

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr M B S Sreekara Reddy

**Course Name & Code** : CAD/CAM & 23ME28

**Regulation:** R23

**L-T-P Structure** : 3-0-0

**Credits:** 2

**Program/Sem/Sec** : B.Tech VII SEM

**A.Y.:** 2026-2027

**PREREQUISITE:** Engineering Graphics, Manufacturing Processes, Design of Machine Elements

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The student will acquire knowledge to understand and apply CAD/CAM, computer graphics, modeling techniques, CNC programming, group technology, flexible manufacturing systems, and computer-integrated manufacturing concepts in engineering product design and manufacturing applications.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Illustrate the role of Computer-Aided Design (CAD) and the application of geometric transformations in engineering graphics. ( <b>Understanding-L2</b> )
<b>CO2</b>	Differentiate various geometric modeling techniques and basic wireframe and surface geometries. ( <b>Understanding-L2</b> )
<b>CO3</b>	Develop solid models and CNC part programs using manual and APT programming methods. ( <b>Applying-L3</b> )
<b>CO4</b>	Apply coding and classification systems for manufacturing components and utilize the concepts of Flexible Manufacturing System (FMS) layouts and control systems. ( <b>Understanding-L2</b> )
<b>CO5</b>	Differentiate the components of Computer Integrated Manufacturing Systems (CIMS) and variant and generative process planning approaches. ( <b>Understanding-L2</b> )

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	1	1			1							1		2	
C02	1	1	2	2	3							1		3	
C03	1	1	2	1	3							1		3	
C04	1	2	2	2	1						1			3	
C05	1	1	1	1	1						1			3	
	1 - Low			2 -Medium				3 - High							

**TEXTBOOKS:**

1. Automation, Production systems & Computer integrated Manufacturing/  
M.P. Groover/Pearson Education.
2. Mastering CAD / CAM / Ibrahim Zeid / McGraw-Hill.

**REFERENCE BOOKS:**

<b>R1</b>	Mikel P.Groover and Emory W.Zimmers, CAD/CAM-Prentice Hall of India Private Ltd. New Delhi,
<b>R2</b>	P.Radhakrishnan,S.Subramanyam&V.Raju,CAD/CAM/CIM, New Age International Publishers,
<b>R4</b>	Ibrahim Zeid and R. Sivasubramanian, CAD/CAM theory and practice, Tata McGraw Hill Publishing Co. Ltd,New Delhi
<b>R5</b>	Tien-Chienchang, Richard A.Wysk and HSU-Pin (Ben) Wang, –Computer Aided Manufacturing, 3 <sup>rd</sup> Edition.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section - A****UNIT-I: FUNDAMENTALS OF CAD, COMPUTER GRAPHICS**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to CAD/CAM, Automation	1	30-06-2026		TLM 2	
2.	Conventional Design & Computer Aided design processes	1	03-07-2026		TLM 1	
3.	Product Life Cycle & Role of CAD and CAM.	1	04-07-2026		TLM 1	
4.	Benefits of CAD in product design and product development cycle.	1	07-07-2026		TLM 1	
5.	Computer Graphics- Introduction , Database structure	1	10-07-2026		TLM 2	
6.	Functions of a graphics package, Raster scan graphics	1	14-07-2026		TLM 2	
7.	Transformation of geometry- 2D	1	17-07-2026		TLM 1	
8.	Transformation of geometry- 3D	1	18-07-2026		TLM 1	
9.	Problems on Transformations	1	21-07-2026		TLM 1	
<b>No. of classes required to complete UNIT-I: 09</b>				<b>No. of classes taken:</b>		

**UNIT-II: GEOMETRIC MODELING: REPRESENTATION OF CURVES, SURFACES AND SOLIDS**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Geometric Modelling: Introduction	1	24-07-2026		TLM 2	
11.	Wireframe Modelling : Introduction, Advantages &	1	25-07-2026		TLM 2	

	Disadvantages, Wireframe Entities				
12.	Parametric representation of analytical curves	1	28-07-2026		<b>TLM 1</b>
13.	Parametric representation of synthetic curves	1	31-07-2026		<b>TLM 1</b>
14.	Surface representation: Introduction, Advantages & Disadvantages, Entities	1	01-08-2026		<b>TLM 2</b>
15.	Parametric modeling of Analytical surface entities	1	04-08-2026		<b>TLM 1</b>
16.	Parametric modeling of Synthetic surface entities	1	07-08-2026		<b>TLM 1</b>
17.	Solid modeling : Introduction, Solid Entities	1	11-08-2026		<b>TLM 2</b>
18.	Constructive Solid Geometry, Advantages & Disadvantages of Solid Modeling	1	14-08-2026		<b>TLM 1</b>
<b>No. of classes required to complete UNIT-II: 9</b>				<b>No. of classes taken:</b>	

### UNIT-III: COMPUTER NUMERICAL CONTROL, PART PROGRAMMING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	Numerical control: Introduction, NC Modes, NC elements ,N C Coordinate systems	1	18-08-2026		<b>TLM 2</b>	
20.	CNC machine tools and their applications	1	21-08-2026		<b>TLM 2</b>	
21.	Parts and Power transmission of CNC Machine tools, Features of Machining & Turning centres.	1	22-08-2026		<b>TLM 2</b>	
22.	CNC Part programming: Fundamentals, Manual part programming	1	01-09-2026		<b>TLM 1</b>	
23.	Computer Aided Part programming, APT Language	1	05-09-2026		<b>TLM 1</b>	
24.	Simple problems in manual & Computer Aided Part programming	1	08-09-2026		<b>TLM 1</b>	
25.	Part programming example	1	11-09-2026		<b>TLM 1</b>	
<b>No. of classes required to complete UNIT-III: 07</b>				<b>No. of classes taken:</b>		

### UNIT-IV: GROUP TECHNOLOGY, FLEXIBLE MANUFACTURING SYSTEM

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Group Technology: Introduction	1	15-09-2026		<b>TLM 2</b>	
27.	Coding and classification schemes-OPITZ, MICLASS and CODE system	1	18-09-2026		<b>TLM 2</b>	

28.	Example on GT coding	1	19-09-2026		<b>TLM 1</b>	
29.	Benefits, Production Flow Analysis, Advantages and limitations	1	22-09-2026		<b>TLM 2</b>	
30.	Flexible Manufacturing System: Introduction, Types, Equipment	1	25-09-2026		<b>TLM 2</b>	
31.	FMS components, FMS layouts, Benefits	1	26-09-2026		<b>TLM 2</b>	
32.	FMS Control: Planning & Implementation	1	29-09-2026		<b>TLM 2</b>	
<b>No. of classes required to complete UNIT-IV: 07</b>				<b>No. of classes taken:</b>		

### UNIT-V: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	CAQC: Introduction, Types of manufacturing systems	1	03-10-2026		<b>TLM 2</b>	
34.	Machine tools and related equipment , Material handling system	1	06-10-2026		<b>TLM 2</b>	
35.	Material Requirement Planning, Computer Control System	1	09-10-2026		<b>TLM 2</b>	
36.	Human labour in manufacturing systems, CIM benefits	1	13-10-2026		<b>TLM 2</b>	
37.	CAQC	1	16-10-2026		<b>TLM 2</b>	
38.	CAPP: Generative & Retrieval	1	17-10-2026		<b>TLM 2</b>	
39.	Implementation consideration.	1	27-10-2026		<b>TLM 2</b>	
<b>No. of classes required to complete UNIT-V: 07</b>				<b>No. of classes taken:</b>		

### CONTENT BEYOND SYLLABUS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Awareness on Industry related skills related to CAD/CAM	2	30-10-2026 & 31-10-2026		<b>TLM2</b>	

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## Academic Calander: 2026-27

Description	From	To	Weeks
B.Tech VII semester			
Commencement of class work	29-06-2026		
I phase of Instructions	29-06-2026	22-08-2026	8 weeks
I Mid examinations	24-08-2026	29-08-2026	1 week
II phase of Instructions	31-08-2026	31-10-2026	8 weeks
II Mid examinations	02-11-2026	07-11-2026	1 week
Preparation and practical's	09-11-2026	14-11-2026	1 week
Semester end examinations	16-11-2026	28-11-2026	2 weeks

### PART-C

#### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III,IV & V)	M2=15
II-Quiz Examination (UNIT-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

### PART-D

#### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.
PEO 2	To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.
PEO 3	To develop inquisitiveness towards good communication and lifelong learning.

#### PROGRAMME OUTCOMES (POs):

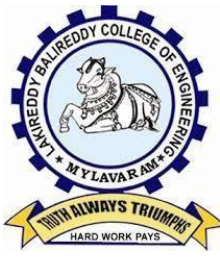
PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design/development of solutions:</b> 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.
PO 4	<b>Conduct investigations of complex problems:</b> 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.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	<b>The engineer and society:</b> 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.
PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> 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.
PO 11	<b>Project management and finance:</b> 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.
PO 12	<b>Life-long learning:</b> 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.

#### PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr M B S S Reddy	Dr M B S S Reddy	Mr J Subba Reddy	Dr M B S S Reddy
Signature				



# LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier-I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. And Affiliated to JNTUK, Kakinada

L.B.REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521230.

Phone: 08659-222933, Fax: 08659-222931

**DEPARTMENT OF MECHANICAL ENGINEERING**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor :** Dr.K.DILIP KUMAR, Professor

**Course Name & Code :** Operations Research - 23ME29

**Regulation:** R23

**L-T-P Structure :** 4-0-0

**Credits:** 03

**Program/Sem/Sec :** B.Tech- ME VII Sem

**A.Y.:** 2026-27

**PREREQUISITE :** MATHEMATICS

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** The objective of this course is to introduce the concepts of formulating an engineering problem into mathematical model to develop an optimal solution.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

CO1	Apply linear programming approach for optimizing the objectives of industrial oriented problems. <b>(Applying-L3)</b>
CO2	Formulate and solve transportation models and assignment models. <b>(Applying-L3)</b>
CO3	Implement the strategies in competitive situations and able to sequence the jobs to be processed on machines. <b>(Applying-L3)</b>
CO4	Identify the replacement period of the equipment and analyze the waiting situations in an organization. <b>(Applying-L3)</b>
CO5	Determine the optimum inventory level and resolve the complex problem into simple problems by dynamic programming approach and apply optimum strategies. <b>(Applying-L3)</b>

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				3			3		3	
CO2	3	3	1	2	1				3			3		3	
CO3	3	3	3	2	1				3			3		3	
CO4	3	2	3	2	3				1			3		3	
CO5	2	3	3	2	1				1			3		3	

### **TEXT BOOKS:**

T1	S.D Sharma, —Operation Research, Kedar Nath and RamNath - Meerut, 2008.
T2	Operations Research / N.V.S. Raju / SMS, 2009.

## REFERENCE BOOKS:

<b>R1</b>	Singiresu S Rao, Engineering Optimization: Theory and Practice, A Wiley- Interscience Publication, 4 <sup>th</sup> edition, 2009.
<b>R2</b>	Hiller & Libermann, Introduction to O.R (TMH), 9 <sup>th</sup> EDITION, 2009.
<b>R3</b>	Kantiswarup. P.K.Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Educational Publications, New Delhi, 14 <sup>th</sup> Edition, 2008.
<b>R4</b>	A.M.Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research, Pearson Education, 2 <sup>nd</sup> edition, 2014.
<b>R5</b>	Taha, Introduction to O.R .PHI, 9 <sup>th</sup> edition, 2010.

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN): Section-A

#### UNIT-I: INTRODUCTION & LINEAR PROGRAMMING

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	<b>INTRODUCTION:</b> Introduction To ORT & CEO, COs	1	29.06.2026		TLM1/TLM2	
2.	Definition, characteristics and phases Types of operation research models, Applications.	1	30.06.2026		TLM1/TLM2	
3.	<b>Linear Programming Problem (LPP):</b> Formulation	1	02.07.2026		TLM1	
4.	Numericals	1	04.07.2026		TLM1	
5.	Graphical Solution for Special Cases Of LPP	1	06.07.2026		TLM1	
6.	Simplex Method	1	07.07.2026		TLM1	
7.	Numericals	1	09.07.2026		TLM1	
8.	Numericals	1	11.07.2026		TLM1	
9.	Artificial variable techniques	1	13.07.2026		TLM1	
10.	Numericals	1	14.07.2026		TLM1	
11.	Two Phase Simplex Method Numericals	1	16.07.2026		TLM1	
12.	Big M method, Numericals	1	18.07.2026		TLM1	
13.	Duality principle,	1	20.07.2026		TLM1	
14.	Numericals	1	21.07.2026		TLM1	
<b>No. of classes required to complete UNIT-I:</b>		<b>14</b>		<b>No. of classes taken:</b>		

#### UNIT-II: TRANSPORTATION PROBLEMS & SEQUENCING

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Introduction To TP, Terminology, Formulation	1	23.07.2026		TLM1/TLM2	
16.	Optimal solution, Unbalanced TP	1	25.07.2026		TLM1	
17.	Numericals	1	27.07.2026		TLM1	
18.	Degeneracy, assignment problem formulation	1	28.07.2026		TLM1	
19.	Numericals	1	30.07.2026		TLM1	

20.	Test For Optimality: Stepping Stone Method, Modified Distribution Method (MODI Method)	1	01.08.2026		TLM1	
21.	Numericals	1	03.08.2026		TLM1	
22.	Introduction to Assignment Problem	1	04.08.2026		TLM1	
23.	Variants of Assignment Problems	1	06.08.2026		TLM1	
24.	Optimal Solution, Numericals	1	08.08.2026		TLM1	
25.	Travelling Salesmen Problem, Numericals	1	10.08.2026		TLM1	
26.	SEQUENCING: introduction, flow	1	11.08.2026		TLM1	
27.	Shop sequencing, n jobs through two machines	1	13.08.2026		TLM1	
28.	Numericals	1	17.08.2026		TLM1	
29.	N jobs through three machines, Job shop sequencing	1	18.08.2026		TLM1	
30.	Two jobs through m machines	1	20.08.2026		TLM1	
31.	Numericals	1	22.08.2026		TLM1	
No. of classes required to complete UNIT-II		17		<b>No. of classes taken:</b>		

### UNIT-III: REPLACEMENT AND THEORY OF GAMES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	<b>Introduction to Games Theory:</b> Terminology	1	31.08.2026		TLM1/TLM2	
33.	Minimax or Maxmini Criterion, Optimal Strategy	1	01.09.2026		TLM1	
34.	Solution of games with saddle point	1	03.09.2026		TLM1	
35.	Rectangular games without saddle point, Numericals	1	05.09.2026		TLM1	
36.	2x2 games, mx2, 2xn, mxn games, Dominance Principle,	1	07.09.2026		TLM1	
37.	Graphical approach, Numericals	1	08.09.2026		TLM1	
38.	<b>REPLACEMENT:</b> Introduction, replacement of items that deteriorate with time When money value is not counted and counted	1	10.09.2026		TLM1	
39.	Numericals	1	12.09.2026		TLM1	
40.	Replacement of items that fail completely	1	15.09.2026		TLM1	
41.	Group replacement,	1	17.09.2026		TLM1	
42.	Numericals	1	19.09.2026		TLM1	
No. of classes required to complete UNIT-III		11		<b>No. of classes taken:</b>		

### UNIT-IV: QUEUEING THEORY, INVENTORY CONTROL

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--------	----------------------	-------------------------	------------------------------	---------------------------	---------------------------	-----------------

44.	<b>QUEUEING THEORY:</b> Introduction, single channel, poison arrivals	1	21.09.2026		TLM1/TLM2	
45.	Numericals	1	22.09.2026		TLM1	
46.	Exponential service times with infinite population and finite population models	1	24.09.2026		TLM1	
47.	Numericals	1	26.09.2026		TLM1	
48.	Multi channel, poison arrivals Numericals	1	28.09.2026		TLM1/TLM2	
49.	Exponential service times with infinite population single channel	1	29.09.2026		TLM1	
50.	Numericals	1	01.10.2026		TLM1/TLM2	
51.	<b>INVENTORY CONTROL:</b> introduction, single item, deterministic models ,Numericals	1	03.10.2026		TLM1	
52.	Purchase inventory models with one price break and multiple price breaks Shortages are not allowed	1	05.10.2026		TLM1	
53.	Numericals	1	06.10.2026		TLM1	
54.	Stochastic models, demand may be discrete variable or continuous variable, Numericals	1	08.10.2026		TLM1/TLM2	
55.	Instantaneous demand and continuous demand and set up cost, ABC & VED analysis,	1	10.10.2026		TLM1	
56.	Numericals	1	12.10.2026		TLM1/TLM2	
<b>No. of classes required to complete UNIT-IV</b>		13		<b>No. of classes taken:</b>		

#### UNIT-V: INVENTORY MODELS AND DYNAMIC PROGRAMMING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
61.	<b>DYNAMIC PROGRAMMING (DP):</b> Introduction To DP	1	13.10.2026		TLM1/TLM2	
62.	Bellman's Principle of Optimality, Applications of Dynamic Programming	1	15.10.2026		TLM1/TLM2	
63.	Shortest path problems ,Numericals	1	17.10.2026		TLM1	
64.	<b>SIMULATION:</b> Definition, types of simulation models	1	26.10.2026		TLM1	
65.	Phases of simulation, Numericals	1	27.10.2026		TLM1	
66.	Applications of simulation, inventory problems	1	29.10.2026		TLM1/TLM2	
67.	Numericals	1	31.10.2026		TLM1/TLM2	
<b>No. of classes required to complete UNIT-V</b>		07		<b>No. of classes taken:</b>		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration(Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/ MOOCS)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## Academic Calendar

<b>Description</b>	<b>From</b>	<b>To</b>	<b>Weeks</b>
I Phase of Instructions	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
DUSHEERA HOLIDAYS	19-10-2026	24-10-2026	1
II Phase of Instructions	26-10-2026	31-10-2026	1
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

**PART-C**

**EVALUATION PROCESS (R20 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II-Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus),IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1),(M2+Q2+A2))+20% of Min((M1+Q1+A1),(M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE):M	30
Semester End Examination (SEE)	70
Total Marks = CIE+SEE	100

## PART-D

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology.
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner.

### PROGRAMME OUTCOMES (POs):

<b>PO1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3</b>	<b>Design/development of solutions:</b> 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.
<b>PO4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO5</b>	<b>Modern tool usage:</b> 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.
<b>PO6</b>	<b>The engineer and society:</b> 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.
<b>PO7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Communication:</b> 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.
<b>PO11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the ring 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.
<b>PO12</b>	<b>Life-long learning:</b> 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.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Design and develop modern communication technologies for building the interdisciplinary skills to meet current and future needs of industry.
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools.
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	Kamala Priya B	Mr.V.Sankararao	Mr.J.Subba Reddy	Dr.M.B.S.Sreekara Reddy
<b>Signature</b>				





# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr.A. DHANUNJAY KUMAR

**Course Name & Code** : MECHATRONICS(23ME30)

**L-T-P Structure** :3-0-0

**Program/Sem/Sec** : B.Tech/VII/A

**Credits:** 3

**A.Y.:** 2026-27

**Course Objective:** The student will acquire knowledge of mechatronic system fundamentals, sensors, solid-state devices, signal conditioning, actuation systems, digital control systems, microcontrollers, PLCs, interfacing techniques, data acquisition, and digital signal processing for automation applications.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Illustrate the structure of mechatronic systems and identify various sensors used for measurement and control applications. <b>(Understanding-L2)</b>
<b>CO2</b>	Discuss the working principles of electronic devices and analog signal conditioning circuits using operational amplifiers. <b>(Understanding-L2)</b>
<b>CO3</b>	Analyze hydraulic, pneumatic, and electromechanical actuation systems and their components. <b>(Analyzing - L4)</b>
<b>CO4</b>	Develop basic control logic using microprocessors, microcontrollers, and PLCs. <b>(Applying-L3)</b>
<b>CO5</b>	Apply data acquisition, signal processing, and motor drive interfacing techniques in mechatronic systems. <b>(Applying-L3)</b>

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	2						1	1	2	2
CO2	3	2	1	2	3						1		3	2
CO3	3	3	2	2	2						1		3	3
CO4	2	3	3	2	3			1	1	1	2		3	2
CO5	2	2	3	2	3	1		1	1	1	3		3	2

#### **TEXTBOOKS:**

<b>T1</b>	MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran, GK Vijaya Raghavan & MS Balasundaram/WILEY India Edition.
-----------	---

#### **REFERENCE BOOKS:**

<b>R1</b>	Mechatronics /Smaili A, Mrad F/ Oxford Higher Education, Oxford University Press
<b>R2</b>	Mechatronics Source Book / Newton C Braga/Thomson Publications, Chennai.
<b>R3</b>	Mechatronics – N. Shanmugam / Anuradha AgenciesPublishers.
<b>R4</b>	Mechatronics System Design / Devdasshetty/Richard/Thomson.
<b>R5</b>	Mechatronics – Principles and Application / Godfrey C. Onwubolu/Elsevier, Indianprint
<b>R6</b>	Zsolt Nagy - Artificial Intelligence and Machine Learning Fundamentals-Apress (2018)

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: MECHATRONICS SYSTEMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	29-06-2026		TLM2	
2.	Elements & levels of mechatronics system	1	30-06-2026		TLM2	
3.	Mechatronics design process	1	02-07-2026		TLM2	
4.	system, measurement systems	1	03-07-2026		TLM2	
5.	control systems	1	04-07-2026		TLM2	
6.	<b>Tutorial-1</b>	1	06-07-2026		TLM3	
7.	microprocessor-based controllers	1	07-07-2026		TLM2	
8.	advantages and disadvantages of mechatronics systems	1	09-07-2026		TLM2	
9.	Sensors and transducer, types	1	10-07-2026		TLM2	
10.	displacement, position	1	11-07-2026		TLM1	
11.	proximity, velocity, motion	1	14-07-2026		TLM2	
12.	<b>Tutorial-2</b>	1	16-07-2026		TLM3	
13.	force, acceleration	1	17-07-2026		TLM1	
14.	torque, fluid pressure,	1	18-07-2026		TLM2	
15.	liquid flow, liquid level	1	20-07-2026		TLM2	
16.	temperature and light sensors.	1	21-07-2026		TLM1	
<b>No. of classes required to complete UNIT-I: 16</b>				<b>No. of classes taken:</b>		

#### UNIT-II: SOLID STATE ELECTRONIC DEVICES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	PN junction diode	1	23-07-2026		TLM2	
18.	BJT	1	24-07-2026		TLM1	
19.	FET	1	25-07-2026		TLM2	
20.	DIAC	1	27-07-2026		TLM2	
21.	TRIAC	1	28-07-2026		TLM1	
22.	LED	1	30-07-2026		TLM2	
23.	<b>Tutorial-3</b>	1	31-07-2026		TLM3	
24.	Analog signal conditioning	1	01-08-2026		TLM2	
25.	operational amplifiers	2	03-08-2026, 04-08-2026		TLM1	
26.	noise reduction	1	06-08-2026		TLM2	
27.	filtering	1	07-08-2026		TLM2	
28.	<b>Tutorial-4</b>	1	08-08-2026		TLM1	
<b>No. of classes required to complete UNIT-II: 13</b>				<b>No. of classes taken:</b>		

#### UNIT-III: HYDRAULIC AND PNEUMATIC ACTUATING SYSTEMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Fluid systems	1	10-08-2026		TLM2	
30.	Hydraulic systems	1	11-08-2026		TLM2	
31.	<b>Tutorial-5</b>	1	12-08-2026		TLM3	

32.	pneumatic systems	1	13-08-2026		TLM2	
33.	components	1	14-08-2026		TLM1	
34.	control valves	1	17-08-2026		TLM2	
35.	electro pneumatic	1	18-08-2026		TLM2	
36.	<b>Tutorial-6</b>	1	19-08-2026		TLM3	
37.	hydro-pneumatic	1	20-08-2026		TLM2	
38.	electrohydraulic servo systems	1	21-08-2026		TLM2	
39.	Mechanical actuating systems- basic principles and elements	1	22-08-2026		TLM2	
40.	electrical actuating systems-basic principles and elements	1	31-08-2026		TLM2	
<b>No. of classes required to complete UNIT-III: 12</b>				<b>No. of classes taken:</b>		

#### UNIT-IV: DIGITAL ELECTRONICS AND SYSTEMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Digital logic control	1	01-09-2026		TLM2	
42.	microprocessors	2	02-09-2026 03-09-2026		TLM1	
43.	micro controllers	2	05-09-2026 07-09-2026		TLM2	
44.	programming	1	08-09-2026		TLM2	
45.	<b>Tutorial-7</b>	1	09-09-2026		TLM3	
46.	process controllers	1	10-09-2026		TLM2	
47.	programmable logic controllers	2	11-09-2026 12-09-2026		TLM1	
48.	PLCs versus computers	1	15-09-2026		TLM2	
49.	application of PLCs for control	1	16-09-2026		TLM2	
50.	<b>Tutorial-8</b>	1	17-09-2026		TLM3	
<b>No. of classes required to complete UNIT-IV: 13</b>				<b>No. of classes taken:</b>		

#### UNIT-V: SYSTEM AND INTERFACING AND DATA ACQUISITION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Data Acquisition Systems	2	18-09-2026 19-09-2026		TLM2	
52.	Analog to Digital conversion	1	21-09-2026		TLM2	
53.	Digital to Analog conversion	1	22-09-2026		TLM2	
54.	<b>Tutorial-9</b>	1	23-09-2026		TLM3	
55.	Digital Signal Processing	2	24-09-2026 25-09-2026		TLM2	
56.	data flow in DSP	1	26-09-2026		TLM1	
57.	block diagrams	2	28-09-2026 29-09-2026		TLM2	
58.	typical layouts	2	30-09-2026 01-10-2026		TLM2	
59.	Interfacing motor drives	2	03-10-2026 05-10-2026		TLM2	

60.	Design of mechatronics systems & future trends.	2	06-10-2026 07-10-2026		TLM2	
61.	<b>Tutorial-10</b>	1	08-10-2026		TLM3	
<b>No. of classes required to complete UNIT-V: 17</b>				<b>No. of classes taken:</b>		

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### VALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, IV & V)	Q2=10
<b>Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	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.
<b>PO 4</b>	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.
<b>PO 5</b>	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.
<b>PO 6</b>	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.
<b>PO 7</b>	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in

	multidisciplinary settings.
<b>PO 10</b>	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.
<b>PO 11</b>	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.
<b>PO 12</b>	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.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	To apply the principles of thermal sciences to design and develop various thermal systems.
<b>PSO 2</b>	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
<b>PSO 3</b>	To apply the basic principles of mechanical engineering design or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Dr.A. DHANUNJAY KUMAR</b>	<b>Dr.A. DHANUNJAY KUMAR</b>	<b>J. SUBBA REDDY</b>	<b>Dr.M.B.S.S REDDY</b>
<b>Signature</b>				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr.Seelam Pichi Reddy

**Course Name & Code** : Smart Manufacturing & 23ME35

**L-T-P Structure** : 3-0-0

**Program/Sem/Sec** : B.Tech, VII Sem

**Credits:** 3

**A.Y.:** 2026-27

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The student will acquire knowledge of smart and circular manufacturing, smart machines and sensors, cyber-physical systems, digital twin technology, AI and ML applications, and IoT communication protocols in industrial automation and smart factories.

#### **COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Discuss the fundamental of smart manufacturing, Industry 4.0 and Industry 5.0. (Understanding-L2)
<b>CO2</b>	Identify smart sensors, subsystems, and interfaces used in IIoT-based manufacturing. (Understanding-L2)
<b>CO3</b>	Analyze CPS functions and compare traditional manufacturing with Industry 4.0 CPS based systems. (Analyzing-L4)
<b>CO4</b>	Explain digital twin implementation, AI/ML concepts for predictive maintenance in manufacturing. (Understanding-L2)
<b>CO5</b>	Understand and differentiate IoT network layers and protocols used in Industry 4.0 applications. (Understanding-L2)

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	1	-	2	2	--	--	--	--	2	--	3	1
<b>CO2</b>	3	2	2	1	3	--	--	--	--	--	2	--	3	2
<b>CO3</b>	3	3	2	2	3	1	--	--	--	--	2	--	3	2
<b>CO4</b>	3	2	2	2	3	1	--	--	--	--	3	1	3	3
<b>CO5</b>	3	2	1	1	3	--	--	--	--	--	2	--	2	1

#### **TEXTBOOKS:**

<b>T1</b>	Industry 4.0 The Industrial Internet of Things by Alasdair Gilchrist, Apress
<b>T2</b>	Industrial Internet of Things, Cyber Manufacturing System by Sabina Jeschke, Christian Brecher, Houbing Song Danda B. Rawat, Springer.

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: CONCEPTS OF SMART MANUFACTURING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction – CO's, CEO's	1	29-06-2026		TLM1, TLM2	
2.	Importance of smart manufacturing in modern era	1	01-07-2026		TLM1, TLM2	
3.	Definition and Key Characteristics of Smart Manufacturing	1	03-07-2026		TLM1, TLM2	
4.	Evolution of Manufacturing Systems	1	04-07-2026		TLM3, TLM2	
5.	Corporate Adaptation Processes	1	06-07-2026		TLM1, TLM2	
6.	Manufacturing Challenges in Modern Industries	1	08-07-2026		TLM1, TLM2	
7.	Challenges vs Technologies in Smart Manufacturing Introduction to Smart Manufacturing	1	10-07-2026		TLM1, TLM2	
8.	Overview of Circular Manufacturing and Stages of Smart Manufacturing	1	13-07-2026		TLM1, TLM2	
9.	Six Big Losses in Manufacturing and Industry 4.0 Solutions	1	15-07-2026		TLM1, TLM2	
10.	Industry 5.0 Concepts, Benefits and Unit-I Discussion	1	17-07-2026		TLM1, TLM2	
11.	Definition and Key Characteristics of Smart Manufacturing	1	18-07-2026		TLM3, TLM2	
12.	Case study on Tesla, Siemens, Bosch, or Tata Motors smart factories	1	20-07-2026		TLM4	
<b>No. of classes required to complete UNIT-I: 12</b>				<b>No. of classes taken:</b>		

#### UNIT-II: SMART MACHINES AND SMART SENSORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to Smart Machines	1	22-07-2026		TLM1, TLM2	
14.	Functions and Characteristics of Smart Machines	1	24-07-2026		TLM1, TLM2	
15.	Machine Salient Features	1	25-07-2026		TLM3, TLM2	
16.	Critical Subsystems of Smart Machines	1	27-07-2026		TLM1, TLM2	
17.	Introduction to Smart Sensors	1	29-07-2026		TLM1, TLM2	
18.	Smart Sensor Ecosystem	1	31-07-2026		TLM1, TLM2	
19.	Need of Sensors in Industry	1	01-08-2026		TLM3, TLM2	
20.	Benefits of Sensors in Industry	1	03-08-2026		TLM1, TLM2	
21.	Industrial Applications of Smart Sensors	1	05-08-2026		TLM1, TLM2	
22.	Sensing for Manufacturing Process in IIoT	1	07-08-2026		TLM1, TLM2	
23.	Sensing for Manufacturing Process in IIoT	1	10-08-2026		TLM1, TLM2	
24.	IoT Sensing Device Block Diagram and Components	1	12-08-2026		TLM3, TLM2	
25.	Sensors in IIoT Applications and Smart Machine Interfaces	1	14-08-2026		TLM1, TLM2	
26.	Draw and explain the block diagram of an IoT sensing system; build a simple sensor monitoring setup	1	17-08-2026		TLM4	
<b>I Mid Examination -24-08-2026 TO 29-08-2026</b>						
<b>No. of classes required to complete UNIT-II: 14</b>				<b>No. of classes taken:</b>		

**UNIT-III: ARCHITECTURE OF CYBER-PHYSICAL SYSTEM (CPS)**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Introduction to Cyber Physical Systems (CPS)	1	19-08-2026		TLM1, TLM2	
28.	Functions of CPS	1	21-08-2026		TLM1, TLM2	
29.	Overview of 5C Architecture	1	22-08-2026		TLM3, TLM2	
30.	Smart Connection Level	1	31-08-2026		TLM1, TLM2	
31.	Data-to-Information Level	1	02-09-2026		TLM1, TLM2	
32.	Cyber Level	1	05-09-2026		TLM3, TLM2	
33.	Cognition Level, Configuration Level	1	07-09-2026		TLM3, TLM2	
34.	Design of PHM-Based CPS Systems	1	09-09-2026		TLM1, TLM2	
35.	Comparison of Traditional Factory and Industry 4.0 Factory	1	11-09-2026		TLM1, TLM2	
36.	Group activity to compare conventional and smart factories using charts/posters	1	16-09-2026		TLM4	
<b>No. of classes required to complete UNIT-III: 10</b>				<b>No. of classes taken:</b>		

**UNIT-IV: DIGITAL TWIN**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction to Digital Twin	1	18-09-2026		TLM3, TLM2	
38.	Components and Working of Digital Twin, Applications of Digital Twin	1	19-09-2026		TLM3, TLM2	
39.	Impact Zones in Manufacturing Plants	1	21-09-2026		TLM1, TLM2	
40.	Digital Twin Applications in OEMs	1	23-09-2026		TLM1, TLM2	
41.	Advantages and Challenges of Digital Twin	1	25-09-2026		TLM3, TLM2	
42.	Basic Steps in Digital Twin Technology	1	26-09-2026		TLM3, TLM2	
43.	Introduction to Multiverse Concepts	1	28-09-2026		TLM1, TLM2	
44.	AR and VR Applications in Manufacturing	1	30-09-2026		TLM1, TLM2	
45.	AI & ML Concepts for Predictive Maintenance	1	03-10-2026		TLM3, TLM2	
46.	Demonstration videos or VR applications for assembly and maintenance	1	05-10-2026		TLM4	
<b>No. of classes required to complete UNIT-IV: 10</b>				<b>No. of classes taken:</b>		

**UNIT-V: IOT CONNECTIVITY FOR INDUSTRY 4.0**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Industrial Communication Requirements	1	07-10-2026		TLM1, TLM2	
48.	Industrial Communication Infrastructure. Overview of Industrial Networks.	1	09-10-2026		TLM3, TLM2	
49.	Mesh Networks in Industrial IoT, IoT Protocols and the Internet	1	12-10-2026		TLM1, TLM2	
50.	TCP/IP Model for Industry 4.0	1	14-10-2026		TLM1, TLM2	
51.	IoT Connectivity Standards and Common Protocols	1	16-10-2026		TLM1, TLM2	

52.	Application Layer, Network Layer and Physical Layer Protocols	1	17-10-2026		TLM3,TLM2
53.	Comprehensive Revision and Case Studies	1	26-10-2026		TLM1,TLM2
<b>No. of classes required to complete UNIT-V: 07</b>				<b>No. of classes taken:</b>	

### Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
54.	Digital Twin Case Study	1	28-10-2026		TLM1,TLM2	
55.	Predictive Maintenance using AI/ML	1	30-10-2026		TLM1,TLM2	
56.	Smart Sensor Applications in Manufacturing	1	31-10-2026		TLM1,TLM2	

### Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### ACADEMIC CALENDER:

Commencement of Class work		29-06-2026	
I Phase of Instructions	29-06-2026	22-08-2026	8 W
I Mid Examinations	<b>24-08-2026</b>	<b>29-08-2026</b>	<b>1 W</b>
II Phase of Instructions	31-08-2026	31-10-2026	7 W
II Mid Examinations	<b>02-11-2026</b>	<b>07-11-2026</b>	<b>1 W</b>
Preparation and Practical's	09-11-2026	14-11-2026	1 W
Semester End Examinations	<b>16-11-2026</b>	<b>28-11-2026</b>	<b>2 W</b>

## PART-C

### EVALUATION PROCESS (R 23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I & II)	A1=5
I-Descriptive Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, IV & V)	Q2=10
<b>Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
<b>PO 3</b>	<b>Design/development of solutions:</b> Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
<b>PO 5</b>	<b>Engineering Tool Usage:</b> Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
<b>PO 6</b>	<b>The Engineer and The World:</b> Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
<b>PO 7</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
<b>PO 8</b>	<b>Individual and Collaborative Team work:</b> Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
<b>PO 9</b>	<b>Communication:</b> Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
<b>PO 10</b>	<b>Project Management and Finance:</b> Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
<b>PO 11</b>	<b>Life-Long Learning:</b> Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	To apply the principles of thermal sciences to design and develop various thermal systems.
<b>PSO 2</b>	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
<b>PSO 3</b>	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.S. Pichi Reddy	Dr.S. Pichi Reddy	J.Subba Reddy	Dr.M.B.S.Sreekara Reddy
Signature				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 21001:2018 Certified Institution

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

L.B. REDDY NAGAR, MYLAVARAM, N.T.R. DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF CIVIL ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor	: Mr. M. Karthik Kumar	
Course Name & Code	: DISASTER MANAGEMENT & 23CE81	
L-T-P Structure	: 3-0-0	Credits : 3
Program/Sem/Sec	: B.Tech., Mech/VII-Sem/A,	A.Y : 2026-27

**PRE-REQUISITE: NIL**

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course deals with different types of disasters, impacts of disasters, importance of technology in handling disaster management situations, importance of planning and risk prevention in case of occurrence of disaster, importance of education and community approach for the responsive actions to be taken in case of occurrence of disaster.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	Identify the usefulness of integrating management principles in disaster mitigation work ( <b>Understand-L2</b> ).
<b>CO 2</b>	Illustrate the different approaches needed to manage pre- during and post- disaster periods ( <b>Understand-L2</b> ).
<b>CO 3</b>	Identify and explain the process of risk management ( <b>Understand-L2</b> ).
<b>CO 4</b>	Evaluate the risk transfer Relate to importance of education and community approach for the responsive actions to be taken in case of disaster occurrence ( <b>Understand-L2</b> ).

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	-	1	2	1	-	-	-	-	-	1	2	1	2
<b>CO2</b>	1	1	1	2	2	1	-	-	-	-	-	1	2	1	2
<b>CO3</b>	1	-	-	1	2	1	1	1	-	-	-	1	1	1	2
<b>CO4</b>	1	-	-	1	1	1	1	1	1	1	1	1	1	1	2

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'

**1-** Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

#### **TEXT BOOKS:**

- T1** An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S. Vaidyanathan: CBS Publishers & Distributors Pvt.Ltd.
- T2** Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
- T3** ‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
- T4** ‘Disaster Management – Future Challenges and Opportunities’ by Jagbir Singh (2007), I K International Publishing House Pvt.Ltd.

#### **REFERENCE BOOKS:**

**R1** 'Disaster Management' edited by H K Gupta (2003), Universities press.

**R2** 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy (2009), Universities press. R. Nishith, Singh AK

**R3** "Disaster Management in India: Perspectives, Issues and strategies" New Royal Book Company."

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: Natural Hazards and Disaster Management

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction CO's & PO's, Subject	1	01/7/2026		TLM2	
2.	<b>Natural Hazards and Disaster Management:</b> Introduction of DM	1	02/7/2026		TLM2	
3.	Inter disciplinary nature of the subject	1	03/7/2026		TLM2	
4.	Disaster Management cycle	1	04/7/2026		TLM2	
5.	Five priorities for action	1	08/7/2026		TLM2	
6.	Case study methods - Vegetal Cover floods	1	09/7/2026		TLM2	
7.	Case study methods - Droughts	1	10/7/2026		TLM2	
8.	Case study methods - Earthquakes - landslides	1	15/7/2026		TLM2	
9.	Case study methods - Global warming - Cyclones	1	16/7/2026		TLM2	
10.	Case study methods - Tsunamis – Post Tsunami hazards along the Indian coast.	1	17/7/2026		TLM2	
11.	Revision	1	18/7/2026		TLM2	
<b>No. of classes required to complete UNIT-I: 11</b>				<b>No. of classes taken:</b>		

#### UNIT-II: Man Made Disaster and Their Management Along with Case Study Methods of the Following

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	<b>Man Made Disaster - Intro</b>	1	22/07/2026		TLM2	
13.	Man Made Disaster and Their Management	1	23/07/2026		TLM2	
14.	Case study methods - Fire hazards	1	24/07/2026		TLM2	
15.	Case study methods - transport hazard dynamics	1	25/07/2026		TLM2	
16.	Case study methods - solid waste management	1	29/07/2026		TLM2	
17.	Case study methods - post disaster	1	30/07/2026		TLM2	
18.	Case study methods - bio terrorism - threat in mega cities	1	31/07/2026		TLM2	
19.	Case study methods - rail and aircraft accidents	1	01/08/2026		TLM2	
20.	Case study methods - ground water, industries	1	05/08/2026		TLM2	
21.	Emerging infectious diseases	1	06/08/2026		TLM2	
22.	Aids and their management	1	07/08/2026		TLM2	
23.	Revision	1	12/08/2026		TLM2	
<b>No. of classes required to complete UNIT-II: 12</b>				<b>No. of classes taken:</b>		

### UNIT-III: Risk and Vulnerability

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	<b>Risk and Vulnerability:</b> Intro	1	13/08/2026		TLM2	
25.	Building codes	1	14/08/2026		TLM2	
26.	Land use planning	1	19/08/2026		TLM2	
27.	Social Vulnerability	1	20/08/2026		TLM2	
28.	Environmental vulnerability	1	21/08/2026		TLM2	
29.	Macro-economic management	1	22/08/2026		TLM2	
30.	Sustainable development	1	02/09/2026		TLM2	
31.	Climate change risk rendition	1	03/09/2026		TLM2	
32.	Financial management of disaster – related losses	1	05/09/2026		TLM2	
33.	Revision	1	09/09/2026		TLM2	
<b>No. of classes required to complete UNIT-III: 09</b>				<b>No. of classes taken:</b>		

### UNIT-IV: Role of Technology in Disaster Managements

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	<b>Role of Technology in Disaster Managements:</b> Intro	1	10/09/2026		TLM2	
35.	Disaster management for infra structures, taxonomy of infra structure	1	11/09/2026		TLM2	
36.	treatment plants and process facilities	1	16/09/2026		TLM2	
37.	electrical substations	1	17/09/2026		TLM2	
38.	roads and bridges	1	18/09/2026		TLM2	
39.	mitigation programme for earth quakes	1	11/09/2026		TLM2	
40.	geospatial information in agriculture drought assessment	1	19/09/2026		TLM2	
41.	Multimedia Technology in disaster risk management and training	1	23/09/2026		TLM2	
42.	Transformable Indigenous Knowledge in disaster reduction	1	24/09/2026		TLM2	
43.	Role of RS & GIS	1	25/09/2026		TLM2	
44.	Revision	1	26/09/2026		TLM2	
<b>No. of classes required to complete UNIT-IV:09</b>				<b>No. of classes taken:</b>		

### UNIT-V: Multi-sectional Issues, Education and Community Preparedness

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	<b>Multi-sectional Issues, Education and Community Preparedness - Intro</b>	1	30/09/2026		TLM2	
46.	Impact of disaster on poverty and deprivation	1	01/10/2026		TLM2	
47.	Climate change adaptation and human health	1	03/10/2026		TLM2	
48.	Exposure, health hazards and environmental risk	1	07/10/2026		TLM2	
49.	Forest management and disaster risk reduction	1	08/10/2026		TLM2	
50.	The Red cross and red crescent movement	1	09/10/2026		TLM2	
51.	Corporate sector and disaster risk reduction	1	14/10/2026		TLM2	

52.	Education in disaster risk reduction- Essentials of school disaster education	1	15/10/2026		<b>TLM2</b>
53.	Community capacity and disaster resilience	1	16/10/2026		<b>TLM2</b>
54.	Community based disaster recovery	1	17/10/2026		<b>TLM2</b>
55.	Community based disaster management and social capital	1	28/10/2026		<b>TLM2</b>
56.	Designing resilience	1	29/10/2026		<b>TLM2</b>
57.	Building community capacity for action	1	30/10/2026		<b>TLM2</b>
58.	Revision	1	31/10/2026		<b>TLM2</b>
<b>No. of classes required to complete UNIT-V: 13</b>				<b>No. of classes taken:</b>	

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### **PART-C**

#### **EVALUATION PROCESS (R23 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Objective Examination (Units-I & II)	O1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Objective Examination (Units-III, IV & V)	O2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =80% of Max(M1,M2)+20% of Min(M1,M2)	M=15
Objective Marks =80% of Max(O1,O2)+20% of Min(O1,O2)	O=10
Cumulative Internal Examination (CIE): A+M+O	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

PO No.	PO Statement
PO1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. (WK1 to WK4)
PO2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. (WK1 to WK4)
PO3	<b>Design/development of solutions:</b> 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. (WK5)
PO4	<b>Conduct investigations of complex problems:</b> 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. (WK8)
PO5	<b>Engineering Tool Usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 to WK6)
PO6	<b>The Engineer and The World:</b> Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. (WK9)
PO8	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9	<b>Communication:</b> 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.
PO10	<b>Project management and finance:</b> 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.
PO11	<b>Life-Long Learning:</b> Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

### **Knowledge and Attitude Profile (WK)**

- WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
- WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

- WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
- WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- WK9:** Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Possesses necessary skill set to analyse and design various systems using analytical and software tools related to civil engineering
<b>PSO 2</b>	Possesses ability to plan, examine and analyse the various laboratory tests required for the professional demands
<b>PSO 3</b>	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. M. Karthik Kumar</b>	<b>Dr. C. RAJAMALLU</b>	<b>Dr. M.B.S. Sreekar Reddy</b>
<b>Signature</b>			



## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	<b>History of Making of the Indian Constitution:</b> History,	1	30-06-2026		TLM2	
2.	Drafting Committee, (Composition & Working)	1	3-07-2026		TLM2	
3.	Philosophy of the Indian Constitution-	1	7-07-2026		TLM2	
4.	Preamble,	1	10-07-2026		TLM2	
5.	Salient, Features	1	14-07-2026		TLM2	
<b>No. of classes required to complete UNIT-I: 5</b>				<b>No. of classes taken:</b>		

#### UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
6.	<b>Contours of Constitutional Rights &amp; Duties:</b> Fundamental Rights,	1	17-07-2026		TLM2	
7.	Right to Equality, Right to Freedom,	1	21-07-2026		TLM2	
8.	Right against Exploitation, Right to Freedom of Religion,	1	24-07-2026		TLM2	
9.	Cultural and Educational Rights,	1	28-07-2026		TLM2	
10.	Right to Constitutional Remedies,	1	31-07-2026		TLM2	
11.	Directive Principles of State	1	4-08-2026		TLM2	
12.	Policy, Fundamental Duties.	1	7-08-2026		TLM2	
<b>No. of classes required to complete UNIT-II: 7</b>				<b>No. of classes taken:</b>		

#### UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	<b>Organs of Governance:</b> Parliament,	1	11-08-2026		TLM2	
14.	Composition, Qualifications and Disqualifications,	1	14-08-2026		TLM2	
15.	Powers and Functions,	1	18-08-2026		TLM2	
16.	Executive- President, Governor,	1	21-08-2026		TLM2	
17.	Council of Ministers, Judiciary,	1	1-09-2026		TLM2	
18.	Appointment and Transfer of Judges, Qualifications, Powers and Functions	1	8-09-2026		TLM2	
<b>No. of classes required to complete UNIT-III: 6</b>				<b>No. of classes taken:</b>		
<b>I-Mid Exams :</b>				<b>24-08-2026 to 29-08-2026</b>		

**UNIT-IV: IOT PHYSICAL DEVICES & ENDPOINTS**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	Local Administration: District's Administration head:	1	11-09-2026		TLM2	
20.	Role and Importance, Municipalities: Introduction,	1	15-09-2026		TLM2	
21.	Introduction, Mayor and role of Elected Representative	1	18-09-2026		TLM2	
22.	Zila Pachayat: Position and role,	1	22-09-2026		TLM2	
23.	Block level: Organizational Hierarchy (Different departments),	1	25-09-2026		TLM2	
24.	Village level: Role of Elected and Appointed officials,	1	29-09-2026		TLM2	
25.	Importance of grass root democracy	1	6-10-2026		TLM2	
<b>No. of classes required to complete UNIT-IV: 7</b>				<b>No. of classes taken:</b>		

**UNIT-V: IOT PHYSICAL SERVERS AND CLOUD OFFERINGS**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	<b>Election Commission:</b> Election Commission:	1	9-10-2026		TLM2	
27.	Role and Functioning, Chief Election Commissioner and	1	13-10-2026		TLM2	
28.	Election Commissioners,	1	16-10-2026		TLM2	
29.	<b>State Election Commission:</b> Role and Functioning,	1	16-10-2026		TLM2	
30.	Institute and Bodies for the welfare of SC/ST/OBC	1	27-10-2026		TLM2	
31.	Institute and Bodies for the welfare of women.	1	31-10-2026		TLM2	
<b>No. of classes required to complete UNIT-V: 6</b>				<b>No. of classes taken:</b>		
<b>II-Mid Exams :</b>				<b>02-11-2026 to 07-11-2026</b>		

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C****EVALUATION PROCESS (R17 Regulation):**

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10

Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

### PART-D

#### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering Problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, Natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> 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.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.

<b>PO 12</b>	<b>Life-long learning:</b> 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.
--------------	--

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	To apply the principles of thermal sciences to design and develop various thermal systems.
<b>PSO 2</b>	To apply the principles of manufacturing technology, scientific management towards Improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
<b>PSO 3</b>	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. S. Srinivasa Reddy</b>	<b>S. Srinivasa Reddy</b>	<b>Mr. J. Subba Reddy</b>	<b>Dr. M.B.S. Sreekara Reddy</b>
<b>Signature</b>				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Mr.K.V.Viswanadh/Mrs.B.Kamala Priya/Mr.K.venkateswra Reddy

**Course Name & Code** : CAD/CAM LAB & 23ME61

**Regulation:**R23

**L-T-P Structure** : 0-0-2-1

**Credits:** 1.5

**Program/Sem/Sec** : B.Tech/VII

**A.Y.:** 2026-27

**PREREQUISITE:** Computer Aided Machine Drawing, CAD/CAM

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The student will acquire knowledge of simulation based structural, thermal, and vibration analysis using FEA tools, CNC programming for lathe and milling operations, CAM software for tool path generation and G-code creation, rapid prototyping using 3D printing technologies, and virtual simulation of additive manufacturing processes.

#### **COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Apply finite element analysis techniques to evaluate structural, thermal, and dynamic behaviour of mechanical components and interpret engineering results such as stress, deflection, frequency, and buckling. <b>(Applying - L4)</b>
<b>CO2</b>	Develop and validate CNC part programs for basic turning and milling operations and demonstrate machining processes using simulation tools. <b>(Applying - L3)</b>
<b>CO3</b>	Generate, optimize, and verify tool paths and G-codes for prismatic components using CAM software and machining simulation packages. <b>(Applying - L3)</b>
<b>CO4</b>	Design, fabricate, and evaluate simple 3D printed components using rapid prototyping systems and virtual simulation platforms for process analysis. <b>(Analysing - L4)</b>

C

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3		2		3						2			3
CO2	2		3		3						2		3	
CO3			3		2						2		3	
CO4	2		2		3						2		3	2
	1 - Low			2 -Medium				3 - High						

**SOFTWARE PACKAGES:** ANSYS (FEA), CAM Softwares, CNC Simulator, Cura / any other slicing Software

#### **REFERENCES:**

- Lab Manuals

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### Schedule of Experiments

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	23761A0301-364, 24765A0301-307	64

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demonstration	3	29-06-2026		TLM4	
2.	Experiment-1	3	06-07-2026		TLM4	
3.	Experiment-2	3	13-07-2026		TLM4	
4.	Experiment-3	3	20-07-2026		TLM4	
5.	Experiment-4	3	27-07-2026		TLM4	
6.	Experiment-5	3	03-08-2026		TLM4	
7.	Demonstration	3	10-08-2026		TLM4	
8.	Experiment-6	3	17-08-2026		TLM4	
9.	Experiment-7	3	31-08-2026		TLM4	
10.	Experiment-8	3	07-09-2026		TLM4	
11.	Experiment-9	3	21-09-2026		TLM4	
12.	Experiment-10	3	28-09-2026		TLM4	
13.	Lab Internal	3	05-10-2026		TLM4	
14.	Capston project	3	12-10-2026		-	
<b>No. of classes required to complete:</b>				<b>No. of classes taken:</b>		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

#### ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	29/06/2026	22/08/2026	8
I Mid Examinations	24/08/2026	29/08/2026	1
II Phase of Instructions	31/08/2026	17/10/2026	7
Dassehra Holidays	19/10/2026	24/10/2026	1
II Phase of Instructions Contd...	26/10/2026	31/10/2026	1
II Mid Examinations	01/11/2026	07/11/2026	1
Preparation and Practicals	09/11/2026	14/11/2026	1
Semester End Examinations	16/11/2026	28/11/2026	2

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day Evaluation: A (Manual, Record, Viva)	1-10	A=15
Internal Lab Exams: B	1-10	B=15
<b>Cumulative Internal Examination : CIE=A+B</b>	<b>1-10</b>	<b>CIE=30</b>
<b>Semester End Examinations: SEE</b>	<b>1-10</b>	<b>SEE=70</b>
<b>Total Marks: CIE+SEE</b>	<b>1-10</b>	<b>100</b>

### LIST OF EXPERIMENTS:

Exp.No.	Name of the Experiment	Related CO
Exp1	Determination of deflection and stresses in 2D and 3D trusses and beams.	CO1
Exp2	Determination of principal and Von Mises stresses in plane stress, plane strain and axisymmetric components.	CO1
Exp3	Estimation of natural frequencies and mode shapes, harmonic response of 2D beam.	CO1
Exp4	Steady state heat transfer analysis of plane and axisymmetric components.	CO1
Exp5	CNC part programming for turned components	CO2
Exp6	CNC programming for milled components	CO2
Exp7	G-code generation using CAM software	CO3
Exp8	Simulation and verification of machining processes	CO3
Exp9	G-Code Generation from 3D Model	CO4
Exp10	Preparation of 3D printed components from G-Code	CO4

### NOTIFICATION OF CYCLE

Cycle	Exp.No.	Name of the Experiment	Related CO
CAD Software	Exp1	Determination of deflection and stresses in 2D and 3D trusses and beams.	CO1
	Exp2	Determination of principal and Von Mises stresses in plane stress, plane strain and axisymmetric components.	CO1
	Exp3	Estimation of natural frequencies and mode shapes, harmonic response of 2D beam.	CO1
	Exp4	Steady state heat transfer analysis of plane and axisymmetric components.	CO1
CNC Program	Exp5	CNC part programming for turned components	CO2
	Exp6	CNC programming for milled components	CO2
CAM Software	Exp7	G-code generation using CAM software	CO3
	Exp8	Simulation and verification of machining processes	CO3
3D Printing	Exp9	G-Code Generation from 3D Model	CO4
	Exp10	Preparation of 3D printed components from G-Code	CO4

## PART-D

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

<b>PEO 1</b>	To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.
<b>PEO 2</b>	To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.
<b>PEO 3</b>	To develop inquisitiveness towards good communication and lifelong learning.

### KNOWLEDGE ATTRIBUTES:

**WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

**WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

**WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

**WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the fore front of the discipline.

**WK5:** Knowledge, including efficient resource use, environmental impacts, whole life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

**WK6:** Knowledge of engineering practice (technology) in the practice area as in the engineering discipline.

**WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

**WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

**WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect.

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering Knowledge:</b> Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem Analysis:</b> Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
<b>PO 3</b>	<b>Design/Development of Solutions:</b> Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

<b>PO 4</b>	<b>Conduct Investigations of Complex Problems:</b> Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & Interpretation of data to provide valid conclusions. (WK8).
<b>PO 5</b>	<b>Engineering Tool Usage:</b> Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
<b>PO 6</b>	<b>The Engineer and The World:</b> Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal frame work, culture and environment. (WK1, WK5, and WK7).
<b>PO 7</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
<b>PO 8</b>	<b>Individual and Collaborative Team work:</b> Function effectively as an individual,and as a member or leader in diverse/multi-disciplinary teams
<b>PO 9</b>	<b>Communication:</b> Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation,make effective presentations considering cultural, language, and learning differences
<b>PO 10</b>	<b>Project Management and Finance:</b> Apply knowledge and understanding of engineeringmanagementprinciplesandeconomicdecision-makingandapplytheseto one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
<b>PO 11</b>	<b>Life Long Learning:</b> Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

#### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	To apply the principles of thermal sciences to design and develop various thermal systems.
<b>PSO 2</b>	To apply the principles of manufacturing technology, scientific management towards Improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
<b>PSO 3</b>	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>				
<b>Signature</b>	Mr.K.V.Viswanadh/ Mrs.B.Kamala Priya/ Mr.K.Venkateswra Reddy	Mr.K.V.Viswanadh	Mr.B.Sudheer Kumar	Dr.M.B.S.Sreekara Reddy



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr.A.Dhanunjay Kumar/ B. Kamala Priya /Dr. Ch.Siva Sankar Babu

**Course Name & Code** : Mechatronics Lab & 23MES4

**Regulation:**R23

**L-T-P Structure** : 0-0-4

**Credits:** 2

**Program/Sem/Sec** : B.Tech/VII

**A.Y.:** 2026-27

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The student will acquire knowledge of transducers and signal conditioning, PLC ladder logic programming, hydraulic and electro-pneumatic circuit design and simulation using Automation Studio, and modeling and simulation of control systems using MATLAB and SIMULINK.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Analyze and interpret the response of LVDT, strain gauges, opto transducers, and amplifiers. (Analyzing-L4)
<b>CO2</b>	Design and simulate PLC programs for sensors, actuators, and process control applications. (Analyzing-L4)
<b>CO3</b>	Create and simulate control circuits with various hydraulic and pneumatic configurations including PID-based position control. (Analyzing-L4)
<b>CO4</b>	Analyze control algorithms and system responses using MATLAB and SIMULINK. (Analyzing-L4)

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	1	2	3						1			2	2
<b>CO2</b>	2	3	3	2	3			1	1	1	2			3	3
<b>CO3</b>	2	3	3	3	3			1	1	1	2			3	3
<b>CO4</b>	2	3	2	3	3				1		3			2	3
	1 - Low			2 -Medium			3 - High								

#### **REFERENCES:**

- Lab Manuals

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### Schedule of Experiments

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	23761A0301-364, 24765A0301-308	70

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Mechatronics lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	4	01-07-2026		TLM4	
<b>Cycle-I</b>						
2.	Characteristics of LVDT	4	08-07-2026		TLM4	
3.	Principle & Characteristics of Strain Gauge	4	15-07-2026		TLM4	
4.	Ladder programming on Logic gates	4	22-07-2026		TLM4	
5.	Ladder programming on Timers	4	29-07-2026		TLM4	
6.	Ladder programming & Simulations of Virtual System of Traffic Light control	4	05-08-2026		TLM4	
7.	Ladder programming & Simulations of Virtual System of Water level control	4	12-08-2026		TLM4	
8.	Draw & Simulate Hydraulic circuits for series & parallel cylinders connection	4	19-08-2026		TLM4	
<b>Cycle-II</b>						
9.	Simulation for meter-in and meter-out hydraulic press & clamping using automation studio software	4	02-09-2026		TLM4	
10.	Using if else statement to calculate area of circle using MATLAB	4	16-09-2026		TLM4	
11.	To generate a 2-D plot and label the axis, add a title, turn on a grid, put a title and legend on the plot, and force the axis to a set range using MATLAB	4	23-09-2026		TLM4	
12.	To generate Stress Strain curves for the known stress and strain values using MATLAB	4	30-09-2026		TLM4	
13.	To solve Navier-Stokes equation using MATLAB	4	07-10-2026		TLM4	
14.	Revision	4	14-09-2026		TLM4	

15	Revision	4	28-10-2026	TLM4
<b>No. of classes required to complete:</b>			<b>No. of classes taken:</b>	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

#### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work = A	1,2,3,4,5,6,7,8...	A=15
Record = B	1,2,3,4,5,6,7,8	B=05
Internal Test = C	1,2,3,4,5,6,7,8	C = 15
<b>Cumulative Internal Examination: A + B + C = 30</b>	1,2,3,4,5,6,7,8	<b>30</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8	<b>D = 70</b>
<b>Total Marks: A + B + C + D = 100</b>	1,2,3,4,5,6,7,8	<b>100</b>

### PART-D

#### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

<b>PEO 1</b>	To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.
<b>PEO 2</b>	To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.
<b>PEO 3</b>	To develop inquisitiveness towards good communication and lifelong learning.

#### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> 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.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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.

#### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	To apply the principles of thermal sciences to design and develop various thermal systems.
<b>PSO 2</b>	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
<b>PSO 3</b>	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>				
<b>Signature</b>	<b>Dr.A.Dhanunjay Kumar / Mrs. B. Kamala Priya / Dr. Ch.Siva Sankar Babu</b>	<b>Dr.A.Dhanunjay Kumar</b>	<b>Mr.J.Subba Reddy</b>	<b>Dr.M.B.S.Sreekara Reddy</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade,

ISO 21001:2018, 50001:2018, 14001:2015 Certified Institution

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

L.B.REDDY NAGAR, MYLAVARAM. NTR District, AP, India. 521230.

hodads@lbrce.ac.in , ads@lbrce.ac.in , Phone: 08659-222933, Fax: 08659-222931

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor:** Mrs V SOWJANYA

**Course Name & Code** : Fundamentals of Deep Learning (23AMM3)

**L-T-P Structure** : 3-1-0

**Program/Sem/Sec** :IV B.Tech /I Sem/ Minor

**Credits:** 3

**A.Y.:** 2026-27

**PREREQUISITE:** Probability and Statistics, LATT, Machine Learning.

### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to make students learn the frameworks of deep learning and their application

**COURSE OUTCOMES (CO's):** After successful completion of the course the students are able to

<b>CO1</b>	Apply the fundamentals of linear algebra to machine learning algorithms. ( <b>Apply- L3</b> )
<b>CO2</b>	Understand the fundamental building blocks of deep learning ( <b>Understand- L2</b> )
<b>CO3</b>	Apply the concepts of Convolutional Neural Networks to computer vision applications. ( <b>Apply- L3</b> )
<b>CO4</b>	Apply the concepts of Recurrent Neural Networks to Natural Language Processing. ( <b>Apply- L3</b> )
<b>CO5</b>	Apply the regularization techniques to improve the model performance. ( <b>Apply- L3</b> )

### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	-	-	-	-	-	-	-	-	-	1	-	3
<b>CO2</b>	3	2	-	-	-	-	-	-	-	-	-	2	-	-
<b>CO3</b>	-	-	3	-	3	2	-	-	2	-	-	-	2	2
<b>CO4</b>	-	-	3	-	3	2	-	-	2	-	-	2	-	-
<b>CO5</b>	-	3		3	-	-	-	-	-	-	1	2	2	-

### **TEXTBOOKS:**

**T1** Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courville, MIT Press, 2016

**T2** Deep Learning with Python, Francois Chollet, Manning Publications, Released December 2017.

**T2** Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence – Jon Krohn, Grant Beyleveld, AglaéBassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821

**T4** Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

### **REFERENCE BOOKS:**

**R1** Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009

**R2** Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.

**R3** Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-HillEducation, 2004.

**e-Resources:**1. Swayam NPTEL: [https://onlinecourses.nptel.ac.in/noc22\\_cs22](https://onlinecourses.nptel.ac.in/noc22_cs22)**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Mathematical foundations of Deep Learning**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Syllabus, CEOs, COs, CO-PO mapping	1	3.7.2026		TLM 1&2	
2.	Mathematical foundations of Deep Learning	1	3.7.2026		TLM 1&2	
3.	Multiplying Matrices and Vectors	1	4.7.2026		TLM 1&2	
4.	Identity and Inverse Matrices	1	4.7.2026		TLM 1&2	
5.	Linear dependence and Span	1	10.7.2026		TLM 1&2	
6.	Norms	1	10.7.2026		TLM 1&2	
7.	Special kinds of matrices and vectors	1	11.7.2026		TLM 1&2	
8.	Trace operations	1	11.7.2026		TLM 1&2	
9.	Eigen Decomposition	1	17.7.2026		TLM 1&2	
10.	<b>UNIT CASE STUDY:</b> Reconstructing image matrices via top-k Eigenvalues	1	17.7.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-I: 10</b>				<b>No. of classes taken:</b>		

**UNIT-II: Fundamentals of Deep Learning**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Anatomy of Neural Networks: Artificial Neuron vs Biological Neuron	1	18.7.2026		TLM 1&2	
12.	Network Layers: Input, Hidden, Output configurations	1	18.7.2026		TLM 1&2	
13.	Deep Models & Feedforward Propagation mathematics	1	24.7.2026		TLM 1&2	
14.	Activation Functions: Sigmoid, Tanh, ReLU, Leaky ReLU.	1	24.7.2026		TLM 1&2	
15.	Loss Functions: MSE, Cross-Entropy, Hinge Loss	1	25.7.2026		TLM 1&2	
16.	<b>Training Deep Networks: Empirical Risk Minimization</b>	1	25.7.2026		TLM 1&2	
17.	Backpropagation & Gradient Descent computation loops.	1	31.7.2026		TLM 1&2	
18.	Optimizers: Stochastic Gradient Descent (SGD), Momentum, Adam.	1	31.7.2026		TLM 1&2	

19.	Types of Deep Neural Networks: Brief architectural taxonomy.	1	1.8.2026		TLM 1&2	
20.	<b>UNIT CASE STUDY:</b> Building a multi-layer perceptron using custom Adam settings	1	1.8.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-II: 10</b>				<b>No. of classes taken:</b>		

### UNIT-III: Convolutional Neural Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Motivation for CNNs: Locality, Stationarity, Parameter Sharing	1	7.8.2026		TLM 1&2	
22.	Convolution Operation: Kernels, Stride, Padding math	1	7.8.2026		TLM 1&2	
23.	Types of Convolutional Layers (Standard, Dilated)	1	8.8.2026		TLM 1&2	
24.	Pooling Operations: Max Pooling, Average Pooling boundaries	1	8.8.2026		TLM 1&2	
25.	Fully Connected (FC) Layer integration requirements	2	14.8.2026		TLM 1&2	
26.	<b>Classical Architectures: Introduction to LENET5 structural map</b>	1	21.8.2026		TLM 1&2	
27.	LENET5 Parameter calculations (Weights, Biases per layer)	1	21.8.2026		TLM 1&2	
28.	<b>UNIT CASE STUDY:</b> Training a modified LENET5 to classify medical imaging patches	2	22.8.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-III: 10</b>				<b>No. of classes taken:</b>		

### UNIT-IV: Recurrent Neural Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Architecture of traditional RNN	2	5.9.2026		TLM 1&2	
30.	Types and applications of RNN	2	11.9.2026		TLM 1&2	
31.	Variants of RNNs	2	12.9.2026		TLM 1&2	
32.	Word Embedding using Word2vec	4	18.9.2026 19.9.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-IV: 16</b>				<b>No. of classes taken:</b>		

### UNIT-V: Regularization and Autoencoders

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Introduction to Regularization for Deep Learning	1	25.9.2026		TLM 1&2	
34.	L1 and L2 Regularizations.	1	25.9.2026		TLM 1&2	
35.	Dropout implementation mechanics during training vs inference	1	26.9.2026		TLM 1&2	
36.	Data Augmentation strategies for image and text sets	1	26.9.2026		TLM 1&2	
37.	Early Stopping criteria and validation monitoring systems	1	3.10.2026		TLM 1&2	
38.	<b>UNIT CASE STUDY PART A:</b> Improving baseline CNN test accuracy on MNIST	1	3.10.2026		TLM 1&2	
39.	Autoencoders Architecture: Bottleneck, Encoder, Decoder pathways	1	9.10.2026		TLM 1&2	
40.	Implementation details of Vanilla Autoencoders	1	9.10.2026		TLM 1&2	
41.	Denoising Autoencoders: Reconstruction objective functions	1	10.10.2026		TLM 1&2	
42.	Sparse Autoencoders: L1 Activity constraints and KL-Divergence	1	10.10.2026		TLM 1&2	
43.	Industry Use cases: Anomaly detection, data synthesis	2	16.10.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-V: 12</b>				<b>No. of classes taken:</b>		

#### CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
44.	Denoising heavily corrupted MNIST pixels using autoencoders	2	30.10.2026		TLM 1&2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO1</b>	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	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.
<b>PO3</b>	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.
<b>PO4</b>	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.
<b>PO5</b>	Modern Tool Usage - Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO6</b>	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

<b>PO7</b>	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO8</b>	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO9</b>	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.
<b>PO10</b>	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.
<b>PO11</b>	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.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
<b>PSO 2</b>	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
<b>PSO 3</b>	To provide a concrete foundation and enrich their abilities for Employment and Higher studies in Artificial Intelligence and Data science with ethical values.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mrs V Sowjanya</b>	<b>Mrs V Sowjanya</b>	<b>Dr. O. Rama Devi</b>	<b>Dr. P. Bhagath</b>
<b>Signature</b>				