design to gear boxes .		K3
			CO5	Apply the concepts of design to cams, brakes and clutches		K3
17M602	ME8691	COMPUTER AIDED DESIGN AND MANUFACTURING	CO1	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics		K2
			CO2	Explain the fundamentals of parametric curves, surfaces and Solids		K2
			CO3	Summarize the different types of Standard systems used in CAD		K1
			CO4	Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines		K3
			CO5	Summarize the different types of techniques used in Cellular Manufacturing and FMS		K1
17M603	ME8693	HEAT AND MASS TRANSFER	CO1	Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems		K3
			CO2	Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems		K3
			CO3	Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems		K3
			CO4	Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems		K3

			CO5	Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications	K3
17M604	**ME8692**	**FINITE ELEMENT ANALYSIS**	CO1	Summarize the basics of finite element formulation.	K1
			CO2	Apply finite element formulations to solve one dimensional Problems.	K3
			CO3	Apply finite element formulations to solve two dimensional scalar Problems.	K3
			CO4	Apply finite element method to solve two dimensional Vector problems.	K3
			CO5	Apply finite element method to solve problems on iso parametric element and dynamic Problems.	K3
17M605	**ME8694**	**HYDRAULICS AND PNEUMATICS**	CO1	Explain the Fluid power and operation of different types of pumps.	K2
			CO2	Summarize the features and functions of Hydraulic motors, actuators and Flow control valves	K1
			CO3	Explain the different types of Hydraulic circuits and systems	K2
			CO4	Explain the working of different pneumatic circuits and systems	K2
			CO5	Summarize the various trouble shooting methods and Applications of hydraulic and pneumatic systems.	K2
17M606	**ME8076**	**GAS DYNAMICS AND JET PROPULSION**	CO1	Apply the concept of compressible flows in variable area ducts.	K3
			CO2	Apply the concept of compressible flows in constant area ducts.	K3
			CO3	Examine the effect of compression and expansion waves in compressible flow.	K3
			CO4	Use the concept of gas dynamics in Jet Propulsion.	K1
			CO5	Apply the concept of gas dynamics in Space Propulsion.	K3

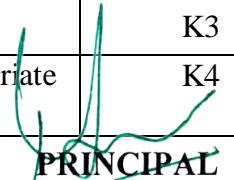|					
			CO1	Able to handle 2D drafting and 3D modelling	K3
			CO2	Demonstrate manual part programming with G and M codes using CAM	K2
			CO3	Prepare CNC part programming for turning operations and perform manufacturing	K3
			CO4	Prepare CNC part programming for Thread cutting operations and perform manufacturing	K3
			CO5	Prepare CL data and post process generation using CAM packages, and perform machining	K3
17M608	ME8682	DESIGN AND FABRICATION PROJECT	CO1	Identify a problem of current relevance	K4
			CO2	design and Fabricate the machine element or the mechanical product	K3
			CO3	demonstrate the working model of the machine element or the mechanical product	K6
			CO4	Make use of system integration, project management skill and problem solving skills	K2
			CO5	Design principles and develop conceptual and engineering design of any components	K3
17M609	HS8581	PROFESSIONAL COMMUNICATION	CO1	Make effective presentations	K3
			CO2	Participate confidently in Group Discussions.	K4
			CO3	Attend job interviews and be successful in them	K3
			CO4	Develop adequate Soft Skills required for the workplace	K3
			CO5	Develop good leadership quality.	K3

					SEMESTER VII	
17ME701	ME8792	POWER PLANT ENGINEERING	CO1	Explain the layout, construction and working of the components inside a thermal power plant.		K2
			CO2	Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.		K2
			CO3	Explain the layout, construction and working of the components inside nuclear power plants.		K2
			CO4	Explain the layout, construction and working of the components inside Renewable energy power plants.		K2
			CO5	Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.		K2
17ME702	ME8793	PROCESS PLANNING AND COST ESTIMATION	CO1	Select the process, equipment and tools for various industrial products.		K2
			CO2	Prepare process planning activity chart.		K3
			CO3	Explain the concept of cost estimation		K2
			CO4	Compute the job order cost for different type of shop floor.		K3
			CO5	Calculate the machining time for various machining operations		K3
17ME703	ME8791	MECHATRONICS	CO1	Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.		K2
			CO2	Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.		K2
			CO3	Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device interfacing		K2
			CO4	Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronics engineering.		K2
			CO5	Discuss various Actuators and Mechatronics system using the knowledge and skills acquired		K2

				through the course and also from the given case studies	
17ME704	**GE8077**	**TOTAL QUALITY MANAGEMENT**	CO1	Identify the TQM concept for continuous process improvement	K2
			CO2	Make use of the basic management tool, quality concept in manufacturing and services process	K2
			CO3	Apply traditional & modern quality management tools and techniques to manufacturing and service processes.	K3
			CO4	Apply statistical tools & techniques to different processes	K3
			CO5	Apply the various ISO standards and qualiy systems	K2
17ME705	**ME8073**	**UNCONVENTIONAL MACHINING PROCESS**	CO1	Explain the need for unconventional machining processes and its classification	K2
			CO2	Compare various thermal energy and electrical energy based unconventional machining processes.	K2
			CO3	Summarize various chemical and electro-chemical energy based unconventional machining processes.	K2
			CO4	Explain various nano abrasives based unconventional machining processes.	K2
			CO5	Distinguish various recent trends based unconventional machining processes.	K2
17ME706	**ME 8099**	**ROBOTICS**	CO1	Explain the concepts of industrial robots, classification, specifications and coordinate systems. Also summarize the need and application of robots in different sectors.	K2
			CO2	Illustrate the different types of robot drive systems as well as robot end effectors.	K2
			CO3	Apply the different sensors and image processing techniques in robotics to improve the ability of robots.	K2
			CO4	Develop robotic programs for different tasks and familiarize with the kinematics motions of	K6

17ME707	ME 8751	SIMULATION AND ANALYSIS LABORATORY		robot.	
			CO5	Examine the implementation of robots in various industrial sectors and interpolate the economic analysis of robots.	K4
			CO1	Demonstrate stress analysis of various beams by giving suitable loads and constraints	K6
			CO2	Construct a 2-D & 3D structural, non-structural model and axisymmetric model to perform stress analysis.	K3
			CO3	Construct model analysis for 2D component	K3
			CO4	Experiment with thermal stresses in a component to determine conduction and convection	K3
			CO5	Analyze the structures based on the vibration and perform harmonic analysis &Determine mechanical systems using simulation software	K4
17ME708	ME 8781	MECHATRONICS LABORATORY	CO1	Execute programs with microprocessor and microcontroller kits	K5
			CO2	Examine different pneumatics and hydraulics circuits using PLC and suitable actuators	K5
			CO3	Compare different types of interfaces and speed control devices	K2
			CO4	Analyze basic hydraulics, pneumatics and electrical circuit using software	K4
			CO5	Classify various types of transducers & Asses existing mechatronics system and improve its efficiency.	K2
17ME709	ME 8712	TECHNICAL SEMINAR	CO1	Explain the basic concepts involved in various courses of mechanical engineering	K2
			CO2	Identify real time problems in the field of engineering and provide with suitable solutions	K2
			CO3	Infer the risk factors by assessing the risk benefit analysis in Engineering	K2
			CO4	Relate and make students work in groups and solve a variety of problems given to them	K2
			CO5	Build the importance of solving the real industrial problems selected by a group of faculty	K3

				members of the department & Illustrate for a suitable solution to solve the industrial problem	

SEMESTER VIII					
17M801	MG8591	PRINCIPLES OF MANAGEMENT	CO1	Explain the purpose of management & managerial roles in local and global organization.	K2
			CO2	Prescribe the decision making model under different conditions	K2
			CO3	Explain the process of staff selection and career development	K2
			CO4	Demonstrate creativity and innovation, and explain the motivational theories	K2
			CO5	Explain the process of different types of control, and planning operations in management.	K2
17M802	ME8094	COMPUTER INTEGRATED MANUFACTURING	CO1	Explain the concept of various process and procedure of CAD/CAM, lean, JIT production and automation	K2
			CO2	Utilize knowledge of CAD/CAM and CIM via design and proper planning and material handling system	K3
			CO3	Explain the concept of group technology, CAPP, SFC	K2
			CO4	Construct the concept of factory data collection, FMS, MRP, MRPII, Agile Manufacturing	K3
			CO5	Apply the knowledge in the area of robots and their industrial application	K3
17M803	ME8811	PROJECT WORK	CO1	Identify a problem of current relevance to society	K2
			CO2	Create and select the suitable solution methodology for the given complex engineering problem in Mechanical Engineering	K2
			CO3	Inference the Mechanical machines developed for the given applications	K2
			CO4	Demonstrate system integration, project management skill and problem solving skills	K3
			CO5	Analyze the given complex engineering problem in Mechanical Engineering using appropriate software& Demonstrate the Oral presentation and Technical report writing Skill	K4

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ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
B.E. COMPUTER SCIENCE AND ENGINEERING
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. To enable graduates to pursue higher education and research, or have a successful career in industries associated with Computer Science and Engineering, or as entrepreneurs. To ensure that graduates will have the ability and attitude to adapt to emerging technological changes.

PROGRAM OUTCOMES POs:

Engineering Graduates will be able to:

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

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

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

To analyze, design and develop computing solutions by applying foundational concepts of Computer Science and Engineering.

To apply software engineering principles and practices for developing quality software for scientific and business applications.

To adapt to emerging Information and Communication Technologies (ICT) to innovate ideas and solutions to existing/novel problems.

Mapping of POs/PSOs to PEOs

Contribution	1: Reasonable	2:Significant	3:Strong

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	HS8151 – COMMUNICATIVE ENGLISH
C101.1	**Enable** students to frame sentences, enrich vocabulary and develop basic LSRW Skills
C101.2	**Relate** synthesis of sentences and enhance LSRW skills for general purposes
C101.3	**Apply** coherence and sequence expressions and substitutes for advanced task
C101.4	**Refine** tense sense and word enrichment techniques for more complex and demanding social activities
C101.5	**Develop** usage of language to ensure development in the LSRW Skills
	MA 8151 - ENGINEERING MATHEMATICS I
C102.1	Able to **understand** the various techniques in differentiation
C102.2	Able to **solve** the maxima, minima of functions of two variables and applications of Lagrange's method
C102.3	**Acquire** skills in analyzing and solving the Integral problems
C102.4	Able to **solve** the problems based on multiple integration
C102.5	**Acquire** skills in analyzing and solving the ordinary differential equations.
	PH8151/ ENGINEERING PHYSICS
C103.1	**Retrieve** the basics of properties of matter
C103.2	**Summarize** the concepts of waves, optical devices and analyze their applications in fiber optics.
C103.3	**Understand** the concepts of thermal properties of materials and assess their applications in expansion joints and heat exchangers
C103.4	**Extend** the physics concepts of quantum theory and apply in tunneling microscopes
C103.5	**Retrieve** the basics of crystals, their structures and experimenting the preparation of different growth techniques.
	CY8151 - ENGINEERING CHEMISTRY
C104.1	**Understand** the concept of hard water, its problems and water treatment techniques.
C104.2	**Categorize** the concepts of adsorption, its isotherms and catalytic reaction
C104.3	**Apply** the phase rule to the one and two component system and to understand the significance of alloys.
C104.4	**Summarize** the different types of fuels and its manufacturing process and able to calculate the calorific value of the fuel
C104.5	**Apply** the principles of generation of energies in batteries, nuclear reactors and solar cells.
	GE8151 PROBLEM SOLVING AND PYTHON PROGRAMMING
C105.1	**Explain** algorithmic solutions to simple computational problems
C105.2	**Read,** write, execute by simple Python programs.
C105.3	**Describe** simple Python programs for solving problems. Decompose a Python program into

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	functions.
C105.4	**Use** compound data with Python lists, tuples and dictionaries.
C105.5	**Describe** read and write data from/to files in Python.
	GE8152 - ENGINEERING GRAPHICS
C106.1	**Understand** the fundamentals and standards of Engineering graphics
C106.2	**Perform** freehand sketching of basic geometrical constructions and multiple views of objects
C106.3	**Understand** the concept of orthographic projections of lines and plane surfaces
C106.4	**Draw** the projections of section of solids and development of surfaces
C106.5	**Visualize** and to project isometric and perspective sections of simple solids
	GE8161 - PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY
C107.1	**Understand** how to write, test, and debug simple Python programs.
C107.2	**Describe** Python programs with conditionals and loops.
C107.3	**Implement** Python programs step-wise by defining functions and calling them.
C107.4	**Use** Python lists, tuples, dictionaries for representing compound data.
C107.5	**Implement** read and write data from/to files in Python.
	BS8161 - PHYSICS CHEMISTRY LABORATORY
C108.1	**Acquire** the skills in the determination hardness of the water by EDTA method
C108.2	**Analyze** the alkalinity present in water by titrimetric method
C108.3	**Determine** the molecular weight of a polymer.
C108.4	**Deduce** the amount substance present by pH metry and Potentiometry method.
C108.5	**Calculate** the amount of acid and base present in the solution and inthe mixture Conductometric method.
	HS8251 TECHNICAL ENGLISH
C109.1	**Enables** students to acquire competence in LSRW for basic general and technology-based professional requirements.
C109.2	**Develop** ability in LSRW to achieve more demaniding tasks in technical fields
C109.3	**Apply** more strategies and skills to enhance LSRW to produce quick, effective and coherent responses in the professional fields
C109.4	**Build** communication employment-based communication competence by making students self reliant and analytical
C109.5	**Foster** LSRW ability to respond effectively and competently for job-based demands

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	MA8251 ENGINEERING MATHEMATICS II
C110.1	**Understand** the concepts in diagonalisation of matrices
C110.2	**Understands** the conceptof vector calculus
C110.3	**Understand** the uses of analytic functions. and conformal mapping
C110.4	**Understand** the techniques of complex integratin and contour integrals
C110.5	**Understand** the applications of laplace transforms
	PH8252 - PHYSICS FOR INFORMATION SCIENCE
C111.1	**Retrieve** the electrical properties of solid state materials and explain the theoretical aspects of mobility of electrons
C111.2	**Determine** the doping properties of semiconductors and determining the carrier concentration of materials
C111.3	**Understand** the magnetic properties of materials and to analyze their applications in data storage.
C111.4	**Understand** on the functioning of optical properties for opto elecronics.
C111.5	**Analyze** the concept of electrical properties in bulk material and design novel materials
	BE8255 BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING
C112.1	**Discuss** the essentials of electric circuits and analysis.
C112.2	**Discuss** the basic operation of electric machines and transformers
C112.3	**State** the renewable sources and common domestic loads.
C1124	**Understand** the fundamentals of electronic circuit constructions
C112.5	**Describe** the measurement and metering for electric circuits.
	GE8291- ENVIRONMENTAL SCIENCE AND ENGINEERING
C113.1	**Apply** Knowledge gained on types of biodiversity, conservation of biodiversity, structure, function and types of ecosystem
C113.2	**Understand** the sources, causes, consequences and control method of air, water, soil, noise, thermal and nuclear pollution
C113.3	**Apply** Knowledge gained on existence of natural resources, over utilization, problems of these resources and control techniques.
C113.4	**Apply** Knowledge gained on the environment and its social issues, Air Act, Water Act, Wild life protection act, Forest conservation act and public awareness.
C113.5	**Apply** Knowledge gained on population growth, population explosion, family welfare Program, human rights, value education, AIDS, women and child welfare, role of information technology in environment and human health.

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	CS8251- PROGRAMMING IN C
C114.1	**Develop** simple applications in C using basic constructs
C114.2	**Design** and implement applications using arrays and strings
C114.3	**Develop** and implement applications in C using functions and pointers
C114.4	**Develop** applications in C using structures.
C114.5	**Design** applications using sequential and random access file processing
	GE8261 - ENGINEERING PRACTICES LABORATORY
C115.1	**Fabricate** carpentry components and pipe connections including plumbing works, use welding equipments to join the structures and carry out the basic machining operations
C115.2	**Build** the models using sheet metal works
C115.3	**Illustrate** on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings
C115.4	**Build** basic home electrical works and appliances and measure the electrical quantities
C115.5	**Elaborate** on the components, gates, soldering practices
	CS8261 - C PROGRAMMING LABORATORY
C116.1	**Develop** C programs for simple applications making use of basic constructs, arrays and strings.
C116.2	**Develop** C programs involving functions, recursion
C116.3	**Develop** C programs involving pointers, and structures.
C116.4	**Design** applications using sequential and random access file processing.
C116.5	**Design** applications like railway reservation system.
	IT8211 - INFORMATION TECHNOLOGY ESSENTIALS LABORATORY
C117.1	**Design** interactive websites using basic HTML tags, different styles, links and with all Basic control elements
C117.2	**Implement** client side and server side programs using scripts using PHP.
C117.3	**Implement** dynamic web sites and handle multimedia components
C117.4	**Implement** applications with PHP connected to database and Implement the technologies behind computer networks and mobile communication.
C117.5	**Implement** Personal Information System
	CS8351 - DIGITAL PRINCIPLES AND SYSTEM DESIGN
C202.1	**Design** digital circuits using simplified Boolean functions
C202.2	**Analyze** and design combinational circuits
C202.3	**Analyze** and design synchronous and asynchronous sequential circuits
C202.4	**Understand** Programmable Logic Devices
C202.5	**Explain** HDL code for combinational and sequential circuits

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CS8391- DATA STRUCTURES	
C203.1	**Understand** & Implement abstract data types for linear data structures - Lists
C203.2	**Understand** & Apply the different linear(Stack & Queue) data structures to problem solutions
C203.3	**Understand** & Apply the different Non-Linear(Tree) data structures to problem solutions
C203.4	**Understand** & Apply the different Non-Linear(Graph) data structures to problem solutions
C203.5	Critically **analyze** the various sorting algorithms and Hashing Techniques
CS8392 - Object Oriented Programming	
C204.1	**Develop** Java programs using OOP Principles.
C204.2	**Develop** Java programs with the concepts inheritance and interfaces.
C204.3	**Build** Java applicatios using exceptions and I/O streams.
C204.4	**Develop** java applications with threads and generic classes.
C204.5	**Develop** interactive Java program using Swings.
EC8395 - COMMUNICATION ENGINEERING	
C205.1	**Ability** to comprehend and appreciate the significance and role of this course in the present contemporary world
C205.2	**Apply** analog and digital communication techniques.
C205.3	**Use** data and pulse communication techniques.
C205.4	**Analyze** Source and Error control coding.
C205.5	**Design** Spread spectrum and multiple access
CS8381 – DATA STRUCTURES LABORATORY	
C206.1	**Gain knowledge** about fundamental concepts of Linear Data Structures.
C206.2	**Gain knowledge** about nonlinear data structures (Tree).
C206.3	**Gain knowledge** about nonlinear data structures (Graphs)
C206.4	**Gain knowledge** about nonlinear data structures for Sorting and Searching Algorithms
C206.5	**Apply** appropriate hash functions that result in a collision free scenario for data storage and retrieval
CS8383 - OBJECT ORIENTED PROGRAMMING LABORATORY	
C207.1	Develop and implement Java programs for simple applications that make use of classes.
C207.2	Develop and implement Java programs for packages and interfaces.
C207.3	Develop and implement Java programs with arraylist.
C207.4	Develop and implement Java programs exception handling and multithreading.
C207.5	Design applications using file processing, generic programming and event handling.

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CS8382 DIGITAL SYSTEMS LABORATORY	
C208.1	Implement simplified combinational circuits using basic logic gates
C208.2	Implement combinational circuits using MSI devices
C208.3	Implement sequential circuits like registers and counters
C208.4	Simulate combinational and sequential circuits using HDL
C208.5	Design and implementation of a simple digital system
HS8381 - Interpersonal Skills/Listening & Speaking	
C209.1	Listen and respond appropriately especially in academic contexts
C209.2	Participate in group discussions with special emphasis on stress and intonation
C209.3	Develop lexical accuracy and fluency in articulation
C209.4	Assess conversations and offer Verbal and Non-Verbal feedbacks
C209.5	Plan and devise effective presentations
MA8402- PROBABILITY & QUEUEING THEORY	
C210.1	**Gain** knowledge on Probability and various distributions
C210.2	**Solve** the Joint distributions, Covariance, Correlation and Linear regression Problems.
C210.3	**Gain** knowledge on Stationary process, Markov process, Poisson process and its Applications.
C210.4	**Acquire** skills in analyzing and Solving the Various types of Morkovian Queue Problems.
C210.5	**Gain** knowledge on General Queueing Models (Non Morkovian)
CS8491 – COMPUTER ARCHITECTURE	
C211.1	**Understand** the basics structure of computers, operations and instructions.
C211.2	**Design** arithmetic and logic unit.
C211.3	**Understand** pipelined execution and design control unit.
C211.4	**Understand** parallel processing architectures. I
C211.5	**Understand** the various memory systems and I/O communication
CS8492- DATABASE MANAGEMENT SYSTEMS	
C212.1	**Learn** the fundamentals of Data Models and to represent a database system using ER diagrams.
C212.2	**Study** SQL and Relational Database design.

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C212.3	**Understand** the internal storage structures using different File and Indexing techniques which will help in physical DB design.
C212.4	**Understand** the fundamental concept of transaction processing-concurrency control techniques and recovery procedures.
C212.5	**Understand** an introductory knowledge about the storage and Query processing technique.
	CS8451 - DESIGN AND ANALYSIS OF ALGORITHMS
C213.1	**Design** algorithms for various computing problems.
C213.2	**Analyze** the search and sorting complexity of algorithms.
C213.3	**Analyze** the time and space complexity of algorithms.
C213.4	Critically **analyze** the different algorithm design techniques for a given problem.
C213.5	**Modify** existing algorithms to improve efficiency.
	CS8493–OPERATING SYSTEM
C214.1	**Understand** the basic concepts and functions of operating systems.
C214.2	**Understand** and analyze Processes, Threads and Scheduling algorithms.
C214.3	**Understand** the concept of Deadlocks.
C214.4	**Analyze** various memory management schemes and understand I/O management and File systems.
C214.5	**Understand** Linux basic concepts and Mobile OS like iOS and Android.
	CS8494 SOFTWARE ENGINEERING
C215.1	**Identify** the key activities in managing a software project.
	Compare different process models.
C215.2	**Compare** different process models.
C215.3	**Concepts** of requirements engineering and Analysis Modeling.
C215.4	**Apply** systematic procedure for software design and deployment.
C215.5	**Compare** and contrast the various testing and maintenance and Manage project schedule, estimate project cost and effort required
	CS8481- DBMS LABORATORY
C216.1	**Use** typical data definitions and manipulation commands.
C216.2	**Design** applications to test Nested, Join Queries and views
C216.3	**Implement** applications that require a Front-end Tool.
C216.4	Critically **analyze** the use of Tables, Views, Functions and Procedures
C216.5	**Design** and implement real time applications.
	CS8461 - OPERATING SYSTEMS LABORATORY
C217.1	**Compare** the performance of various CPU Scheduling Algorithms

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C217.2	**Implement** page replacement algorithms, file organization and allocation techniques
C217.3	**Implement** Deadlock avoidance and Detection Algorithms
C217.4	**Implement** Semaphores and to Create processes and implement IPC
C217.5	**Analyze** the performance of the various Page Replacement Algorithms and Implement File Organization and File Allocation Strategies

	HS8461 ADVANCED READING AND WRITING
C218.1	**Strengthen** the reading and writing skills of the students
C218.2	**Comprehend** and interpret data into coherent paragraphs
C218.3	**Evaluate** texts critically
C218.4	**Draft** winning Job applications
C218.5	**Write** impressive project proposals with critical acumen

	MA8551 ALGEBRA AND NUMBER THEORY
C301.1	**Apply** the basic notions of groups, rings, fields which will then be used to solve related problems.
C301.2	**Explain** the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
C301.3	**Demonstrate** accurate and efficient use of advanced algebraic techniques
C301.4	**Demonstrate** their mastery by solving non - trivial problems related to the concepts, and by proving simple theorems about the, statements proven by the text.
C301.5	**Apply** integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

	CS8591 - COMPUTER NETWORKS
C302.1	**Understand** the basic layers and its functions in computer networks.
C302.2	**Evaluate** the performance of a network.
C302.3	**Understand** the basics of how data flows from one node to another.
C302.4	**Analyze** and design routing algorithms.
C302.5	**Design** protocols for various functions in the network and Understand the working of various application layer protocols

	EC8691 MICROPROCESSORS AND MICROCONTROLLERS
C303.1	**Understand** and execute programs based on 8086 microprocessor.
C303.2	**Design** Memory Interfacing circuits.
C303.3	**Design** and interface I/O circuits.
C303.4	**Design** and implement 8051 microcontroller based systems.
C303.5	**Design** and develop Traffic Light control, LED display, LCD display and Alarm Controller.

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CS8501 - THEORY OF COMPUTATION	
C304.1	**Build** automata for any pattern.
C304.2	**Construct** regular expression for any pattern.
C304.3	**Write** Context free grammar for any construct and Develop PDA for any CFL.
C304.4	**Design** Turing machines for any language and Propose computation solutions using it.
C304.5	**Derive** whether a problem is decidable or not.
CS8592 - OBJECT ORIENTED ANALYSIS AND DESIGN	
C305.1	**Express** software design with UML diagrams
C305.2	**Design** software applications using OO concepts.
C305.3	**Identify** various scenarios based on software requirements
C305.4	**Transform** UML based software design into pattern based design using design patterns
C305.5	**Understand** the various testing methodologies for OO software
OCE552 GEOGRAPHIC INFORMATION SYSTEM	
C306.1	Have **basic** idea about the fundamentals of GIS.
C306.2	**Understand** the types of data models
C306.3	Get **knowledge** about data input and topology
C306.4	**Gain** knowledge on data quality and standards
C306.5	**Understand** data management functions and data output
EC8681 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	
C307.1	**Write** ALP Programmes for fixed and Floating Point and Arithmetic operations
C307.2	**Interface** different I/Os with processor
C307.3	**Generate** waveforms using Microprocessors
C307.4	**Execute** Programs in 8051
C307.5	**Explain** the difference between simulator and Emulator
CS8582 OBJECT ORIENTED ANALYSIS AND DESIGN LAB	
C308.1	**Perform** OO analysis and design for a given problem specification.
C308.2	**Identify** and map basic software requirements in UML mapping.
C308.3	Improve the software quality using design patterns and to explain the rationale behind applying specific design patterns
C308.4	**Test** the compliance of the software with the SRS.
C308.5	**Implement** the forward and reverse engineering
CS8581 NETWORKS LABORATORY	
C309.1	**Implement** various protocols using TCP and UDP.

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C309.2	**Compare** the performance of different transport layer protocols.
C309.3	**Use** simulation tools to analyze the performance of various network protocols.
C309.4	**Analyze** various routing algorithms.
C309.5	**Implement** error correction codes.
	CS 8651 INTERNET PROGRAMMING
C310.1	**Construct** a basic website using HTML and Cascading Style Sheets.
C310.2	**Build** dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
C310.3	**Develop** server side programs using Servlets and JSP.
C310.4	**Construct** simple web pages in PHP and to represent data in XML format.
C310.5	**Use** AJAX and web services to develop interactive web applications
	CS8691 ARTIFICIAL INTELLIGENCE
C311.1	**Use** appropriate search algorithms for any AI problem
C311.2	**Represent** a problem using first order and predicate logic
C311.3	**Provide** the apt agent strategy to solve a given problem
C311.4	**Design** software agents to solve a problem
C311.5	**Design** applications for NLP that use Artificial Intelligence
	CS8601 – MOBILE COMPUTING
C312.1	**Understand** the basic concepts of mobile computing
C312.2	**Learn** the basics of mobile telecommunication system
C312.3	**Familiar** with the network layer protocols and Ad-Hoc networks
C312.4	**Understand** the basis of transport and application layer protocols
C312.5	**Gain** knowledge about different mobile platforms and application development
	CS 8602 COMPILER DESIGN
C313.1	**Understand** the different phases of compiler and Design a lexical analyzer for a sample language.
C313.2	**Apply** different parsing algorithms to develop the parsers for a given grammar.
C313.3	**Understand** syntax-directed translation and run-time environment.
C313.4	**Learn** to implement code optimization techniques and a simple code generator.
C313.5	**Design** and implement a scanner and a parser using LEX and YACC tools.
	CS8603– DISTRIBUTED SYSTEM
C314.1	**Elucidate** the foundations and issues of distributed systems Understand the various synchronization issues and global state for distributed systems
C314.2	**Understand** the various synchronization issues and global state for distributed systems

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C314.3	**Understand** the Mutual Exclusion and Deadlock detection algorithms in distributed systems
C314.4	**Describe** the agreement protocols and fault tolerance mechanisms in distributed systems
C314.5	**Describe** the features of peer-to-peer and distributed shared memory systems

	IT8076 SOFTWARE TESTING
C315.1	**Design** the test cases suitable for a software development for different domains
C315.2	**Prepare** test planning based on the document. Identify suitable tests to be carried out
C315.3	**Explain** the various level of testing
C315.4	**Design** test plans and test cases.
C315.5	**Develop and validate** a test plan. Make use of automatic testing tools.

	CS8661 Internet Programming Laboratory
C316.1	**Construct** Web pages using HTML/XML and style sheets.
C316.2	**Build** dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
C316.3	**Develop** dynamic web pages using server side scripting.
C316.4	**Use** PHP programming to develop web applications.
C316.5	**Construct** web applications using AJAX and web services

	CS8662 Mobile Application Development Laboratory
C317.1	**Develop** mobile applications using GUI and Layouts.
C317.2	**Develop** mobile applications using Event Listener.
C317.3	**Develop** mobile applications using Databases.
C317.4	**Develop** mobile applications using RSS Feed, Internal/External Storage, SMS, Multi-threading and GPS.
C317.5	**Analyze** and discover own mobile app for simple needs.

	HS8581 Professional Communication
C318.1	**Make** effective presentations
C318.2	**Participate** confidently in Group Discussions.
C318.3	**Attend** job interviews and be successful in them.
C318.4	**Develop** adequate Soft Skills required for the workplace
C318.5	**Implement** the protocols for career management

	MG8591- PRINCIPLES OF MANAGEMENT
C401.1	**Able** to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management
C401.2	**Enable** the students to study the evolution of Management
C401.3	**To study** the functions and principles of management

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C401.4	**To learn** the application of the principles in the organization
C401.5	**To learn** and understand the effective administration
	CS8792 - CRYPTOGRAPHY AND NETWORK SECURITY
C402.1	**Understand** the fundamentals of networks security, security architecture, threats and vulnerabilities
C402.2	**Apply** the different cryptographic operations of symmetric cryptographic algorithms
C402.3	**Apply** the different cryptographic operations of public key cryptography
C402.4	**Apply** the various Authentication schemes to simulate different applications
C402.5	**Understand** various Security practices and System security standards
	CS8791- CLOUD COMPUTING
C403.1	**Articulate** the main concepts, key technologies, strengths and limitations of cloud computing
C403.2	**Learn** the key and enabling technologies that help in the development of cloud
C403.3	**Develop** the ability to understand and use the architecture of compute and storage cloud, service and delivery models
C403.4	**Explain** the core issues of cloud computing such as resource management and security
C403.5	**Be able** to install and use current cloud technologies
C403.6	**Evaluate** and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud
	OEC754 - MEDICAL ELECTRONICS
C404.1	**Know** the human body electro-physiological parameters and recording of bio-potentials
C404.2	**Comprehend** the non-electrical physiological parameters and their measurement - body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.,
C404.3	**Interpret** the various assist devices used in the hospitals viz.,pacemakers, defibrillators, dialyzers and ventilators
C404.4	**Comprehend** physical medicine methods eg.ultrasonic, shortwave, microwave surgical diathermies & bio-telemetry principles and methods
C404.5	**Know** about recent trends in medical instrumentation

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	IT8075 - SOFTWARE PROJECT MANAGEMENT
C405.1	**Understand** Project Management principles while developing software
C405.2	**Gain** extensive knowledge about the basic project management concepts, framework and the process models
C405.3	**Obtain** adequate knowledge about software process models and software effort estimation techniques
C405.4	**Estimate** the risks involved in various project activities
C405.5	**Define** the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles
C405.6	**Learn** staff selection process and the issues related to people management
	CS8079 - HUMAN COMPUTER INTERACTION
C406.1	**Design** effective dialog for HCI
C406.2	**Design** effective HCI for individuals and persons with disabilities
C406.3	**Assess** the importance of user feedback
C406.4	**Explain** the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites
C406.5	**Develop** meaningful user interface
	CS8711 - CLOUD COMPUTING LABORATORY
C407.1	**Configure** various virtualization tools such as Virtual Box, VMware workstation
C407.2	**Design** and deploy a web application in a PaaS environment.
C407.3	**Learn** how to simulate a cloud environment to implement new schedulers
C407.4	**Install** and use a generic cloud environment that can be used as a private cloud
C407.5	**Manipulate** large data sets in a parallel environment
	IT8761 - SECURITY LABORATORY
C408.1	**Develop** code for classical Encryption Techniques to solve the problems
C408.2	**Build** cryptosystems by applying symmetric and public key encryption algorithms
C408.3	**Construct** code for authentication algorithms
C408.4	**Develop** a signature scheme using Digital signature standard
C408.5	**Demonstrate** the network security system using open source tools
	CS8811 - PROJECT WORK
C409.1	**Identify** the problem by applying acquired knowledge.
C409.2	**Analyze** and categorize executable project modules after considering risks.
C409.3	**Choose** efficient tools for designing project modules.
C409.4	**Combine** all the modules through effective team work after efficient testing
C409.5	**Elaborate** the completed task and compile the project report.

PRINCIPAL
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ABBREVIATIONS

C101.1   **C stands for Course**

                  1 stands for year of study

                  01 stands for first paper as per the curriculum

                  .1 stands for Outcomes for particular course

*The same format is followed for remaining years and courses

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