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

NAAC Accredited **A** Grade CGPA - 3.20/4

NBA for CSE IT ECE EEE ME ASE CE

R23 - Regulation first year courses CO-PO-mappings and their articulation matrices

S.No	Course code	Course Name	CO No.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
1	23CS01	Introduction to Programming	CO1	Understand basics of computers, concept of algorithms and flowcharts	3	2	-	-	-	-	-	-	-	-	-	-
			CO2	Understand the features of C language	3	2	2	-	-	-	-	-	-	-	-	-
			CO3	Interpret the problem and develop an algorithm to solve it.	3	2	2	-	-	-	-	-	-	-	-	-
			CO4	Implement various algorithms using the C programming language.	3	2	2	-	-	-	-	-	-	-	-	-
			CO5	Develop skills required for problem-solving and optimizing the code	3	2	2	-	-	-	-	-	-	-	-	-
2	23FE01	Communicative English	CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.	-	-	-	1					3	3		2
			CO2	Apply grammatical structures to formulate sentences and correct word forms	-	-	-	1	-	-	-	-	3	3	-	2
			CO3	Use discourse markers to speak clearly on a specific topic in informal discussions.	-	-	-	1	-	-	-	-	3	3	-	2
			CO4	Read / Listen the texts and write summaries based on global comprehension of these texts.	-	-	-	1	-	-	-	-	3	3	-	2
			CO5	Prepare a coherent paragraph, essay, and resume	-	-	-	1	-	-	-	-	3	3	-	2
3	23FE02	Chemistry	CO1	Understand the fundamentals of quantum mechanics and molecular orbital energy diagrams for molecules.	3	-	-	-	-	-	-	-	-	-	-	1
			CO2	Summarize the suitability of advanced materials like semiconductors, superconductors,	3	2	2	2	-	2	2	-	-	-	-	2

S.No	Course Code	Course Name	CO	Description	1	2	3	4	5	6	7	8	9	10	11	12
				super capacitors and nano materials, in advanced fields.												
			CO3	Apply Nernst equation in calculating cell potentials and understand conductometric, potentiometric titrations, electrochemical sensors and compare batteries for different applications.	3	3	2	2	-	2	2	-	-	-	-	2
			CO4	Outline the importance of polymers and conducting polymers in advanced technologies.	3	2	2	2	-	2	2	-	-	-	-	2
			CO5	Outline the importance of poUnderstand the fundamentals of UV-Visible, IR spectroscopic techniques and basic principles of chromatographic techniques.	3	2	1	1	-	-	-	-	-	-	-	1
4	23FE03	Linear Algebra and Calculus	CO1	Apply matrix algebra techniques to solve engineering problems	3	2	-	-	-	-	-	-	-	-	-	1
			CO2	Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix.	3	2	-	-	-	-	-	-	-	-	-	1
			CO3	Expand various functions using Mean value theorems.	3	1	-	-	-	-	-	-	-	-	-	1
			CO4	Understand the concepts of functions of several variables which are useful in optimization.	3	2	-	-	-	-	-	-	-	-	-	1
			CO5	Evaluate areas and volumes by using double and triple integrals.	3	2	-	-	-	-	-	-	-	-	-	1
5	23FE04	Engg Physics	CO1	Analyze the intensity variation of light due to interference, diffraction, and Polarization	3	3	3	1	1	1	1					1
			CO2	Understand the basics of crystals and their structures	3	3	2	1	1	1	1					1
			CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials	3	3	2	1	1	1						1
			CO4	Explain fundamentals of quantum mechanics and free electron theory of metals	3	3	2	1	1	1	1					1
			CO5	Identify the type of semiconductor using Hall Effect	3	3	2	1	1	1	1					1
6	23ME01	Engineering Graphics	CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections	3	2	2	-	-	-	-	-	-	-	-	3
			CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.	3	2	1	-	-	-	-	-	-	-	-	3

#	Code	Course	CO	Description	1	2	3	4	5	6	7	8	9	10	11	12
			CO3	Understand and draw projection of solids in various positions in first quadrant.	3	2	2	-	-	-	-	-	-	-	-	3
			CO4	Able to draw the development of surfaces of simple objects	3	2	2	-	-	-	-	-	-	-	-	3
			CO5	Prepare isometric and orthographic sections of simple solids	2	2	2	-	-	-	-	-	-	-	-	3
7	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									
8	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	-	-	-	-	-
			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	-	-	-	-	-
			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	-	-
9	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	-	-	-	-	-	-	-

#	Code	Course	CO	Course Outcome												
		Communicative English Lab	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
			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	dentifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension.	-	-	-	2		2			3	3		2
10	23FE51		CO4	Exhibit professionalism in participating in debates and group discussions	-	-	-	2		2			3	3		2
		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	-	-	-	-	-	-	-	-	-	-
11	23FE52		CO5	Improve individual / teamwork skills, communication and report writing skills with ethical values	3	2	-	-	2	-	-	-	-	-	-	-
		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	-	-	-	-	-	-	-
12	23IT51		CO4	Improve individual / teamwork skills, communication and report writing skills with ethical values	-	-	-	-	-	-	-	2	2	2	-	-
		Engineering Physics Lab	CO1	Analyze the wave properties of light using optical instruments	3	3	2	1				1	1			1
13	23FE53		CO2	Estimate the elastic nalyz of various materials and acceleration due to gravity	3	3	2	1				1	1			1

Sl	Code	Course	CO	Course Outcome												
			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
14	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		
			CO4	Estimate reactive power and power factor in electrical loads	2	2		3				2	3	2		1
			CO5	Plot the characteristics of semiconductor devices.	3	2			2			2	2	2	1	1
			C06	Demonstrate the working of various logic gates using Ics.	3	3		2	2			2	3	3		1
15	23ME51	Engineering Workshop	CO1	Identify workshop tools and their operational capabilities	3	2	1	-	-	-	-	-	-	-	-	1
			CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding	3	3	2	3	-	-	-	-	2	-	-	2
			CO3	Modal various basic prototypes in fitting trade	3	1	1	3	-	-	-	-	1	-	-	2
			CO4	Apply basic electrical engineering knowledge for House Wiring Practice	3	3	2	2	-	-	-	3	-	-	-	2
16	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
17	23CS02	Data Structures	CO1	Understand the role of linear and non linear data structures in organizing and accessing data	3	2				-	-	-	-	-	-	

#	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
			CO2	Implement abstract data type (ADT) and data structures for given application	3	2	2	1		-	-	-	-	-	-	
			CO3	Design algorithms based on techniques like linked list, stack, queue, trees etc	3	2	2	1		-	-	-	-	-	-	
			CO4	Apply the appropriate linear and nonlinear data structure techniques for solving a problem.	3	2	2	1		-	-	-	-	-	-	
			CO5	Design hash-based solutions for specific problems.	3	2	2	1		-	-	-	-	-	-	
		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
18	23FE06		CO5	Understand the concepts of collides, micelles and nanomaterials	3	2	1	1	-	-	-	-	-	-	-	1
		Electrical Circuit Lab	CO1	Demonstrate fundamental circuit laws, network theorems, node and mesh analysis of electrical circuits	2	2		3	2				2	3	2	
			CO2	Design resonance circuit for given specifications	2	2	1	3	2				2	3	2	
			CO3	Measure time constants of RL & RC circuits	2	2		3	2				2	3	2	
19	23EE52		CO4	Analyze the 1st and 2nd order circuits with respect to parameter variation	2	2		2					2	3	2	
		Network Analysis And Simulation Lab	CO1	Demonstrate fundamental circuit laws, network theorems, node and mesh analysis of electrical circuits	2	2	-	1	2	-	-	-	-	2	1	2
			CO2	Design resonance circuit for given specifications	2	2	-	1	2	-	-	-	-	2	2	2
			CO3	Measure time constants of RL & RC circuits	2	2	-	1	1	-	-	-	-	2	1	2
20	23EC51		CO4	Analyze the 1st and 2nd order circuits with respect to parameter variation	2	3	-	1	2	-	-	-	-	2	1	2

No	Code	Subject	CO	Course Outcome												
			CO5	Characterize and model the network in terms of all network parameters	2	2	-	1	2	-	-	-	-	2	2	2
		Network Analysis	CO1	Apply fundamental laws and theorems to compute electrical variables of DC circuits	3	3										
			CO2	Analyze electrical networks during transients in the Laplace domain	3	3	2									
			CO3	Apply fundamental laws and theorems to compute electrical variables of AC electrical circuits	3	3										
			CO4	Analyse resonance circuits	3	2	1									
			CO5	Evaluate variables associated with magnetic circuits	3	2	1									
21	23EC01		CO6	Compute the parameters of a two-port network	3	3	1	1								
		Electrical Circuit Analysis-I	CO1	Understand various circuit elements and network reduction techniques	3	2	-	-	-	-	-	-	-	-	-	-
			CO2	Compute variables associated with magnetic circuits	3	2	2	-	-	-	-	-	-	-	-	-
			CO3	Apply fundamental laws to compute electrical variables in DC&AC circuits	3	2	2	-	-	-	-	-	-	-	-	-
			CO4	Analyze resonance circuits and construct locus diagrams	3	2	2	-	-	-	-	-	-	-	-	-
22	23EE02		CO5	Apply circuit theorems to compute electrical variables in DC&AC circuits	3	2	2	-	-	-	-	-	-	-	-	-
		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
23	23ME02		CO5	Solve the problems involving the translational and rotational motion of rigid bodies.	3	2	-	1	-	-	-	-	-	-	-	3

Sl. No	Code	Course	CO	Course Outcome												
24	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
			CO2	Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.	3				3	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
25	23CE51	Engineering Mechanics And Building Practices	CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller	2	-	-	-	-	-	-	-	-	-	-	1
			CO2	Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.	2	-	-	-	-	-	-	-	-	-	-	1
			CO3	Determine the Centre of gravity and Moment of Inertia of different configurations	3	2		2	-	-	-	-	-	-	-	1
26	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	-	-	-	-	-	-	-
27	23CS52	Data Structures Lab	CO1	Apply Linear Data Structures for organizing the data efficiently	3	2	2	1	3	-	-	-	-	-	-	-
			CO2	Apply Non-Linear Data Structures to organize data efficiently	3	2	2	1	3	-	-	-	-	-	-	-
			CO3	Develop and implement hashing techniques for solving problems	3	2	2	1	3	-	-	-	-	-	-	-
			CO4	Improve individual / teamwork skills, communication and report writing skills with ethical values.	-	-	-	-	-	-	-	2	2	2	2	2

#	Code	Activity	CO	CO Statement												
		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
28	23AU01		CO5	Develop leadership skills and civic responsibilities. (Applying Level L3)						3		3	3	3	-	1
		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 nalyzing 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
29	23AU02		CO5	Develop leadership skills and civic responsibilities. (Applying Level L3)	-	-	-	-	-	3	2	3	2	3	-	1

Head of the Department