LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(An Autonomous Institution since 2010)

Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada

L.B. Reddy Nagar, Mylavaram, NTR District, Andhra Pradesh - 521230

Regulation R23 Course Articulation Matrix

Courses	SEM	Course Name	COs	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C101	23CS01	**Introduction to Programming**	CO1	Understand basics of computers, concept of algorithms and flowcharts (L2)	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO2	Understand the features of C language (L2)	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Interpret the problem and develop an algorithm to solve it (L3).	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
			CO4	Implement various algorithms using the C programming language (L3).	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
			CO5	Develop skills required for problem-solving and optimizing the code (L3)	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
				Average	**3.00**	**2.00**	**2.00**	-	-	-	-	-	-	-	-	-	-	-	-
C102	23FE01	**Communicative English**	CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.(L2)	-	-	-	1	-	-	-	-	3	3	-	2	-	-	-
			CO2	Apply grammatical structures to formulate sentences and correct word forms (L3)	-	-	-	1	-	-	-	-	3	3	-	2	-	-	-
			CO3	Use discourse markers to speak clearly on a specific topic in informal discussions. L1	-	-	-	1	-	-	-	-	3	3	-	2	-	-	-
			CO4	Read / Listen the texts and write summaries based on global comprehension of these texts. L2	-	-	-	1	-	-	-	-	3	3	-	2	-	-	-

			CO5	Prepare a coherent paragraph, essay, and resume L3	-	-	-	1	-	-	-	-	3	3	-	2	-	-	-
				Average	-	-	-	**1.00**	-	-	-	-	**3.00**	**3.00**	-	**2.00**	-	-	-
C103	23FE03	**Linear Algebra and Calculus**	CO1	Apply matrix algebra techniques to solve engineering problems -L3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO2	Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix. L3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO3	Expand various functions using Mean value theorems. L2	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO4	Understand the concepts of functions of several variables which are useful in optimization. L2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO5	Evaluate areas and volumes by using double and triple integrals. L3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
				Average	**3.00**	**1.80**	-	-	-	-	-	-	-	-	-	**1.00**	-	-	-
C104	23FE04	**Engineering Physics**	CO1	Analyse the intensity variation of light due to interference, diffraction, and Polarization L4	3	3	3	1	1	1	1	-	-	-	-	1	-	-	-
			CO2	Understand the basics of crystals and their structures L2	3	3	2	1	1	1	1	-	-	-	-	1	-	-	-
			CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials L2	3	3	2	1	1	1	-	-	-	-	-	1	-	-	-
			CO4	Explain fundamentals of quantum mechanics and free electron theory of metals L2	3	3	2	1	1	1	1	-	-	-	-	1	-	-	-
			CO5	Identify the type of semiconductor using Hall Effect L1	3	3	2	1	1	1	1	-	-	-	-	1	-	-	-
				Average	**3.00**	**3.00**	**2.20**	**1.00**	**1.00**	**1.00**	**1.00**	-	-	-	-	**1.00**	-	-	-
C105	23ME01	**Engineering Graphics**	CO1	Understand the principles of engineering drawing, including engineering curves, scales, Orthographic and isometric projections. (**Understanding Level –L2**)	3	2	2	-	-	-	-	-	-	-	-	3	2	1	2

			CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. (**Applying Level –L3**)	3	2	1	-	-	-	-	-	-	-	-	3	1	1	2
			CO3	Understand and draw projection of solids in various positions in first quadrant. (**Applying Level –L3**)	3	2	2	-	-	-	-	-	-	-	-	3	-	1	2
			CO4	Draw the development of surfaces of simple objects. (**Applying Level –L3**)	3	2	2	-	-	-	-	-	-	-	-	3	2	1	2
			CO5	Prepare isometric and orthographic sections of simple solids. (**Applying Level –L3**)	2	2	2	-	-	-	-	-	-	-	-	3	-	-	-
				Average	**2.80**	**2.00**	**1.80**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.00**	**1.67**	**1.00**	**2.00**
C106	23EE01	**Basic Electrical and Electronics Engineering**	CO1	Extract electrical variables of AC & DC circuits using fundamental laws	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-
			CO2	Understand the operation of electrical machines and measuring instruments	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems.	2	2	-	-	-	3	-	-	-	-	2	2	-	-	-
			CO4	Interpret the characteristics of various semiconductor devices	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO5	Infer the operation of rectifiers, amplifiers.	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO6	Contrast various logic gates, sequential and combinational logic circuits	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
				Average	**2.50**	**2.00**	**2.50**	**-**	**-**	**3.00**	**-**	**-**	**-**	**-**	**2.00**	**1.25**	**-**	**-**	**-**
C107	23MC01	**Basic Civil and Mechanical Engineering**	CO1	Describe various sub-divisions of Civil Engineering and to appreciate their role in societal development.	1	-	-	-	2	-	2	-	-	-	-	-	2	-	2
			CO2	Outline the concepts of surveying and obtain the theoretical measurement of distances, angles and levels through surveying.	-	-	-	-	2	-	2	-	-	-	-	-	-	-	-

			CO3	Classify the various materials used in construction and highway engineering and identify their appropriate usage as per the needs	1	-	-	-	2	-	2	-	-	-	-	-	-	-	2
			CO4	Illustrate the fundamental principles involved in transportation network system, their individual components and their engineering importance.	1	-	-	-	1	-	-	-	-	-	-	3	-	-	-
			CO5	Explain the quality parameters of various water sources and functions of selected water storage and conveyance structures	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-
				Average	**1.00**				**1.60**		**2.00**			**1.00**		**3.00**	**2.00**		**2.00**
			CO1	Summarize the different manufacturing processes.(Remember Level -L1)	1	1	1	-	-	-	-	-	-	-	-	-	-	1	
			CO2	Explain the basics of thermal engineering and its applications. (Understand Level –L2)	1	1	-	-	-	-	-	-	-	-	-	-	-	1	
			CO3	Illustrate the working of different mechanical power transmission systems and power plants. (Understand Level –L2)	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1
			CO4	Describe the basics of robotics and its applications. (Understand Level –L2)	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1
				Average	**1.00**	**1.00**	**1.00**	-	-	-	-	-	-	-	-	-	-	**1.00**	**1.00**
C108	23CS51	**Computer Programming Lab**	CO1	Understand the different aspect of the English language proficiency with emphasis on LSRW skills	3	2	-	-	3	-	-	-	-	-	-	-	-	-	-
			CO2	Apply Communication Skills through various language learning activities.	3	2	2	-	3	-	-	-	-	-	-	-	-	-	-
			CO3	Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension	3	2	2	-	3	-	-	-	-	-	-	-	-	-	-

			CO4	Exhibit professionalism in participating in debates and group discussions	-	-	-	-	-	-	-	2	2	2	2	2	-	-	-
				Average	**3.00**	**2.00**	**2.00**	**-**	**3.00**	**-**	**-**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**-**	**-**	**-**
C109	23FE51	**Communicative English Lab**	CO1	Understand the different aspect of the English language proficiency with emphasis on LSRW skills.	-	-	-	2	-	2	-	-	3	3	-	-	-	-	-
			CO2	Apply Communication Skills through various language learning activities	-	-	-	2	-	2	-	-	3	3	-	2	-	-	-
			CO3	Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension.	-	-	-	2	-	2	-	-	3	3	-	2	-	-	-
			CO4	Exhibit professionalism in participating in debates and group discussions	-	-	-	2	-	2	-	-	3	3	-	2	-	-	-
				Average	**-**	**-**	**-**	**2.00**	**-**	**2.00**	**-**	**-**	**3.00**	**3.00**	**-**	**2.00**	**-**	**-**	**-**
C110	23IT51	**IT Workshop**	CO1	Identify the components of a PC and troubleshooting the malfunctioning of PC	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO2	Develop presentation /documentation using Office tools and LaTeX	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Build dialogs and documents using ChatGPT	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-
			CO4	Improve individual / teamwork skills, communication and report writing skills with ethical values	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-
				Average	**3.00**	**-**	**-**	**-**	**2.00**	**-**	**-**	**2.00**	**2.00**	**2.00**	**-**	**-**	**-**	**-**	**-**
C111	23FE53	**Engineering Physics Lab**	CO1	Analyze the wave properties of light using optical instruments	3	3	2	1	-	-	-	1	1	-	-	1	-	-	-
			CO2	Estimate the elastic modulii of various materials and acceleration due to gravity	3	3	2	1	-	-	-	1	1	-	-	1	-	-	-
			CO3	Demonstrate the vibrations in stretched strings	3	3	2	1	-	-	-	1	1	-	-	1	-	-	-

			CO4	Evaluate dielectric constant and magnetic field of circular coil carrying current	3	3	2	1	-	-	-	1	1	-	-	1	-	-	-
			CO5	Examine the characteristics of semiconductor devices	3	3	2	1	-	-	-	1	1	-	-	1	-	-	-
				Average	**3.00**	**3.00**	**2.00**	**1.00**	-	-	-	**1.00**	**1.00**	-	-	**1.00**	-	-	-
C112	23EE51	**Electrical & Electronics Engineering Workshop**	CO1	Compute voltage, current and power in an electrical circuit	3	2	-	-	-	-	-	2	3	2	-	1	-	-	-
			CO2	Compute medium resistance using Wheat stone bridge	2	2	-	2	-	-	-	2	2	2	-	-	-	-	-
			CO3	Discover critical field resistance and critical speed of DC shunt generators	2	2	2	2	-	-	-	2	2	2	-	-	-	2	-
			CO4	Estimate reactive power and power factor in electrical loads	2	2	-	3	-	-	-	2	3	2	-	1	2	-	-
			CO5	Plot the characteristics of semiconductor devices.	3	2	-	-	2	-	-	2	2	2	1	1	2	2	3
			C06	Demonstrate the working of various logic gates using ICs.	3	3	-	2	2	-	-	2	3	3	-	1	-	-	2
				Average	**2.50**	**2.17**	**2.00**	**2.25**	**2.00**			**2.00**	**2.50**	**2.17**	**1.00**	**1.00**	**2.00**	**2.00**	**2.50**
C113	23ME51	**Engineering Workshop**	CO1	Identify workshop tools and their operational capabilities	3	2	1	-	-	-	-	-	-	-	-	1	2	-	-
			CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding	3	3	2	3	-	-	-	-	2	-	-	2	3	-	1
			CO3	Modal various basic prototypes in fitting trade	3	1	1	3	-	-	-	-	1	-	-	2	3	-	2
			CO4	Apply basic electrical engineering knowledge for House Wiring Practice	3	3	2	2	-	-	-	3	-	-	-	2	1	-	3
				Average	**3.00**	**2.25**	**1.50**	**2.67**	-	-	-	**3.00**	**1.50**	-	-	**1.75**	**2.25**	-	**2.00**
C114	23FE05	**Differential Equations & Vector Calculus**	CO1	Solve the differential equations related to various engineering fields	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO2	Apply knowledge of partial differentiation in modelling and solving of Partial differential equations	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-

			CO3	Interpret the physical meaning of different operators such as gradient, curl and divergence.	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO4	Evaluate the work done against a field, circulation and flux using Vector Calculus.	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
				Average	**3.00**	**1.75**	-	-	-	-	-	-	-	-	-	**1.00**	-	-	-
C115	23FE06	**Engineering Chemistry**	CO1	Identify the troubles due to hardness of water and its maintenance in industrial applications	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
			CO2	Apply Nernst equation in calculating cell potentials, compare batteries for different applications and outline the principles of corrosion for design and effective maintenance of various devices	3	2	2	2	-	2	2	-	-	-	-	2	-	-	-
			CO3	Outline the importance of polymers and alternate fuels.	3	3	2	2	-	2	2	-	-	-	-	2	-	-	-
			CO4	Summarize the suitability of engineering materials like composites, refractories, lubricants, and building materials	3	2	2	2	-	2	2	-	-	-	-	2	-	-	-
			CO5	Understand the concepts of collides, micelles and nanomaterials	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-
				Average	**3.00**	**2.25**	**1.75**	**1.75**	-	**2.00**	**2.00**	-	-	-	-	**1.60**	-	-	-
C116	23ME02	**Engineering Mechanics**	CO1	Determine the resultant of coplanar concurrent and non-concurrent force systems	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-
			CO2	Apply static equilibrium conditions to determine unknown planar force systems and determine the frictional forces for bodies in contact.	3	2	2	1	-	-	-	-	-	-	-	3	-	-	-
			CO3	Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.	3	1	-	2	-	-	-	-	-	-	-	3	-	-	-
			CO4	Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle	3	2	-	2	-	-	-	-	-	-	-	3	-	-	-

			CO5	Solve the problems involving the translational and rotational motion of rigid bodies.	3	2	-	1	-	-	-	-	-	-	-	3	-	-	-
				Average	**3.00**	**1.80**	**1.50**	**1.50**	-	-	-	-	-	-	-	**3.00**	-	-	-
C117	23ME52	**Engineering Mechanics Lab**	CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller	-	-	-	-	3	3	-	-	-	-	-	2	1	3	3
			CO2	Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.	3	-	-	-	3	2	-	-	-	-	-	2	-	2	2
			CO3	Determine the Centre of gravity and Moment of Inertia of different configurations	3	-	-	-	3		-	-	-	-	-	2	-	-	-
			CO4	Apply the equilibrium conditions of a rigid body under the action of different force systems	3	-	-	-	3		-	-	-	-	-	2	-	2	2
				Average	**3.00**	-	-	-	**3.00**	**2.50**	-	-	-	-	-	**2.00**	**1.00**	**2.33**	**2.33**
C118	23FE54	**Engineering Chemistry Lab**	CO1	Analyze important parameters of water to check its suitability for drinking purposes and industrial applications	3	2	-	-	-	1	2	-	-	-	-	-	-	-	-
			CO2	Acquire practical knowledge related to preparation of Bakelite and nanomaterials	3	-	1	-	-	2	1	-	-	-	-	-	-	-	-
			CO3	Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus	3	2	1	-	-	-	2	-	-	-	-	-	-	-	-
			CO4	To estimate the amount of calcium in cement and the strength of acid present in Pb-Acid battery.	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO5	Improve individual / teamwork skills, communication and report writing skills with ethical values.	3	2	-	-	2	-	-	-	-	-	-	-	-	-	-
				Average	**3.00**	**1.75**	**1.00**	-	**2.00**	**1.50**	**1.67**	-	-	-	-	-	-	-	-
C119	23AU01	**HWYS**	CO1	Understand the importance of discipline, character and service motto. (Understanding Level -L2)	-	-	-	-	-	2	-	2	3	2	-	1	-	-	-

			CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques. (Applying Level L3)	-	-	-	-	-	3		3	3	2	-	1	-	-	-
			CO3	Explore human relationships by analyzing social problems.(Understanding Level - L2)	-	-	-	-	-	2		2	3	3	-	1	-	-	-
			CO4	Determine to extend their help for the fellow beings and downtrodden people (Applying Level -L3)	-	-	-	-	-	3		3	3	2	-	1	-	-	-
			CO5	Develop leadership skills and civic responsibilities. (Applying Level L3)	-	-	-	-		3		3	3	3	-	1	-	-	-
				Average	-	-	-	-	-	**2.60**		**2.60**	**3.00**	**2.40**	-	**1.00**	-	-	-
C120	23AU02	**NNCS**	CO1	Understand the importance of discipline, character and service motto. (Understanding Level -L2)	-	-	-	-	-	2	3	2	2	2	-	1	-	-	-
			CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques. (Applying Level L3)	-	-	-	-	-	3	2	3	3	3	-	1	-	-	-
			CO3	Explore human relationships by analysing social problems. (Understanding Level -L2)	-	-	-	-	-	2	3	2	2	3	-	1	-	-	-
			CO4	Determine to extend their help for the fellow beings and downtrodden people –(Applying Level -L3)	-	-	-	-	-	3	2	3	3	2	-	1	-	-	-
			CO5	Develop leadership skills and civic responsibilities. (Applying Level L3)	-	-	-	-	-	3	2	3	2	3	-	1	-	-	-
				Average	-	-	-	-	-	**2.60**	**2.40**	**2.60**	**2.40**	**2.60**		**1.00**	-	-	-
C201	23FE09	**NUMERICAL METHODS AND TRANSFORM TECHNIQUES**	CO1	Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)	3	2	-	2	-	-	-	-	-	-	-	1	-	-	-

			CO2	Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)	3	2	-	2	-	-	-	-	-	-	-	1	-	-	-
			CO3	Apply the Laplace transform for solving differential equations (L3)	3	2	-	2	-	-	-	-	-	-	-	1	-	-	-
			CO4	Find or compute the Fourier series of periodic signals (L3)	3	2	-	2	-	-	-	-	-	-	-	1	-	-	-
			CO5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)	3	2	-	2	-	-	-	-	-	-	-	1	-	-	-
				Average	**3.00**	**2.00**	**-**	**2.00**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.00**	**-**	**-**	**-**
C202	23ME03	**THERMODYNAMICS**	CO1	Understand the basic concepts of thermodynamics and can distinguish the forms of heat and work. (Understanding - L2)	3	2	1	-	-	-	-	-	-	-	-	2	2	-	-
			CO2	Apply first of law of thermodynamics to flow and non-flow processes of thermodynamic systems (Applying – L3)	3	3	2	3	-	-	-	-	2	-	-	2	3	-	2
			CO3	Apply the second law of thermodynamics to solve second law parameters of thermal systems (Applying – L3)	3	1	1	3	-	-	-	-	1	-	-	2	3	-	2
			CO4	Analyze the non-reactive mixture of gases, t-s and h-s diagrams, Mollier charts, and Phase Transformations using steam tables data hand book. (Analyzing – L4)	3	3	2	2	-	-	-	3	-	-	-	2	3	-	3
			CO5	Compute the performance parameters of various thermodynamic cycles. (Applying – L3)	3	3	-	3	-	-	-	-	3	-	-	3	3	-	3
				Average	**3.00**	**2.40**	**1.50**	**2.75**	**-**	**-**	**-**	**3.00**	**2.00**	**-**	**-**	**2.20**	**2.80**	**-**	**2.50**

C203	23ME04	**MECHANICS OF SOLIDS**	CO1	Understand the concepts of basic structural members subjected to uni-axial and bi-axial loads. (Understanding-L2)	3	2	1	--	--	--	--	--	--	--	--	2	--	--	3
			CO2	Construct the shear force and bending moment diagrams along the length of beam. (Applying-L3)	2	3	1	--	--	--	--	--	--	--	--	2	--	--	3
			CO3	Compute the stresses of a member subjected to flexural and torsional loads. (Applying-L3)	3	2	1	--	--	--	--	--	--	--	--	2	--	--	3
			CO4	Determine the transverse shear stresses and deflections of beams due to bending loads. (Applying– L3)	3	2	1	--	--	--	--	--	--	--	--	2	--	--	3
			CO5	Estimate the stresses in pressure vessels and analyze the columns for buckling (Analyzing-L4)	3	1	2	--	--	--	--	--	--	--	--	2	--	--	3
				Average	**2.80**	**2.00**	**1.20**	-	-	-	-	-	-	-	-	**2.00**	-	-	**3.00**
C204	23ME05	**MATERIAL SCIENCE AND METALLURGY**	CO1	Understand the crystalline structure of different metals (Understanding-L2)	1	2	2	1	--	--	--	--	--	--	--	--	--	2	--
			CO2	Recognize the stability of phases in different alloy systems (Remembering-L1).	1	2	2	1	--	--	--	--	--	--	--	--	--	2	--
			CO3	Explain the behavior of ferrous and non-ferrous metals and alloys and their application in different domains. (Understanding-L2)	1	2	2	1	--	--	--	--	--	--	--	--	--	2	--
			CO4	Study the heat treatment and age hardening process. (Remembering-L1)	1	2	2	1	--	--	--	--	--	--	--	--	--	2	--
			CO5	Identify the properties and applications of ceramic, composites	1	2	2	1	--	--	--	--	--	--	--	--	--	2	--

				and other advanced methods. (Understanding-L2)															
				Average	**1.00**	**2.00**	**2.00**	**1.00**										**2.00**	
C205	23HS01	**UHV II - UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT (Common to All branches of Engineering)**	CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)	-	-	-	-	-	3	2	3	1	-	-	3	-	-	-
			CO2	Identify one's self, and one's surroundings (family, society nature) (L2)	-	-	-	-	-	1	2	3	3	-	-	2	-	-	-
			CO3	Relate human values with human relationship and human society. (L2)	-	-	-	-	-	3	2	1	1	-	-	2	-	-	-
			CO4	llustrate the need for universal human values and harmonious existence (L2)	-	-	-	-	-	3	3	2	2	-	-	2	-	-	-
			CO5	Develop as socially and ecologically responsible engineers (L3)	-	-	-	-	-	2	2	3	1	-	-	3	-	-	-
				Average	-	-	-	-	-	**2.4**	**2.2**	**2.4**	**1.6**	-	-	**2.4**	-	-	-
C206	23MC01	**Environmental Science**	CO1	The necessity of resources, their exploitation and sustainable management (Understand – L2)	3	3	-	-	-	3	3	3	-	-	-	3	-	-	-
			CO2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation. (Understand – L2)	3	3	-	-	-	3	3	-	-	-	-	3	-	-	-
			CO3	Environmental problems like pollution, disasters and possible solutions. (Remember – L1)	3		3	-	-		2		-	-	-	2	-	-	-
			CO4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits. (Remember – L1)	3	-	-	-	-	2	3	2	-	-	-	3	-	-	-

			CO5	Environmental issues like over population, human health etc related to local, regional and global levels. (Understand – L2)	3	3	3	3	-	3	3	3	-	-	-	3	-	-	-
				Average	**3.00**	**3.00**	**3.00**	**3.00**		**2.75**	**2.80**	**2.67**	**-**	**-**	**-**	**2.80**	**-**	**-**	**-**
C207	23ME53	**MECHANICS OF SOLIDS & MATERIALS SCIENCE LAB**	CO1	Estimate the behaviour of various materials under different loading. (Understanding L2)	2	3	--	--	--	--	--	--	--	--	--	2	--	2	3
			CO2	Calculate the hardness of different materials. (Applying – L3)	3	--	1	--	--	--	--	--	--	--	--	2	--	3	2
			CO3	Evaluate the mechanical properties of materials by conducting various tests. (Applying-L3)	3	1	2	--	--	--	--	--	--	--	--	2	--	2	3
			CO4	Identify the material by observing the microstructure. (Applying-L3)	3	2	--	--	--	--	--	--	--	--	--	2	--	3	--
			CO5	Evaluate hardness of treated and untreated steels. (Applying-L3)	2	3	--	--	--	--	--	--	--	--	--	2	--	3	2
				Average	**2.60**	**2.25**	**1.50**	-	-	-	-	-	-	-	-	**2.00**	-	**2.60**	**2.50**
C208	23ME54	**COMPUTER-AIDED MACHINE DRAWING**	CO1	Demonstrate the conventional representations of materials and machine components. (Understanding-L2)	2	--	--	--	2	--	--	3	--	--	--	2	--	3	3
			CO2	Model riveted, welded and key joints using CAD system. (Applying-L3)	2	--	2	--	3	--	--	--	--	--	--	2	--	2	3
			CO3	Create solid models and sectional views of machine components. (Applying-L3)	2	--	3	--	3	--	--	--	--	--	--	2	--	2	3
			CO4	Assemble the solid models of machine parts. (Evaluating-L5)	2	--	3	--	3	--	--	--	2	--	--	3	--	2	3
			CO5	Generate part drawings from assembly. (Evaluating-L5)	3	2	3	--	3	--	--	--	3	--	--	3	--	2	3
				Average	**2.25**	**2**	**2.75**	-	**3**	-	-	-	**2.5**	-	-	**2.5**	-	**2**	**3**
C209	23CS57	**PYTHON PROGRAMMING LAB**	CO1	Understand Python programming Constructs, Syntax, and Semantics. (Understand-L2)	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
			CO2	Develop Applications using Python Libraries. (Apply-L3)	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-

			CO3	Implement Different Data Structures, Web Scrapping and Database programming using Python. (Apply-L3)	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
			CO4	Improve individual / teamwork skills, communication & report writing skills with ethical values	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-
				Average	**3.00**	**2.00**	**-**	**-**	**-**	**-**	**-**	**2.00**	**2.00**	**2.00**	**-**	**-**	**2.00**	**-**	**-**
C210	23ECS1	**23ECS1-EMBEDDED SYSTEMS & IoT**	CO1	Comprehend Microcontroller-Transducers Interface techniques. (Understand – L2)	2	3	2	-	2	3	-	-	2	-	-	1	-	-	-
			CO2	Identify the programming concepts of IOT. (Design Level – L5)	2	1	3	2	3	3	-	-	3	-	-	1	-	-	-
			CO3	Develop real time applications using Internet of Things. (Apply – L3)	3	1	3	-	2	3	-	-	2	-	-	1	-	-	-
			CO4	Demonstrate the integration of sensors with IOT.. (Apply – L3)	3	1	2	-	2	3	-	-	2	-	-	1	-	-	-
			CO5	Adapt effective Communication, presentation and report writing skills. (Apply – L3)	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
				Average	**2.5**	**1.5**	**2.5**	**2**	**2.25**	**3**	**-**	**-**	**2.4**	**3**	**-**	**1.4**	**-**	**-**	**-**
C211	23FE11	**COMPLEX VARIABLES, PROBABILITY AND STATISTICS**	CO1	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic. (L3)	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
			CO2	Make use of Cauchy residue theorem to evaluate certain integrals (L3)	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
			CO3	Infer the statistical inferential methods based on small and large sample tests (L4)	3	2	2	3	-	-	-	-	-	-	-	1	-	-	-
			CO4	Find the differentiation and integration of complex functions used in engineering problems (L3)	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
			CO5	Design the components of a classical hypothesis test. (L4)	3	3	2	3	-	-	-	-	-	-	-	1	-	-	-

				Average	**3.00**	**2.20**	**1.40**	**3.00**	-	-	-	-	-	-	-	**1.00**	-	-	-
C212	23HS03	**INDUSTRIAL MANAGEMENT**	CO1	Design the key factors and techniques for optimizing and maintaining plant layouts. (Applying-L3)	3	1	3	3	--	2	--	--	--	--	--	3	--	3	--
			CO2	Demonstrate various work study techniques and evaluate the principles of ergonomics and tools. (Applying-L3)	--	3	2	3	--	--	--	--	--	--	--	3	--	2	--
			CO3	Investigate statistical quality control methods and value the concepts of total quality management. (Applying-L3)	3	--	3	3	--	--	--	--	--	--	--	3	--	2	--
			CO4	Investigate the scope and nature of financial management techniques. (Applying-L3)	3	3	3	3	--	--	2	--	--	--	--	2	--	2	--
			CO5	Integrate human resource management, personnel management, and industrial relations concepts and functions. (Applying-L3)	3	2	3	2	--	--	--	--	2	--	--	3	--	2	--
				Average	**3.00**	**2.50**	**3.00**	**2.67**	-	-	**2.00**	-	**2.00**	-	-	**2.67**	-	**2.00**	-
C213	23ME06	**MANUFACTURING PROCESSES**	CO1	Recognize the patterns and core boxes for metal casting processes. (Remembering -L1)	3	2	2	3	1	--	--	--	--	--	--	--	--	3	--
			CO2	Understand the different welding processes. (Understanding-L2)	3	1	1	3	2	--	--	--	--	--	--	--	2	3	--
			CO3	Explain the different types of bulk forming processes. (Understanding-L2)	3	2	2	3	3	--	--	--	--	--	--	--	--	3	--
			CO4	Understand sheet metal forming processes. (Understanding-L2)	3	3	3	3	2	--	--	--	--	--	--	--	--	3	--
			CO5	Differentiate different types of powder metallurgy processes. (Understanding-L2)	3	1	2	2	1	--	--	--	--	--	--	--	--	3	--
				Average	**3.00**	**1.80**	**2.00**	**2.80**	**1.80**	-	-	-	-	-	-	-	**2.00**	**3.00**	-

C214	23ME07	**FLUID MECHANICS & HYDRAULIC MACHINES**	CO1	Understand the fundamentals of fluid mechanics and summarize the properties of fluid flows. (Understanding L2)	3	2	2	1	--	--	--	--	--	--	--	3	2	--	--
			CO2	Calculate the properties of fluids in static and dynamic conditions. (Applying-L3)	3	2	1	2	--	--	--	--	--	--	--	3	3	--	--
			CO3	Apply the boundary layer theory to determine flow separation in fluid flow systems. (Applying-L3)	3	1	1	2	--	--	--	--	--	--	--	3	3	--	--
			CO4	Solve the hydrodynamic forces of jet on vanes in different positions and turbine performance parameters. (Applying-L3)	3	1	2	2	--	--	--	--	--	--	--	3	3	--	3
			CO5	Distinguishes the performance parameters of turbines and pumps. (Understanding L2)	2	2	1	1	--	--	--	--	--	--	--	3	2	--	2
				Average	**2.80**	**1.60**	**1.40**	**1.60**								**3.00**	**2.60**		**2.50**
C215	23ME08	**THEORY OF MACHINES**	CO1	Understand different mechanisms and their inversions. (Understanding- L2)	3	2	1	--	--	--	--	--	--	--	--	2	--	--	3
			CO2	Analyze velocity and acceleration of different links in a mechanism. (Analyzing-L4)	3	1	2	--	--	--	--	--	--	--	--	1	--	--	3
			CO3	Apply the gear kinematics in various machines and Gyroscopic principles in various vehicles. (Applying-L3)	3	2	--	--	--	--	--	--	--	--	--	2	--	--	3
			CO4	Evaluate unbalance mass in rotating machines and draw various cam profiles.(Analyzing-L4)	2	3	--	--	--	--	--	--	--	--	--	2	--	--	3
			CO5	Analyze vibrations of single degree freedom systems and turning moment diagrams of various engines. (Analyzing-L4)	1	3	2	--	--	--	--	--	--	--	--	2	--	--	3
				Average	**2.40**	**2.20**	**1.67**	-	-	-	-	-	-	-	-	**1.80**	-	-	**3.00**

C216	23ME55	**FLUID MECHANICS & HYDRAULIC MACHINES LAB**	CO1	Demonstrate the devices used for measuring flow. (Applying-L3)	2	2	--	3	--	--	--	--	1	--	--	2	--	--	3
			CO2	Compute major losses in pipes. (Evaluating-L5)	2	--	1	3	--	--	--	--	--	--	--	2	--	--	2
			CO3	Illustrate the operating parameters of turbines. (Understanding-L2)	2	2	3	3	--	--	--	--	1	--	--	2	--	--	3
			CO4	Explain the working of different types of pumps. (Understanding-L2)	2	2	3	3	--	--	--	--	1	--	--	2	--	--	3
			CO5	Explain the devices used for measuring flow. (Understanding-L2)	2	2	--	3	--	--	--	--	1	--	--	2	--	--	3
				Average	**2.00**	**2.00**	**3.00**	**3.00**	-	-	-	-	**1.00**	-	-	**2.00**	-	-	**3.00**
C217	23ME56	**MANUFACTURING PROCESSES LAB**	CO1	Make moulds for sand casting. (Understanding-L2)	3	2	3	3	1	--	--	--	--	--	--	1	--	2	--
			CO2	Fabricate different types of components using various manufacturing techniques. (Applying-L3)	2	1	3	3	1	--	--	--	--	--	--	2	--	3	3
			CO3	Adapt conventional manufacturing methods. (Applying-L3)	2	1	3	3	1	--	--	--	--	--	--	3	--	2	1
			CO4	Develop Different Weld joints. (Applying-L3)	1	1	2	3	1	--	--	--	--	--	--	4	--	2	2
				Average	**2.00**	**1.25**	**2.75**	**3.00**	**1.00**	-	-	-	-	-	-	**2.50**	-	**2.25**	**2.00**
C218	23ME57	**DESIGN THINKING & INNOVATION**	CO1	Apply fundamental design components, principles, and new materials to create and improve design projects. (Applying-L3)	3	3	3	3	--	2	--	--	--	--	3	2	2	3	3
			CO2	Apply the design thinking process to develop and present innovative product solutions. (Applying-L3)	3	3	3	3	--	1	2	--	--	--	2	1	2	2	2
			CO3	Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions. (Analyzing-L4)	3	3	2	3	--	1	--	--	--	--	3	2	2	2	3

			CO4	Analyze to work in a multidisciplinary environment. (Analyzing-L4)	3	3	3	2	2	2	--	--	3	--	2	2	2	2	2
			CO5	Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. (Evaluating-L5)	2	2	3	3	2	2	2	--	--	--	3	3	2	2	3
				Average	**2.80**	**2.80**	**2.80**	**2.80**	**2.00**	**1.60**	**2.00**	**-**	**3.00**	**-**	**2.60**	**2.00**	**2.00**	**2.20**	**2.60**
C219	23MES1	**STRUCTURAL AND MODAL ANALYSIS USING ANSYS**	CO1	Understand the basics and fundamentals related to Finite Element Method. (Understanding-L2)	3	2	--	--	2	--	--	--	--	--	--	2	--	--	3
			CO2	Comprehend the ANSYS utilities to solve the engineering problems. (Understanding-L2)	3	2	--	--	3	--	--	--	--	--	--	2	--	--	3
			CO3	Perform the static structural analysis in 1D, 2D and 3D using ANSYS work bench. (Applying-L3)	2	2	3	--	3	--	--	--	2	--	--	2	--	--	3
			CO4	Analyze the mode shapes of structures and machine elements. (Analyzing-L4)	1	3	3	--	3	--	--	--	3	--	--	3	--	--	3
				Average	**2.25**	**2.25**	**3.00**	**-**	**2.75**	**-**	**-**	**-**	**2.50**	**-**	**-**	**2.25**	**-**	**-**	**3.00**

Module Coordinators Signatures Programme Assessment Committee (PAC) Signatures HoD