LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(An Autonomous Institution since 2010)
Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
L.B. Reddy Nagar, Mylavaram, NTR District, Andhra Pradesh - 521230

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : **Dr.V.Dhana Raju (T405)**
Course Name & Code : 20ME17
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., Mech Engg., VI-Sem., Section-A A.Y: 2024-25

PRE-REQUISITE: Thermodynamics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To learn the physical mechanisms on modes of heat transfer, differential equations in heat transfer applications and the significance of Non-Dimensional Numbers.

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

CO1	Understand the basic heat transfer principles and their practical relevance in Planes, Cylinders and Spherical components. **(Understanding - L2).**
CO2	Analyze steady and unsteady state heat transfer concepts and fins. **(Analyzing – L4).**
CO3	Formulate the expressions to solve free and forced convection problems related to external and internal flows. **(Applying -L3).**
CO4	Apply the concepts of heat transfer in boiling, condensation, and radiation thermal systems. **(Applying -L3).**
CO5	Design the simple heat exchanger for engineering applications using the data handbook. **(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
CO1	3	2	1	-	-	-	-	-	-	-	-	2	1	-	1
CO2	2	3	2	3	-	-	-	-	-	-	-	2	2	-	-
CO3	3	2	3	2	-	-	-	-	-	-	-	2	3	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	2	3	-	2
CO5	2	3	3	3	-	-	-	3	-	-	-	3	2	-	3

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

TEXTBOOKS

T1. R.C.Sachdeva - Fundamentals of Engineering Heat and Mass Transfer -New Age Science Publishers, 3nd Edition, 2009.

T2. Yunus. A. Cengel, Heat & Mass Transfer-A Practical Approach – Tata McGraw Hill, 4 edition, 2012.

T3. P.Holman, Heat transfer - Tata McGraw-Hill, 9th Edition, 2010

REFERENCE BOOKS:

1	M.NecatiOzisik, Heat Transfer- A basic Approach, 4thEdition, McGraw-Hill book company, 1985.
2	P.K.Nag, Heat and Mass Transfer- TMH 2ndEdition, 2007.
3	P.S.Ghoshdastidar, Heat Transfer - Oxford Higher Education 6th Edition 2011.
4	C.P.Kothandaraman and Subramanian, Heat and Mass Transfer, New Age International Publications 7thEdition 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION, ONE- DIMENSIONAL STEADY STATE CONDUCTION

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 Course and Course Outcomes (COs) and POs articulation matrix.	1	02-12-2024		TLM1	
2.	Introduction of five Units importance	1	03-12-2024		TLM1	
3.	Introduction to heat transfer and its applications, Basic Modes of Heat Transfer	1	04-12-2024		TLM1, TLM2 TLM5	
4.	Numerical problems on Modes of Heat Transfer - **Tutorial -I**	1	06-12-2024		TLM5	
5.	Basic laws of Heat Transfer-Steady, Unsteady and Periodic Heat Transfer	1	09-12-2024		TLM1, TLM4	
6.	General heat conduction equation in Cartesian coordinate system and its simplifications.	1	10-12-2024		TLM1	
7.	Fourier's law of heat conduction; Thermal conductivity.	1	11-12-2024		TLM1, TLM2	
8.	Numerical problems on plane wall, composite plane wall.	1	13-12-2024		TLM1,	
9.	General heat conduction equation in cylindrical coordinate system and its simplifications.	1	16-12-2024		TLM1	
10.	Numerical problems on cylinder and composite cylinder.	1	17-12-2024		TLM1,	
11.	General heat conduction equation in spherical coordinate system and its simplifications.	1	18-12-2024		TLM1, TLM2	
12.	Numerical problems on sphere and composite sphere	1	20-12-2024		TLM1,	
13.	Heat conduction through plane wall and cylinder with constant thermal conductivity– Numerical Problems. **Tutorial -2**	1	23-12-2024		TLM1, TLM2	
14.	Electrical analogy, thermal resistance, and overall heat transfer coefficient.	1	24-12-2024		TLM1, TLM2 TLM5	
15.	Numerical Problems on thermal resistance and overall heat transfer coefficient	1	27-12-2024		TLM1, TLM2	
16.	Heat transfer through composite slab and cylinder, Numerical Problems.	1	27-12-2024		TLM1, TLM2, TLM3	
17.	Critical radius of insulation for cylinder, Sphere and Applications. **Tutorial-3**	1	30-12-2024		TLM1, TLM2	
18.	Numerical Problems on critical radius of insulation	1	31-12-2024		TLM1 TLM2	
No. of classes required to complete UNIT-I: 18				No. of classes taken:		

UNIT-II: ONE DIMENSIONAL STEADY AND TRANSIENT STATE HEAT CONDUCTION:

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.	Derivation on heat flow through a plane wall, cylinder with variable thermal conductivity.	1	03-01-2025		TLM1	
2.	Numerical problems on variable thermal conductivity – plane wall and cylinder - **Tutorial-4**	1	03-01-2025		TLM1, TLM2	

3.	Derivation on Uniform Internal heat generation in slabs	1	04-01-2025		TLM1,	
4.	Numerical Problems on Uniform Internal heat generation in slabs.	1	06-01-2025		TLM1,	
5.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	07-01-2025		TLM1, TLM2	
6.	Extended surfaces - Classification	1	08-01-2025		TLM1,	
7.	and their applications; Thermal analysis of long Fins	1	10-01-2025		TLM1, TLM4	
8.	Thermal analysis of short fins with insulated tip.	1	10-01-2025		TLM1, TLM2	
9.	Numerical Problems on long and short fins.	1	17-01-2025		TLM1,	
10.	Fin efficiency and effectiveness	1	17-01-2025		TLM1,	
11.	Problems on Fin efficiency and effectiveness	1	20-01-2025		TLM1,	
12.	Systems with negligible internal Resistance (Lumped Heat Analysis), Significance of Biot and Fourier Numbers	1	21-01-2025		TLM1, TLM2	
13.	Numerical Problems, Heisler chart solutions **Tutorial-5**	1	22-01-2025		TLM1, TLM2	
14.	Basics of convective (Forced and Natural) heat transfer and Applications. Dimensional analysis and Buckingham Pi theorem applied to Forced Convection.	1	24-01-2025		TLM1, TLM2	
15.	Significance of Non-Dimensional Numbers.	1	24-01-2025		TLM3	
16.	Dimensional analysis and Buckingham Pi theorem applied to Natural Convection.	1	27-01-2025		TLM1,	
17.	Derivation of Buckingham Pi theorem applied to forced convection **Tutorial 6**	1	28-01-2025		TLM1,	
18.	Revision of the above two units.	1	31-01-2025		TLM1,	
No. of classes required to complete UNIT-II: 18				No. of classes taken:		

UNIT-III: CONVECTION

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.	Forced Convection heat transfer - Introduction The concept of boundary layer; Velocity and Thermal Boundary Layers,	1	10-02-2025		TLM1, TLM2	
2.	Numerical Problems on boundary layers.	1	11-02-2025		TLM1,	
3.	Forced convection analysis in external flows (Flow over a Flat Plate): Laminar and turbulent flows.	1	12-02-2025		TLM1, TLM2	
4.	Numerical Problems on flow through pipes. **Tutorial -7**	1	14-02-2025		TLM1,	
5.	Forced convection analysis in internal flows (Flow through circular pipe): Laminar and turbulent flows.	1	14-02-2025		TLM1, TLM2	
6.	Numerical Problems on Forced Convection, Reynolds Colburn Analogy.	1	17-02-2025		TLM1, TLM2	

7.	Natural convection: Development of Hydrodynamic and thermal boundary layer along vertical plate.	1	18-02-2025		TLM1, TLM2 TLM4	
8.	Development of Hydrodynamic and thermal boundary layer along horizontal plate,	1	19-02-2025		TLM1, TLM2	
9.	Forced convection in Vertical and horizontal plates	1	21-02-2025		TLM1,	
10.	Numerical Problems **Tutorial -8**	1	21-02-2025		TLM3	
11.	Numerical Problems	1	24-02-2025		TLM1,	
No. of classes required to complete UNIT-III:11				No. of classes taken:		

UNIT-IV: BOILING AND CONDENSATION, THERMAL RADIATION

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 boiling heat transfer and applications, Pool Boiling, Different regimes of boiling; Critical heat flux.	1	25-02-2025		TLM1, TLM2	
2.	Numerical problems on nucleate boiling, Critical heat flux conditions.	1	26-0-2025		TLM1, TLM2 TLM5	
3.	Condensation: Film wise and drop wise condensation, Laminar film wise condensation on Vertical plate	1	28-02-2025		TLM1, TLM2	
4.	Numerical Problems - **Tutorial-9**	1	28-02-2025		TLM3	
5.	Introduction and applications of Thermal Radiation, Emissive Power, Absorption, Reflection and Transmission and	1	03-03-2025		TLM1,	
6.	Definitions related to radiation, Concept of black and non-black bodies , Laws of black body radiation	1	05-03-2025		TLM1,	
7.	Emissivity, Kirchhoff's law, Shape Factors	1	06-03-2025		TLM1,	
8.	Radiation heat exchange between two black isothermal surfaces, Nonblack infinite parallel plates;	2	10-03-2025		TLM1,	
9.	Numerical Problems - **Tutorial-12**	1	12-03-2025		TLM1,	
No. of classes required to complete UNIT-IV:09				No. of classes taken:		

UNIT-V: HEAT EXCHANGERS

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-Classification of heat exchangers - Flow arrangement, Temperature distribution,	1	17-03-2025		TLM1, TLM2 TLM6	
2.	Applications of Heat Exchangers	1	18-03-2025		TLM1, TLM2	
3.	Overall heat transfer coefficient-Fouling factor	1	19-03-2025		TLM1, TLM2	
4.	Derivation on LMTD method of Heat exchanger analysis-	1	21-03-2025		TLM1, TLM2 TLM4	
5.	Parallel flow, Numerical Problems	1	21-03-2025		TLM1,	
6.	Derivation on LMTD method of Heat exchanger analysis- Counter flow,	1	24-03-2025		TLM1, TLM2,	

					TLM3	
7.	Numerical Problems – Counter flow HE – **Tutorial 10**	1	25-03-2025		TLM1,	
8.	Correction factor for LMTD for use with Multi pass and Cross flow Heat Exchangers	1	26-03-2025		TLM1, TLM2	
9.	Derivation - Effectiveness - NTU method of Heat Exchanger Analysis – parallel flow arrangement - Applications	1	28-03-2025		TLM3	
10.	Effectiveness - NTU method of Heat Exchanger Analysis – parallel flow arrangement problems	1	28-03-2025		TLM1,	
11.	Counter flow - Effectiveness - NTU method of Heat Exchanger Analysis- Applications of Heat Exchangers	1	31-03-2025		TLM1, TLM5	
12.	Cross flow - Effectiveness - NTU method of Heat Exchanger Analysis- Applications of Heat Exchangers-	1	01-04-2025		TLM1,	
No. of classes required to complete UNIT-V: 12				No. of classes taken:		

S.No.	Revision and recap of the Contents	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Revision of the course outline	1	02-04-2025		TLM5	

S.No.	Content Beyond the Syllabus	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
2.	PCB Cooling	1	04-04-2025		TLM2	
3.	Unsteady state thermal analysis	1	04-04-2025		TLM2	

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

Academic Calender-A.Y-2024-25

Description	From	To	Weeks
B Tech VI Semester			
Commencement of class work	02.12.2024		
I phase of Instructions	02.12.24	01.02.25	9
I Mid Examination	03.02.25	08.02.25	1
II phase of Instructions	**10.02.25**	**05.04.25**	**8**
II Mid Examination	07.04.25	12.04.25	1
Preparation and Practical	**14.04.25**	**19.04.25**	**1**
Semester End Examination	21.04.25	03.05.25	2
Internship	**05.05.25**	**28.06.25**	**8**

PART-C

EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment- Cycle I	A1=5
I-Mid Examination (Units-I,II half of III unit)	M1=15
I-Quiz Examination (Units-I,II half of III unit)	Q1=10
Assignment- Cycle - II	A3=5
II-Mid Examination (half of Unit-III, IV & V)	M2=15
II-Quiz Examination (half of Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max (M1, M2) +20% of Min (M1, M2)	M=15
Quiz Marks =80% of Max (Q1, Q2) +20% of Min(Q1, Q2)	B=10
Cumulative Internal Examination (CIE): A+B+M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFC 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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Dr.V.Dhana Raju)	(Dr.P.Ravindra Kumar)	(Dr.P.Vijay Kumar)	(Dr.M.B.S.S.Reddy)

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. A NAGESWARA RAO, Sr Assistant Professor

Course Name & Code	**:** CAD/CAM & 20ME18	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	: B.Tech VI Sem (A)	**A.Y.:** 20224-2025

PREREQUISITE: Design of Machine Elements -I, Machine Tools and Metrology

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to familiarize the principles of geometric modeling, numerical control and part programming.

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

CO1	Comprehend the principles of CAD/CAM for design and manufacturing **(Understanding -L2)**
CO2	Formulate mathematical equations for geometrical entities like curves, surface, and solids. **(Applying -L3)**
CO3	Write the program for part profiles to accomplish numerical control machining. **(Applying -L3)**
CO4	Discuss the codes for different parts using GT and apply in automated manufacturing systems. **(Understanding -L2)**
CO5	Contrast CAQC techniques and comprehend the applications of Computer Integrated Manufacturing. **(Understanding -L2)**

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	1			2										2	
CO2	1	1	2	2	1							1		3	
CO3	1	1	1		1							1		3	
CO4		2		1										2	
CO5	1				1									3	
1 - Low						**2 –**Medium						**3 -** High			

TEXTBOOKS:

T1 P.N Rao ,CAD/CAM Principle and applications, Tata McGraw Hill Education Private Ltd, New Delhi,8th edition 2013.

T2 Ibrahim Zeid, Mastering CAD/CAM, TATA McGraw-Hill publishing CO.Ltd, NewDelhi 2011.

REFERENCE BOOKS:

R1	Mikel P.Groover and Emory W.Zimmers, CAD/CAM-Prentice Hall of India Private Ltd. New Delhi, 20th edition, May 2010.
R2	P.Radhakrishnan,S.Subramanyam&V.Raju,CAD/CAM/CIM, New Age International Publishers,3rd edition 2010.
R3	Mikel P.Groover, Automaiton, Production Systems and Computer Integrated Manufacturing, Prentice Hall of India Private Ltd. New Delhi, 3rd edition, May 2008.
R4	Ibrahim Zeid and R. Sivasubramanian, CAD/CAM theory and practice, Tata McGraw Hill Publishing Co. Ltd,New Delhi 2009.
R5	Tien-Chienchang, Richard A.Wysk and HSU-Pin (Ben) Wang, —Computer Aided Manufacturing, 3rd Edition, 2006

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	1	02-12-2024		**TLM1/TLM2**	
2.	Product Cycle Revised with CAD/CAM	1	05-12-2024		**TLM1/TLM2**	
3.	Reasons for implementing CAD	1	06-12-2024		**TLM1/TLM2**	
4.	Creating Manufacturing database & Benefits of CAD	1	07-12-2024		**TLM1/TLM2**	
5.	Tutorial-I	1	09-12-2024		**TLM1/TLM2**	
6.	Computer Graphics- Introduction , Database structure	1	12-12-2024		**TLM1/TLM2**	
7.	Functions of a graphics package	1	13-12-2024		**TLM1/TLM2**	
8.	Raster scan graphics	1	14-12-2024		**TLM1/TLM2**	
9.	Concatenated transformations.	1	16-12-2024		**TLM1/TLM2**	
10.	Translation, scaling,	1	19-12-2024		**TLM1/TLM2**	
11.	Reflection, rotation	1	20-12-2024		**TLM1/TLM2**	
12.	Problems on Transformations	1	21-12-2024		**TLM1/TLM2**	
13.	Tutorial-II	1	23-12-2024		**TLM1/TLM2**	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: GEOMETRIC MODELING: REPRESENTATION OF CURVES, REPRESENTATION OF 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
14.	Geometric Modelling: Introduction	1	26-12-2024		**TLM1/TLM2**	
15.	Wireframe Modelling: Entities wireframe models	1	27-12-2024		**TLM1/TLM2**	
16.	Parametric representation of analytical curves	1	28-12-2024		**TLM1/TLM2**	
17.	Parametric representation of	1	30-12-2024		**TLM1/TLM2**	

	analytical curves					
18.	Hermite cubic spline curve	1	02-01-2025		**TLM1/TLM2**	
19.	Bezier curves	1	03-01-2025		**TLM1/TLM2**	
20.	B-spline curves	1	04-01-2025		**TLM1/TLM2**	
21.	Characteristics of Curves, Problems	1	06-01-2025		**TLM1/TLM2**	
22.	Tutorial-III	1	16-01-2025		**TLM1/TLM2**	
23.	Surface representation: Entities	1	17-01-2025		**TLM1/TLM2**	
24.	Solid modelling	1	18-01-2025		**TLM1/TLM2**	
25.	B-Rep	1	20-01-2025		**TLM1/TLM2**	
26.	CSG	1	23-01-2025		**TLM1/TLM2**	
27.	Tutorial-IV	1	24-01-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

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
28.	Numerical control: Introduction, NC Modes	1	24-01-2025		**TLM1/TLM2**	
29.	NC elements	1	25-01-2025		**TLM1/TLM2**	
30.	N C Coordinate systems	1	27-01-2025		**TLM1/TLM2**	
31.	Structure of CNC machine tools	1	30-01-2025		**TLM1/TLM2**	
32.	Spindle design	1	31-01-2025		**TLM1/TLM2**	
33.	spindle drives,	1	01-02-2025		**TLM1/TLM2**	
34.	Feed drives,	1	03-02-2025		**TLM1/TLM2**	
35.	actuation systems	1	06-02-2025		**TLM1/TLM2**	
36.	Tutorial-V	1	07-02-2025		**TLM1/TLM2**	
37.	CNC Part programming: fundamentals	1	10-02-2025		**TLM1/TLM2**	
38.	Manual part programming	1	13-02-2025		**TLM1/TLM2**	
39.	Computer Aided part programming	1	14-02-2025		**TLM1/TLM2**	
40.	Part programming examples	1	15-02-2025		**TLM1/TLM2**	
41.	examples	1	17-02-2025		**TLM1/TLM2**	
42.	Tutorial-VI	1	20-02-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-III: 15				**No. of classes taken:**		

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
43.	Group Technology	1	21-02-2025		**TLM1/TLM2**	
44.	Coding and classification schemes-OPITZ	1	22-02-2025		**TLM1/TLM2**	
45.	MICLASS, example for coding	1	24-02-2025		**TLM1/TLM2**	
46.	CODE Systems, examples for coding	1	27-02-2025		**TLM1/TLM2**	

47.	Production Flow Analysis	1	28-02-2025		**TLM1/TLM2**	
48.	Advantages and limitations	1	01-03-2025		**TLM1/TLM2**	
49.	GT Machine cells, Benefits of GT	1	03-03-2025		**TLM1/TLM2**	
50.	CAPP- Retrieval and Generative	1	06-03-2025		**TLM1/TLM2**	
51.	Tutorial-VII	1	07-03-2025		**TLM1/TLM2**	
52.	Flexible Manufacturing System: Introduction	1	08-03-2025		**TLM1/TLM2**	
53.	FMS equipment, FMS layouts, benefits	1	10-03-2025		**TLM1/TLM2**	
54.	FMS Planning and implementation	1	15-03-2025		**TLM1/TLM2**	
55.	FMS Planning and implementation	1	17-03-2025		**TLM1/TLM2**	
56.	Tutorial-VIII	1	20-03-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: COMPUTER AIDED QUALITY CONTROL, 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
57.	CAQC: Introduction, The computers in QC	1	21-03-2025		**TLM1/TLM2**	
58.	Contact inspection methods	1	22-03-2025		**TLM1/TLM2**	
59.	Non-Contact inspection methods: Optical	1	24-03-2025		**TLM1/TLM2**	
60.	Non-Contact inspection methods: non optical	1	27-03-2025		**TLM1/TLM2**	
61.	Computer aided testing,	1	28-03-2025		**TLM1/TLM2**	
62.	CAQC with CAD/CAM	1	29-03-2025		**TLM1/TLM2**	
63.	CIM Introduction, Tutorial-IX	1	01-04-2025		**TLM1/TLM2**	
64.	CIM integration, Implementation	1	03-04-2025		**TLM1/TLM2**	
65.	Benefits of CIM	1	04-04-2025		**TLM1/TLM2**	
66.	Lean manufacturing, Tutorial-X	1	05-04-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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 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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**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.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage

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

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	**A.Nageswara Rao**	**A.Nageswara Rao**	**Mr.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 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. CH. Siva Sankara Babu
Course Name & Code : Design of Machine Elements-II & 20 ME19
L-T-P Structure : 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VI/A **A.Y.:** 2024-25
PREREQUISITE: Design of Machine Elements-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to understand and apply the standard procedure available for the design of mechanical components and IC engine components.

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

CO1	Select suitable bearings under different load, speed, and life conditions**. (Applying - L3)**
CO2	Design internal combustion engine components for safe and continuous operation. **(Applying - L3)**
CO3	Select the belt and rope drives for elevators, cranes, and hoisting machinery. **(Applying - L3)**
CO4	Design the springs under static and dynamic loads. **(Applying - L3)**
CO5	Estimate the performance parameters of the gears for various loading conditions. **(Applying - L3)**

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	2	2	3	1	1							1	1	1	3
CO2	1	2	3	1	2							1	2		3
CO3	3	2	3		1	1						1		1	3
CO4	3	2	3	2	1				1			1		-	3
CO5	3	2	3	2	2	1			1			1		1	3
1 - Low							**2** –Medium						**3** - High		

TEXTBOOKS:

T1 Bhandari V.B, Design of Machine Elements, 3rd Edition, TataMcGraw-Hill2010.

T2 Sundararajamoorthy T. V, Shanmugam. N, "Machine Design", Anuradha Publications, Chennai, 2003.

REFERENCE BOOKS:

R1 Norton R.L—Design of Machinery, TataMcGraw-Hill Book Co, 2004.

R2 Shigley J.E and Mischke C.R.—Mechanical Engineering Design‖, TataMcGraw-Hill, 2003

HANDBOOKSTOBEALLOWED

1 Design Data book by PSG College of Technology, Coimbatore.
Design Data Hand book for Mechanical Engineering by Mahadevan.K and K.Balaveera Reddy.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: SLIDING CONTACT BEARINGS & ROLLING CONTACT BEARINGS

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 Subject, CEO's and CO's	1	02-12-2024		TLM1	
2.	Introduction to Unit-1, **Bearings** –Introduction, Types	1	02-12-2024		TLM1 TLM2	
3.	Lubricating Oils Properties, Materials used for bearings and their properties	1	03-12-2024		TLM1 TLM2	
4.	**Journal Bearings** –Introduction, Types, Dimensionless parameters	1	05-12-2024		TLM1 TLM2	
5.	Design procedure of journal bearing	1	09-12-2024		TLM1	
6.	Journal bearings - problems	1	09-12-2024		TLM1.2	
7.	Dimensionless parameters used in the bearing design – problem	1	10-12-2024		TLM1.2	
8.	Tutorial-**1**	1	12-12-2024		TLM3	
9.	**Rolling contact bearings-types**, bearing life, Materials used and designation of rolling contact bearings	1	16-12-2024		TLM1 TLM2	
10.	Static load and dynamic load capacity	1	16-12-2024		TLM1	
11.	Selection of ball bearing - problems	1	17-12-2024		TLM1.2	
12.	Tutorial-**2**	1	19-12-2024		TLM3	
13.	Cubic mean load derivation, Reliability of bearings - problems	1	23-12-2024		TLM1.2	
No. of classes required to complete UNIT-I		13	No. of classes taken:			

UNIT-II: IC ENGINE COMPONENTS: PISTON, CONNECTING ROD AND CRANK SHAFT

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 Unit-II, Engine Parts and working	1	23-12-2024		TLM1 TLM2	
2.	**PISTON**: Design procédure of piston	1	24-12-2024		TLM1.2	
3.	Piston design - problems	1	26-12-2024		TLM1.2	
4.	Piston design - problems	1	30-12-2024		TLM1.2	
5.	Cylinder design, cylinder liners-design	1	30-12-2024		TLM1.2	
6.	Cylinder, cylinder liners-design Problems	1	31-12-2024		TLM1.2	
7.	Tutorial-**3**	1	02-01-2025		TLM3	
8.	**CONNECTING ROD**: Thrust in C.R, buckling load	1	06-01-2025		TLM1 TLM2	
9.	Design Procedure of Connecting rod	1	06-01-2025		TLM1.2	
10.	Stresses due to whipping action on connecting rod ends- problems	1	07-01-2025		TLM1.2	
11.	**CRANK SHAFT:** Design of crank and crank shaft	1	09-01-2025		TLM1.2	
12.	Design of center crank shaft -problems	1	13-01-2025		TLM1,2	
13.	Tutorial-**4**	1	16-01-2025		TLM3	
No. of classes required to complete UNIT-II		13	No. of classes taken:			

UNIT-III: FLAT BELTS & PULLEYS &V-BELTS & V-GROOVED PULLEYS

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 Unit-III** **Flat belts** Introduction, Materials and Design Procedure	1	20-01-2025		TLM1 TLM2	
2.	Design Procedure of flat belts - Problems	1	20-01-2025		TLM1	
3.	**PULLEYS:** Design of pulleys mild steel & cast iron	1	21-01-2025		TLM1	
4.	Design of pulleys mild steel & cast iron	1	23-01-2025		TLM1	
5.	Design of pulleys mild steel & cast iron	1	27-01-2025		TLM1	
6.	Design of pulleys Problems	1	28-01-2025		TLM1	
7.	Tutorial-**5** Revision	1	30-01-2025		TLM3	
8.	**Mid-I Examination from 03-02-2025 to 08-02-2025**					
9.	V-belts –designation, design and selection	1	10-02-2025		TLM1,2	
10.	Design of V belts - problems	1	10-02-2025		TLM1,2	
11.	Design of V belts - problems	1	11-02-2025		TLM1,2	
12.	Design of V- grooved pulley	1	13-02-2025		TLM1	
13.	Design of V- grooved pulley	1	17-02-2025		TLM1,2	
14.	Tutorial-**6**	1	17-02-2025		TLM3	
No. of classes required to complete UNIT-III		14	No. of classes taken:			

UNIT-IV: SPRINGS:

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 Unit-IV** **SPRINGS:** Introduction, classification	1	18-02-2025		TLM1 TLM2	
2.	Stresses, deflection and stiffness in springs and their derivations	1	20-02-2025		TLM1 TLM2	
3.	Springs for fatigue loading	1	24-02-2025		TLM1,2	
4.	Design of springs-problems	1	24-02-2025		TLM1	
5.	Tutorial-**7**	1	27-02-2025		TLM3	
6.	Spring failures, design of helical springs	1	03-03-2025		TLM1	
7.	Natural frequency of helical spring	1	03-03-2025		TLM1	
8.	Energy storage capacity in springs	1	04-03-2025		TLM1	
9.	Tension and torsion springs	1	06-03-2025		TLM1	
10.	Co-axial springs design- Problems	1	10-03-2025		TLM1	
11.	Design of leaf springs- Problems	1	10-03-2025		TLM1	
12.	Tutorial-**8**	1	11-03-2025		TLM3	
No. of classes required to complete UNIT-IV		12	No. of classes taken:			

UNIT-V: SPUR & HELICAL GEARS

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.	**GEARS**: **Introduction** and terminology, Types of gears, design formulae	1	13-03-2025		TLM1 TLM2	
2.	Design formulae	1	17-03-2025		TLM1 TLM2	
3.	Design Analysis of gears, Estimation of centre distance, module & face width	1	17-03-2025		TLM1 TLM2	
4.	Design procedure of spur gears, Check for dynamic and wear considerations	1	18-03-2025		TLM1 TLM2	
5.	Design of spur gears -Problems	1	20-03-2025		TLM1,2	
6.	Design of spur gears -Problems	1	24-03-2025		TLM1,2	

7.	Tutorial-**9**	1	24-03-2025		TLM3	
8.	Design procedure of Helical gears, Check for dynamic and wear considerations	1	25-03-2025		TLM1	
9.	Design of Helical gears -Problems	1	27-03-2025		TLM1,2	
10.	Design of Helical gears -Problems,	1	31-03-2025		TLM1,2	
11.	Tutorial-**10**	1	31-03-2025		TLM3	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

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
1.	Design of flywheels	1	27-01-2025		TLM1 TLM2	
2.	Design of Worm gear	1	01-04-2025		TLM1 TLM2	
3.	Design of Gear Box	1	03-04-2025		TLM1 TLM2	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

PO 1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	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	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	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.
PO 6	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	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	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	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	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 multi-disciplinary environments.
PO 12	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 or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Signature				
Name of the Faculty	Dr. Ch. Siva Sankara Babu	Mr. B. Sudheer Kumar		Dr. M.B.S Sreekara Reddy
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

COURSE HANDOUT
PART-A

Course Instructor	**:** Dr.Murahari Kolli	**Course Coordinator**	**:** Dr.Murahari Kolli
Course Name	**:** Modern Machining Processes	**Course Name**	: 20ME21
L-T-P Structure	**:** 3-0-0	**Credits**	: 3
Program	**:** B.Tech., III Year VI-Sem.,	**Department**	**:** Mechanical
Section	: Mech (A)	**A.Y**	: 2024-25

PRE-REQUISITE: PRODUCTION TECHNOLOGY, MACHINE TOOLS&METAL CUTTING

COURSE OBJECTIVE: The main objective of this course is to familiarize with unconventional machining processes and rapid prototyping.

COURSE OUTCOMES (CO)

CO1	Assort appropriate unconventional machining processes for machining materials and to develop relevant industrial solutions for machining hard materials. **(Understanding-L2)**
CO2	Understand the principles of Electro Chemical Machining Process for machining of hard materials. **(Understanding-L2)**
CO3	Apply Electrical Discharge Machining principles for machining intricate components. **(Understanding-L2)**
CO4	Comprehend the basic principles and applications of thermal machining processes like EBM, LBM and PAM. **(Understanding-L2)**
CO5	Identify the need of Rapid Prototyping in manufacturing sectors. **(Applying-L3)**

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2		3									2	
CO2	3	2	3		3									3	
CO3	3	2	3		3								2	3	
CO4	3	2	3		3								2	3	
CO5	3	2	3		3									3	

Note: Enter Correlation Levels**: 1-**Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Pandey P.C. and shah H.S, Modern machining processes /TMH.

T2 Chua C.K, Leong K.F, and Lim C.S, Rapid prototyping principles and applications, second edition, world scientific publishers, and 2003.

BOS APPROVED REFERENCE BOOKS:

R1 M K Singh, Unconventional machining process / New age international.

R2 V K Jain, Advanced machining processes /Allied publishers.

R3 N.Hopkinson, R.J.MHaque &P.M. Dickens Rapid Manufacturing, John Wiley & sons, 2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction & Mechanical Processes

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction of MMP and Course Co's and Po's	1	02.12.2024		TLM1/TLM2	CO1	T1/R1	
2.	Need for unconventional machining methods	1	03.12.2024		TLM1/TLM2	CO1	T1/R1	
3.	Classification of unconventional machining processes	1	04.12.2024		TLM1/TLM2	CO1	T1/R1	
4.	Classification of unconventional machining processes	1	06.12.2024		TLM1/TLM2	CO1	T1/R1	
5.	Considerations in process selection	1	09.12.2024		TLM1/TLM2	CO1	T1/R1	
6.	Considerations in process selection	1	10.12.2024		TLM1/TLM2	CO1	T1/R1	
7.	Mechanical Processes	1	11.12.2024		TLM3/TLM6	CO1	T1/R1	
8.	ultrasonic machining, Basic principle equipment setup and procedure,	1	13.12.2024		TLM1/TLM2	CO1	T1/R1	
9.	Process variables and applications	1	16.12.2024		TLM1/TLM2	CO1	T1/R1	
10.	Basic principle of Abrasive jet machining,.	1	17.12.2024		TLM1/TLM2	CO1	T1/R1	
11.	Process variables and applications	1	18.12.2024		TLM1/TLM2	CO1	T1/R1	
12.	Water jet machining, Basic principle, equipment setup	1	20.12.2024		TLM1/TLM2	CO1	T1/R1	
13.	Process variables and applications	1	23.12.2024		TLM1/TLM2	CO1	T1/R1	
14.	Comparison of Mechanical methods and **Case Study**	1	24.12.2024		TLM1/TLM2	CO1		
No. of classes required to complete UNIT-I		14			No. of classes taken:			

UNIT-II: Electro Chemical Processes & Chemical Machining

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Electrochemical Process Introduction	1	27.12.2024		TLM1/TLM2	CO2	T1/R1	
16.	ECM Process, and principles	1	30.12.2024		TLM1/TLM2	CO2	T1/R1	
17.	Equipment and material removal rate	1	31.12.2024		TLM1/TLM2	CO2	T1/R1	
18.	Electrochemical machining	1	06.01.2025		TLM1/TLM2	CO2	T1/R1	

19.	Electrochemical grinding	1	07. 1.2025		TLM1/TLM2	CO2	T1/R1	
20.	Electrochemical grinding	1	08. 1.2025		TLM1/TLM2	CO2	T1/R1	
21.	Electrochemical deburring,	1	10.01.2025		TLM1/TLM2	CO2	T1/R1	
22.	Electrochemical honing	1	13.01.2025		TLM1/TLM2	CO2	T1/R1	
23.	Chemical machining-principle	1	14.01.2025		TLM1/TLM2	CO2	T1/R1	
24.	Maskants –Etchants,	1	15.01.2025		TLM1/TLM2	CO2	T1/R1	
25.	Advantages and Applications.	1	17.01.2025		TLM1/TLM2	CO2	T1/R1	
No. of classes required to complete UNIT-II		11			No. of classes taken:			

UNIT-III: Electrical Discharge Machining

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
26.	What is EDM, working Principle	1	20.01.2025		TLM1/TLM2	CO3	T1/R1	
27.	Power circuits for EDM	1	21.01.2025		TLM1/TLM2	CO3	T1/R1	
28.	Power circuits for EDM	1	22.01.2025		TLM1/TLM2	CO3	T1/R1	
29.	Applications of EDM	1	24.01.2025		TLM1/TLM2	CO3	T1/R1	
30.	Mechanics of metal removal in EDM	1	27.01.2025		TLM1/TLM2	CO3	T1/R1	
31.	Process parameters	1	28.01.2025		TLM1/TLM2	CO3	T1/R1	
32.	Selection of tool electrode	1	29.01.2025		TLM1/TLM2	CO3	T1/R1	
33.	dielectric fluid	1	10.02.2025		TLM1/TLM2	CO3	T1/R1	
34.	Electric discharge wire cutting principle	1	11.02.2025		TLM1/TLM2	CO3	T1/R1	
35.	Applications of EDM and Wire EDM	1	12.02.2025		TLM1/TLM2	CO3	T1/R1	
No. of classes required to complete UNIT-III		10			No. of classes taken:			

UNIT-IV: Electron Beam, Laser Beam & Plasma Arc Machining

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
36.	Electron Beam Machining, Principle, process	1	14.02.2025		TLM1/TLM2	CO4	T2/R3	
37.	EBM Applications and Advantages	1	17.02.2025		TLM1/TLM2	CO4	T2/R3	
38.	laser beam machining, Principle, process	1	18.02.2025		TLM1/TLM2	CO4	T2/R3	
39.	LBM Applications and Advantages	1	19.02.2025		TLM1/TLM2	CO4	T2/R3	
40.	Plasma arc machining, Principle, process	1	21.02.2025		TLM1/TLM2	CO4	T2/R3	

41.	PAM Applications and Advantages	1	24.02.2025		TLM1/TLM2	CO4	T2/R3	
42.	Hot machining, Process, equipment, applications	1	25.02.2025		TLM1/TLM2	CO4	T2/R3	
43.	Comparisons of EBM and LBM	1	26.02.2025		TLM1/TLM2	CO4	T2/R3	
44.	**Case study -II**	1	28.02.2025		TLM1/TLM2			
No. of classes required to complete UNIT-IV		9			No. of classes taken:			

UNIT-V: Rapid Prototyping

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
45.	Introduction to Prototype fundamentals	1	03.03.2025		TLM1/TLM2	CO5	T2/R3	
46.	historical development, fundamentals of Rapid Prototyping	1	04.03.2025		TLM1/TLM2	CO5	T2/R3	
47.	Advantages of Rapid Prototyping	1	05.03.2025		TLM1/TLM2	CO5	T2/R3	
48.	classification of Rapid prototyping	1	07.03.2025		TLM1/TLM2	CO5	T2/R3	
49.	classification of Rapid prototyping	1	10.03.2025		TLM1/TLM2	CO5	T2/R3	
50.	Rapid Prototyping process chain	1	11.03.2025		TLM1/TLM2	CO5	T2/R3	
51.	Liquid types –SLA,SGC	1	12.03.2025		TLM1/TLM2	CO5	T2/R3	
52.	Stereo Lithography Apparatus (SLA)	1	14.03.2025		TLM3/TLM2	CO5	T2/R3	
53.	SLA, Solid Ground Curing (SGC)	1	17.03.2025		TLM1/TLM2	CO5	T2/R3	
54.	Solid Ground Curing (SGC) Solid based Porotype-FDM	1	18.03.2025		TLM3/TLM2	CO5	T2/R3	
55.	Powder based Porotype-SLS	1	19.03.2025		TLM1/TLM2	CO5	T2/R3	
56.	Powder based Porotype-SLS	1	21.03.2025		TLM3/TLM2	CO5	T2/R3	
57.	Applications of Rapid Prototyping	1	24.03.2025		TLM1/TLM2	CO5	T2/R3	
No. of classes required to complete UNIT-V		13			No. of classes taken:			

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**	**Learning Outcome COs**	**Text Book followed**	**HOD Sign Weekly**
58.	Abrasive water jet aerospace applications	1	25.03.2025		TLM1/TLM2			
59.	EDM process parameters	1	26.03.2025		TLM1/TLM2			
60.	Rapid prototyping case study	1	28.03.2025		TLM1/TLM2			
61.	Rapid prototyping case study	1	31.03.2025		TLM1/TLM2			

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

Academic Calendar:

Description	From	To	Weeks
I Phase of Instructions	02-12-2024	01-02-2025	9W
I Mid Examinations	03-02-2025	08-02-2025	1W
II Phase of Instructions	10-02-2025	05-04-2025	8W
II Mid Examinations	07-04-2025	12-04-2025	1W
Preparation and Practicals	14-04-2025	09-04-2025	1W
Semester End Examinations	21-04-2025	03-05-2025	2W

EVALUATION PROCESS:

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

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

1. To apply the principles of thermal sciences to design and develop various thermal systems.
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.
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.

Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms.G.DIVYA
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : 3-0-0 **Credits:**3
Program/Branch/Sem : B.Tech/ME- A/B/VI **A.Y.: 2024-25**

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

Course Outcomes: At the end of this course, the student will be able to

CO1	Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**
CO2	Apply the basic principles of AI in problem solving. **(Apply-L3).**
CO3	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(Understand-L2)**

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

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

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach",3rd edition, Prentice Hall, 2009. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmelen, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction to	1	02-12-2024		-	CO1	-	
2.	Introduction: What Is AI?,	1	04-12-2024		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	05-12-2024		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	06-12-2024		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	09-12-2024		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	11-12-2024		TLM1	CO1	T1,T2	
7.	Types of agents	1	12-12-2024		TLM2	CO1	T1,T2	
8.	Types of agents	1	13-12-2024		TLM2	CO1	T1,T2	
9.	Types of agents	1	16-12-2024		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	18-12-2024		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	19-12-2024		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	20-12-2024		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	23-12-2024		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	26-12-2024		TLM1	CO1	-	
No. of classes required to complete UNIT-I: 14					**No. of classes taken:**			

UNIT-II : PROBLEM SOLVING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	1	27-12-2024		TLM1	CO2	T1,T2	

16.	searching for Solutions, Uninformed Search Strategies	1	30-07-2024		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	02-01-2025		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	03-01-2025		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	06-01-2025		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	08-01-2025		TLM2	CO2	T1,T2	
21.	A* Algorithm	1	09-01-2025		TLM2	CO2	T1,T2	
22.	AO* Algorithm	1	10-01-2025		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	16-01-2025		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	17-01-2025		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	20-01-2025		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	22-01-2025		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II: 12					**No. of classes taken:**			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	23-01-2025		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	1	24-01-2025		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	27-01-2025		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	29-01-2025		TLM2	CO3	T1,T2	
31.	Depth limited search	1	30-01-2025		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	31-01-2024		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	10-02-2025		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	12-02-2025		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	13-02-2025		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 09					**No. of classes taken:**			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	14-02-2025		TLM1	CO4	T1,T2	
37.	Minimax algorithm	2	17-02-2025 19-02-2025		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	2	20-02-2025 21-02-2025		TLM2	CO4	T1,T2	

39.	Knowledge Based Agent, Architecture	2	24-02-2025 26-02-2025		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	27-02-2025		TLM1	CO4	T1,T2	
41.	Representation mappings	1	28-03-2025		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	03-02-2025		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	05-03-2025		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	06-03-2025		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	2	07-03-2025 10-03-2025		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	12-03-2025		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 15					**No. of classes taken:**			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	13-03-2025		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	1	17-03-2025		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	19-03-2025		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	20-03-2025		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	1	21-03-2025		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	24-03-2025		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	26-03-2025		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	27-03-2025		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	1	28-03-2025		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	02-04-2025		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	03-04-2025		TLM1	CO5	-	
No. of classes required to complete UNIT-V:11					**No. of classes taken:**			

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	04-04-2025		**TLM1**			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam /MOOCS)
TLM3	Tutorial	**TLM6**	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):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**G.Divya**	**G.Divya**	**Dr.V.Surya Narayana**	**Dr. O. Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Ch. Poorna Venkata Srinivasa Rao
Course Name & Code : CYBER SECURITY AND DIGITAL FORENSICS & 201T84
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech-ME – VI /A&B
A.Y. : 2024-25

PRE-REQUISITE: Understanding of digital logic, operating system concepts, Computer hardware knowledge.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The Objective of the course is to provide the basic concepts of cyber security and digital Forensics which help to protect ourselves from various kinds of cyber-attacks. Digital forensics is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relaxation to computer crime. It enables students to gain experience to do independent study and research

CO1	Understand the implementation of cybercrime. **(Understand - L2)**
CO2	Identify key Tools and Methods used in Cybercrime. **(Remember- L1)**
CO3	Under the Concepts of Cyber Forensics. **(Understand- L2)**
CO4	Apply Cyber Forensics in collection of digital evidence and sources of evidence **(Apply- L3)**
CO5	Analyze the cyber forensics tools for present and future**(Analyze- 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
CO1	1	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	3	1	-	-	-	-	-	1	-	-	-
CO3	1	-	-	1	3	1	-	-	-	-	-	1	-	-	-
CO4	1	1	-	3	1	-	-	-	-	-	-	1	-	-	-
CO5	-	-	1	-	3	1	-	1	-	-	-	1	-	-	-
1 - Low **2 –**Medium **3 -** High															

TEXT BOOKS:

1. Dejey, Dr.Murugan, "cyber Forensics", Oxford University Press, India, 2018

2. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY,2011

REFERENCE BOOKS:

1. Michael Simpson, Kent Blackman and James e. Corley, "Hands on Ethical Hacking and Network Defense", Cengage, 2019
2. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi
3. Alfred Basta, Nadine Basta, Mary Brown and Ravindra Kumar "Cyber Security and Cyber Laws", Cengage, 2018

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): SECTION B

UNIT-I: Introduction to Cybercrime

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
1	Introduction to CSDF	1	02-12-2024		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	04-12-2024		**TLM1**	CO1	
3	Cybercrime and Information Security	1	05-12-2024		**TLM2**	CO1	
4	Cybercriminals	1	06-12-2024		**TLM7**	CO1	
5	Classifications of Cybercrime	1	09-12-2024		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	2	11-12-2024 12-12-2024		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	13-12-2024 16-12-2024		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	2	18-12-2024 19-12-2024		**TLM2**	CO1	
9	Unit-I Assignment Test	1	20-12-2024		**TLM6**	CO1	
No. of classes required to complete UNIT-I		12	No. of classes taken:				

UNIT-II: Tools and Methods

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
10	Proxy Servers and Anonymizers	1	23-12-2024		**TLM2**	CO2	
11	Phishing, Password Cracking	2	26-12-2024 27-12-2024		**TLM7**	CO2	
12	Key loggers and Spywares Virus and Worms	1	02-01-2025		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	03-01-2025		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	06-01-2025 08-01-2025		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	1	09-01-2025		**TLM2**	CO2	
16	Unit-II Assignment Test	1	10-01-2025		**TLM6**	CO2	
No. of classes required to complete UNIT-2		09	No. of classes taken:				

UNIT – III: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
17	Cyber Forensics Definition	1	17-01-2025		**TLM2**	CO3	
18	Disk Forensics	2	20-01-2025 22-01-2025		**TLM1**	CO3	
19	Network Forensics	1	23-01-2025		**TLM2**	CO3	
20	Wireless Forensics	1	24-01-2025		**TLM2**	CO3	
21	Database Forensics	2	27-01-2025		**TLM2**	CO3	
22	Malware Forensics	1	29-01-2025		**TLM2**	CO3	

23	Mobile Forensics	1	30-01-2025		**TLM2**	CO3	
24	Email Forensics	1	31-01-2025		**TLM1**	CO3	
25	Unit-III Assignment Test	1	10-02-2025		**TLM6**	CO3	
No. of classes required to complete UNIT-3		11	No. of classes taken:				

UNIT-IV: Digital Evidence

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
26	Introduction to Digital Evidence and Evidence Collection procedure	2	12-02-2025 13-02-2025		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	14-02-2025 20-02-2025		**TLM7**	CO4	
28	File System Windows Registry	2	21-02-2025 24-02-2025		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	27-02-2025 28-02-2025		**TLM2**	CO4	
30	Linux Artifact	2	03-03-2025 05-03-2025		**TLM1**	CO4	
31	Digital evidence on the internet	2	06-03-2025 07-03-2025		**TLM3**	CO4	
32	Impediments to collection of Digital Evidence	1	10-03-2025		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	12-03-2025 13-03-2025		**TLM2**	CO4	
34	Unit-IV Assignment Test	1	17-03-2025		**TLM6**	CO4	
No. of classes required to complete UNIT-4		16	No. of classes taken:				

UNIT-V: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
35	The Present and The Future Forensics Tools	1	19-03-2025		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	1	20-03-2025		**TLM5**	CO5	
37	Tools for Integrity Verification and Hashing	1	21-03-2025		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	1	24-03-2025		**TLM5**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	26-03-2025 27-03-2025		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	1	02-04-2025		**TLM2**	CO5	
41	Unit -5 Assignment Test.	1	03-04-2025		**TLM6**	CO5	
No. of classes required to complete UNIT-5		8	No. of classes taken:				

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
1.	Cloud Security, Using AI/ML to Analyze	1	04-04-2025		TLM2	
2.	Cyber Threats	1	05-04-2025		TLM2	

TLM1	Chalk and Talk - 8	**TLM6**	Assignment / Quiz - 5
TLM2	PPT - 24	**TLM7**	Seminar / Group Discussion - 3
TLM3	Tutorial -1	**TLM8**	Lab Demo
TLM4	Demonstration (Lab/Field Visit)	**TLM9**	Case Study
TLM5	ICT (NPTEL/Swayam Prabha/MOOCS) - 2		

Part – C

EVALUATION PROCESS:

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+A	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	02-12-2024		
I Phase of Instructions	02-12-2024	01-02-2025	9W
I Mid Examinations	03-02-2025	08-02-2025	1W
II Phase of Instructions	10-02-2025	05-04-2025	8W
II Mid Examinations	07-04-2025	12-04-2025	1W
Preparation and Practical's	14-04-2025	19-04-2025	1W
Semester End Examinations	21-04-2025	03-05-2025	2W

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Pursue a successful career in the area of Information Technology or its allied fields.
PEO 2	Exhibit sound knowledge in the fundamentals of Information Technology and apply practical experience with programming techniques to solve real world problems.
PEO 3	Able to demonstrate self-learning, life-long learning and work in teams on multidisciplinary projects.
PEO 4	Able to understand the professional code of ethics and demonstrate ethical behavior, effective communication and team work and leadership skills in their job.

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solution sin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1 Organize, Analyze and Interpret the data to extract meaningful conclusions.

PSO2 Design, Implement and Evaluate a computer-based system to meet desired needs.

PSO3 Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. Ch.Poorna Venkata Srinivasa Rao	Mr. Ch.Poorna Venkata Srinivasa Rao	Mr. G.Rajendra	Dr.B.Srinivasa Rao
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(An Autonomous Institution since 2010)
Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
L.B. Reddy Nagar, Mylavaram, NTR District, Andhra Pradesh - 521230

HT Lab COURSE HANDOUT

Part-A

PROGRAM : B.Tech, VI-Sem., ME, A/S
ACADEMIC YEAR : 2024-25
COURSE NAME & CODE : Heat Transfer Lab & 20ME62
L-T-P STRUCTURE : 0-0-3
COURSE CREDITS : 2
LABORATORY INSTRUCTORS : Dr. V.Dhana Raju/Mr. K.Sai Babu
LABORATORY INCHARGE : Mr.K.Lakshmi Prasad
PREREQUISITE SUBJECT: Thermodynamics, Heat Transfer

COURSE EDUCATIONAL OBJECTIVES:

The objective of this course is to understand the modes of heat transfer in various heat transfer equipment used for different applications by conducting experiments.

Course Outcomes:

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

CO1: Estimate the thermal conductivity of different materials and powders. (Applying - L3)
CO2: Estimate the value of heat transfer coefficient in free and forced convection. (Applying - L3)
CO3: Validate the Stefan Boltzmann's constant and estimate emissivity of grey body. (Applying - L3)
CO4: Compare the parallel and counter flow heat exchanger performance characteristics. (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
CO1	3	2	2	3	-	-	-	2	2	1	-	1	3	-	1
CO2	3	2	2	3	-	-	-	2	2	1	-	1	3	-	1
CO3	2	1	2	3	-	-	-	2	2	1	-	1	3	-	1
CO4	1	3	2	3	-	-	-	2	2	1	-	1	3	-	1

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

Lab Manuals, Heat and Mass Transfer Data Book, 6th Edition, New Age International Publishers

Part-B

COURSE: B.Tech BRANCH: MECHANICAL ENGG. SECTION: A-Sec (Tuesday) BATCH: 1 A.Y:2024-25

S. No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11	12
		Date	03 -12 - 24	10 - 12 - 24	17 -12 - 24	24 - 12 - 24	31 - 12 - 24	07 - 01 - 25	21 - 01 - 25	28 - 02 - 25	11 -02 - 25	18- 02 - 25	25 - 02 - 25	04 -03 - 25	11 -03 - 25	18 -03 - 25
		Regd. No	CYCLE-I							CYCLE-2						
1	BATCH-I	22761A0301	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION/Experiment beyond the Syllabus	INTERNAL LAB TEST
2		22761A0302														
3		22761A0304														
4		22761A0305														
5		22761A0307														
6	BATCH-2	22761A0310												HT-1		
7		22761A0311														
8		22761A0312		HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5			
9		22761A0313														
10		22761A0314														
11	BATCH-3	22761A0315												HT-2		
12		22761A0316														
13		22761A0317		HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1			
14		22761A0318														
15		22761A0319														
16	BATCH-4	22761A0320	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3		
17		22761A0330														
18		23765A0301														
19		23765A0302														
20		23765A0303														
21		23765A0304														
22	BATCH-5	23765A0305	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4		
23		23765A0306														
24		23765A0307														
25		23765A0308														
26		23765A0309														
27		23765A0310														

LAB INCHARGE

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: A-Sec (Saturday)** **BATCH: 2** **A.Y:2024-25**

S.No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11	12
		Date	07- 12 - 24	21 - 12 - 24	28 -12 - 24	04 - 01 - 25	25- 01 - 25	01 - 02 - 25		15 - 02 - 25	22 - 02 - 25	01 -03 - 25	15 - 03 - 25	22 - 03 - 25	29-03 - 25	29-03 - 25
		Regd. No	CYCLE-I							CYCLE-2						
1	BATCH-1	23765A0311	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5		HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION	INTERNAL LAB TEST
2		23765A0312														
3		23765A0313														
4		23765A0314														
5		23765A0315														
7	BATCH-2	23765A0316	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1		
8		23765A0317														
9		23765A0318														
10		23765A0319														
11		23765A0320														
13	BATCH-3	23765A0321	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2		
14		23765A0322														
15		23765A0323														
16		23765A0324														
17		23765A0325														
18		23765A0326														
19	BATCH-4	23765A0327	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3		
20		23765A0328														
21		23765A0329														
22		23765A0330														
23		23765A0331														
24		23765A0332														
25	BATCH-5	23765A0333	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4		
26		23765A0334														
27		23765A0335														
28		23765A0336														
29		23765A0337														

LAB INCHARGE

LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING (AUTONOMOUS)
MYLAVARAM
DEPARTMENT OF MECHANICAL ENGINEERING
HEAT TRANSFER LABORATORY
LIST OF EXPERIMENTS

Course: B Tech Branch: Mech Sem: VI Section: A Sec Batch: 2022 A.Y: 2024-25

S.No	Cycle	Exp Code	Name of the Experiment
1	CYCLE-I	DEMONSTRATION	DEMONSTRATION
2		HT-1	Determination of Thermal Conductivity of Insulating Powder (Asbestos).
3		HT-2	Determination of Thermal Conductivity of Lagged Pipe (Glass wool).
4		HT-3	Determination of Thermal Conductivity of Metal Bar (Brass).
5		HT-4	Study of Transient Heat Conduction (Unsteady Heat Conduction).
6		HT-5	Test on Tube in Tube Parallel Flow Heat Exchanger.
7		**HT-6 (Content Beyond the Syllabus)**	**Test on Emissivity Measurement Apparatus.**
8	CYCLE-II	HT-1	Determination of Thermal Conductivity of given Liquid.
9		HT-2	Determination of Convective Heat Transfer Co-efficient of air in Natural Convection.
10		HT-3	Determination of Convective Heat Transfer Co-efficient of air in Forced Convection.
11		HT-4	Heat Pipe Demonstration
12		HT-5	Test on Tube in Tube Counter Flow Heat Exchanger.
13		**HT-6 (Content Beyond the Syllabus)**	**Test on Pin-Fin Apparatus.**
14		REPETITION	**REPETITION.**
15		INTERNAL	**INTERNAL LAB TEST.**

LAB INCHARGE

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

Part - C
EVALUATION PROCESS:

Evaluation Task	COs	Marks
Day to Day Evaluation	1	A=5
Record	2	B=5
Internal Examination	3	C=5
Cumulative Internal Marks : A+B+C	**1,2,3**	**A+B+C=15**
Semester End Examinations	**1,2,3**	**D=35**
Total Marks: A+B+C+D	**1,2,3**	**50**

PROGRAMME OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES:

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
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 or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.A Nageswara Rao, Mrs.B.Kamala Priya, Ms.P. Mounika

Course Name & Code : CAD/CAM LAB & 20ME63 **Regulation**:R20

L-T-P Structure : **0-0-3** **Credits:** 1.5

Program/Sem/Sec : B.Tech/VI/B **A.Y.:** 2024-25

PREREQUISITE: Computer Aided Machine Drawing, CAD/CAM

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to design, assemble, analyze and manufacture engineering components using computer aided tools.

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

CO1	Design and assemble the mechanical components using CAD Software. **(Analyzing - L4)**
CO2	Apply finite element analysis for components using analysis software. **(Applying - L3)**
CO3	Develop NC code for different part profiles and perform machining on CNC Machine tools. **(Applying - L3)**
CO4	Simulate part program to perform various operations on CNC machine. **(Applying - L3)**

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	1			2										2	
CO2	1	1	2	2	1							1		3	
CO3	1	1	1		1							1		3	
CO4		2		1										2	
1 - Low **2 –**Medium **3 -** High															

SOFTWARE PACKAGES: CATIA /ANSYS / Iron CAD etc.

REFERENCES:

- Lab Manuals

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments (Section – A)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	22761A0301-331, 23765A0301-329	58

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 CAD/CAM Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	04-12-2024		TLM4	
Cycle-I						
2.	Design and Assembly Modeling of Knuckle joint using CAD software	3	11-12-2024		TLM4	
3.	Design and Assembly Modeling of Universal Coupling using CAD software	3	18-12-2024		TLM4	
4.	Design and Assembly Modeling of Piston, Connecting Rod parts using CAD software	3	08-01-2025		TLM4	
5.	Analysis of trusses using ANSYS	3	22-01-2025		TLM4	
6.	Analysis of Beams using ANSYS	3	29-01-2025		TLM4	
7.	Analysis of 3D solids using ANSYS	3	12-02-2025		TLM4	
8.	Steady state heat transfer analysis using ANSYS	3	19-02-2025		TLM4	
Cycle-II						
9.	Estimation of natural frequencies and mode shapes for simple problems using ANSYS	3	05-03-2025		TLM4	
10.	Development of NC code using CAM packages	3	12-03-2025		TLM4	
11.	Machining of simple components on CNC Turning by transferring NC Code from CAM package	3	19-03-2025		TLM4	
12.	**Additional Experiments:** Machining of Simple components on CNC-Mill by transferring NC Code from CAM Package	3	26-03-2025		TLM4	
13.	Robot programming, simulation, and execution	3	26-03-2025		TLM4	
14.	Revision	3	02-04-2025		TLM4	
16.	Internal Exam	3	05-04-2024		TLM4	
No. of classes required to complete:				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination: A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

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	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and

	responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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				
Signature	Mr.A Nageswara Rao, Mrs.B.Kamala Priya, Ms. P Mounika	**Mr.A.Nageswara Rao**	**Mr.J.Subba Reddy**	**Dr.M.B.S.Sreekara Reddy**

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Ch.Siva Sankara Babu, Mr.K. V. Viswanadh

Course Name & Code : ROBOTICS AND SIMULATION LAB & 20ME64 **Regulation**:R20

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

Program/Sem/Sec : B.Tech/VI/A **A.Y.:** 2024-25

PREREQUISITE: Engineering Mechanics, Theory of Machines, Robotics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to demonstrate and analysis of various types of robots.

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

CO1	Simulate forward and inverse kinematic movements of a robot using Robo Analyzer and MATLAB. **(Understanding - L2)**
CO2	Perform the demo operations on SCARA and PUMA using Robo analyzer software. **(Applying - L3)**
CO3	Experiment the robot operations like palletizing, gluing, spray painting, polishing, loading and Unloading. **(Applying - L3)**
CO4	Develop Robot Programmes to use to control commands. **(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
CO1	2	1			3							2		3	
CO2	1	2	2		3							2		3	
CO3	3	3		2	3							3			3
CO4	1	1			3							2			3
1 - Low					**2** –Medium							**3** - High			

SOFTWARE PACKAGES: ARISTO ROBOT, C Prog, Robo Analyzer, MAT Lab

REFERENCES:

- Lab Manuals

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments (Section – B: B1 Batch): Saturday

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	22761A0301 - 22765A0320, 330, 23765A0301 - 23765A311	28

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 Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	07-12-2024		TLM4	
Cycle-I						
2.	Study the anatomy of robots	3	21-12-2024		TLM4	
3.	Analysis of robot configuration and Simulation of Robot with 2 DOF using Robo Analyzer.	3	28-12-2024		TLM4	
4.	Analysis of robot configuration and Simulation of Robot with 6 DOF using Robo Analyzer.	3	04-01-2025		TLM4	
5.	D-H parametric representation of various robotic arms using Robo Analyzer	3	18-01-2025		TLM4	
6.	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	25-01-2025		TLM4	
7.	Simulation of SCARA, PUMA using Robo Aanlyzer	3	01-02-2025		TLM4	
I Mid Exams : 03-02-2025 to 08-02-2025						
Cycle-II						
8.	Introduction to IGUS Software	3	15-02-2025		TLM4	
9.	Introduction to IGUS Software	3	22-02-2025		TLM4	
10.	Program for commands like a line command, circle command, Point to Point (PTP) command	3	01-03-2025		TLM4	
11.	Palletizing	3	15-03-2025		TLM4	
12.	Loading / Unloading	3	22-03-2025		TLM4	
13.	Pending work	3	29-03-2025		TLM4	
14.	Internal Exam	3	05-04-2025		TLM4	
II Mid Exams:07-04-2025 to 12-04-2025						
No. of classes required to complete: 14				**No. of classes taken:**		

Schedule of Experiments (Section – B: B2 Batch): Tuesday

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B2	23765A0312-23765A0338	27

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 Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	03-12-2024		TLM4	
Cycle-I						
2.	Study the anatomy of robots.	3	10-12-2024		TLM4	
3.	Analysis of robot configuration and Simulation of Robot with 2 Dof using Robo Analyzer.	3	17-12-2024		TLM4	
4.	Analysis of robot configuration and Simulation of Robot with 6 Dof using Robo Analyzer.	3	24-12-2024		TLM4	
5.	D-H parametric representation of various robotic arms using Robo Analyzer	3	31-12-2024		TLM4	
6.	Forward Kinematics Analysis of Robot using Robo Analyzer	3	07-01-2025		TLM4	
7.	Inverse Kinematics Analysis of Robot using Robo Analyzer	3	21-01-2025		TLM4	
I Mid Exams : 03-02-2025 to 08-02-2025						
Cycle-II						
8.	Simulation of SCARA, PUMA using Robo Aanlyzer	3	28-01-2025		TLM4	
9.	Introduction to IGUS Software	3	11-02-2025		TLM4	
10.	Program for commands like a line command, circle command	3	18-02-2025		TLM4	
11.	Program for Point to Point (PTP) command	3	25-02-2025		TLM4	
12.	Palletizing, Loading / Unloading	3	04-03-2025		TLM4	
13.	Pending work	3	11-03-2025		TLM4	
14.	Pending work	3	18-03-2025		TLM4	
15.	Pending work	3	25-03-2025		TLM4	
16.	Internal Exam	3	01-04-2025		TLM4	
17.	**II Mid Exams:07-04-2025 to 12-04-2025**					
No. of classes required to complete: 14				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination: A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

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.
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PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 5	**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.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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.

Signature				
Name of the Faculty	Dr.Siva Sankara Babu Ch / Mr. AK. V. Viswanadh	Mr. J. Subba Reddy	Mr. J. Subba Reddy	Dr.M.B.S.Sreekara Reddy
	Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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COURSE HANDOUT

PART-A

Name of Course Instructor : **Mrs. K. Samaikya**
Course Name & Code : Soft Skills & 20HSS1
L-T-P Structure : 1-0-2 **Credits:** 02
Program/Sem/Sec : B. Tech- VI SEM MECH-A
Academic Year : 2024-25

PREREQUISITE : NIL

Course Educational Objectives:

The Soft Skills Laboratory course equips students with required behavioral, interpersonal & Intrapersonal skills, communication skills, leadership skills etc. It aims at training undergraduate students on soft skills leading to enhanced self-confidence, esteem, and acceptability in professional circles.

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

CO1	To Develop self-awareness and personality traits for professional growth.	L2
CO2	Work effectively in multi-disciplinary and heterogeneous teams through knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.	L3
CO3	Communicate through verbal/oral communication with good listening skills and empathy.	L3
CO4	Apply skills required to qualify in recruitment tests, Interviews & other professional assignments.	L3

COURSE ARTICULATION MATRIX
(Correlation between COs & POs)

Course Outcomes / PO's →	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1.					2			3	3	3		2
CO2.		2			2			3	3	3		3
CO3.					2			3	3	3		3
CO4.					2			3	3	3		

1 = Slight (Low) 2= Moderate (Medium) 3 = Substantial (High)

List of Activities:

1.Personality Development Skills

Role of language in Personality – How language reflects, impacts Personality – Using gender- neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code

Activities: Group Discussion/Role play/Presentations (authentic materials: Newspapers, pamphlets and News Clippings)

2.Impactful Communication

Activities: Extempore / Story Telling/ Group Discussion (Case studies/Current affairs etc.)/ Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing reviews on short story/videos/book/Social Media profiling/ Pronunciation Practice

3.Professional Skills:

Career Planning- job vs. career- goal setting- SWOT Analysis-Time management – self-management – stress-management.

Activities: SWOT analysis of the self/Goal Setting-Presentation/Writing Report/Listening exercises/Effective Resume-Writing and presentation/ Interview Skills: Mock interviews/Video samples.

REFERENCES:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001
2. Adrian Furnham, Personality and Intelligence at Work, Psyc 2. hology Press, 2008.
3. M.Ashraf Rizvi, "Effective Technical Communication", 1 st edition, Tata cGrawHill, 2005.
4. Ace of Soft skills Gopalaswamy Ramesh, Pearson Education India, 2018
5. Soft Skills for the Workplace, Good heart - Willcox Publisher · 2020.
6. How to Win Friends and Influence People, Dale Carnegie · 2020

Software: Walden InfoTech

COURSE DELIVERY PLAN (LESSON PLAN)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	**Activity-1:** Role of language in Personality- How language reflects, impacts Personality/ Using gender Neutral language in MNCs – being Culturally-Sensitive	1+2	05/12/2024		
2.	Personality Traits - Grooming & Dress code & Role-play	1+2	12/12/2024		
3.	Group Discussion	1+2	19/12/2024		
4.	Group Discussion	1+2	26/12/2024		
5.	Presentations	1+2	02/01/2024		
6.	**Activity-2:** Impactful Communication Extempore - Story Telling	1+2	09/01/2025		
7.	Extempore -Group Discussion	1+2	23/01/2025		
8.	Elocution on Interpretation of given quotes Critical Appreciation and Textual Analysis	1+2	30/01/2025		
9.	Writing Reviews on short story /videos /book/Social Media profiling/ Pronunciation Practice	1+2	13/02/2025		
10.	**Activity-3**: Professional Skills: Career Planning- job vs. career- goal setting	1+2	20/02/2025		
11.	SWOT Analysis	1+2	27/02/2025		
12.	Time management – Self- management – stress-management.	1+2	06/03/2025		
13.	Presentation/Writing Report/Listening exercises	1+2	13/03/2025		
14.	Effective Resume-Writing and presentation	1+2	20/03/2025		
15.	Interview Skills: Mock interviews/Video samples.	1+2	27/3/2025		
16.	Interview Skills: Mock interviews/Video samples.	1+2	03/04/2025		
No. of classes required to complete Syllabus :48					

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty				
Signature	**K. Samaikya**	**Dr Padma Venkat**	**Dr Padma Venkat**	**Dr A Rami Reddy**

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. P. Ravindra Kumar (T507)
Course Name & Code : 20ME17
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., Mech Engg., VI-Sem., Section-B A.Y: 2024-25

PRE-REQUISITE: Thermodynamics, Applied Thermodynamics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To learn the physical mechanisms on modes of heat transfer, differential equations in heat transfer applications and the significance of Non-Dimensional Numbers.

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

CO1	Understand the basic heat transfer principles and their practical relevance in Planes, Cylinders and Spherical components. **(Understanding - L2).**
CO2	Analyze steady and unsteady state heat transfer concepts and fins. **(Analyzing – L4).**
CO3	Formulate the expressions to solve free and forced convection problems related to external and internal flows. **(Applying -L3).**
CO4	Apply the concepts of heat transfer in boiling, condensation, and radiation thermal systems. **(Applying -L3).**
CO5	Design the simple heat exchanger for engineering applications using the data handbook. **(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
CO1	3	2	1	-	-	-	-	-	-	-	-	2	1	-	1
CO2	2	3	2	3	-	-	-	-	-	-	-	2	2	-	-
CO3	3	2	3	2	-	-	-	-	-	-	-	2	3	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	2	3	-	2
CO5	2	3	3	3	-	-	-	3	-	-	-	3	2	-	3

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

TEXTBOOKS

T1. R.C.Sachdeva - Fundamentals of Engineering Heat and Mass Transfer -New Age Science Publishers, 3nd Edition, 2009.

T2. Yunus. A. Cengel, Heat & Mass Transfer-A Practical Approach – Tata McGraw Hill, 4 edition, 2012.

T3. P.Holman, Heat transfer - Tata McGraw-Hill, 9th Edition, 2010

REFERENCE BOOKS:

1	M.NecatiOzisik, Heat Transfer- A basic Approach, 4thEdition, McGraw-Hill book company, 1985.
2	P.K.Nag, Heat and Mass Transfer- TMH 2ndEdition, 2007.
3	P.S.Ghoshdastidar, Heat Transfer - Oxford Higher Education 6th Edition 2011.
4	C.P.Kothandaraman and Subramanian, Heat and Mass Transfer, New Age International Publications 7thEdition 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):
UNIT-I: INTRODUCTION, ONE- DIMENSIONAL STEADY STATE CONDUCTION

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 Course and Course Outcomes (COs) and POs articulation matrix.	1	02-12-2024		TLM1 TLM2	
2.	Introduction of five Units importance	1	04-12-2024		TLM1 TLM2	
3.	Introduction to heat transfer and its applications, Basic Modes of Heat Transfer	1	05-12-2024		TLM1, TLM2 TLM5	
4.	Numerical problems on Modes of Heat Transfer **- Tutorial -I**	1	07-12-2024		TLM3	
5.	Basic laws of Heat Transfer-Steady, Unsteady and Periodic Heat Transfer	1	07-12-2024		TLM1, TLM4	
6.	General heat conduction equation in Cartesian coordinate system and its simplifications.	1	09-12-2024		TLM1	
7.	Fourier's law of heat conduction; Thermal conductivity.	1	11-12-2024		TLM1, TLM2	
8.	Numerical problems on plane wall, composite plane wall.	1	12-12-2024		TLM1	
9.	General heat conduction equation in cylindrical coordinate system and its simplifications.	1	16-12-2024		TLM1	
10.	Numerical problems on cylinder and composite cylinder.	1	18-12-2024		TLM1	
11.	General heat conduction equation in spherical coordinate system and its simplifications.	1	19-12-2024		TLM1, TLM2	
12.	Numerical problems on sphere and composite sphere	1	21-12-2024		TLM1	
13.	Heat conduction through plane wall and cylinder with constant thermal conductivity– Numerical Problems. **Tutorial -2**	1	21-12-2024		TLM3	
14.	Electrical analogy, thermal resistance, and overall heat transfer coefficient.	1	23-12-2024		TLM1, TLM2 TLM5	
15.	Numerical Problems with thermal resistance and overall heat transfer coefficient	1	26-12-2024		TLM1, TLM2	
16.	Heat transfer through composite slab and cylinder, Numerical Problems.	1	28-12-2024		TLM4	
17.	Critical radius of insulation for cylinder, Sphere and Applications. **Tutorial-3**	1	28-12-2024		TLM3 TLM4	
18.	Numerical Problems on critical radius of insulation	1	30-12-2024		TLM1 TLM2	
No. of classes required to complete UNIT-I: 18				No. of classes taken:		

UNIT-II: ONE DIMENSIONAL STEADY AND TRANSIENT STATE HEAT CONDUCTION:

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.	Derivation on heat flow through a plane wall, cylinder with variable thermal conductivity.	1	02-01-2025		TLM1	
2.	Numerical problems on variable thermal conductivity – plane wall and cylinder **- Tutorial-4**	1	04-01-2025		TLM3	

3.	Derivation on Uniform Internal heat generation in slabs	1	04-01-2025		TLM1	
4.	Numerical Problems on Uniform Internal heat generation in slabs.	1	06-01-2025		TLM1	
5.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	08-01-2025		TLM1, TLM2	
6.	Extended surfaces - Classification	1	09-01-2025		TLM1, TLM2 TLM4	
7.	Thermal analysis of long Fins	1	18-01-2025		TLM1, TLM4	
8.	Thermal analysis of short fins with insulated tip.	1	18-01-2025		TLM1, TLM2	
9.	Numerical Problems on long and short fins.	1	20-01-2025		TLM1	
10.	Fin efficiency and effectiveness	1	22-01-2025		TLM1, TLM4	
11.	Problems on Fin efficiency and effectiveness	1	23-01-2025		TLM1	
12.	Systems with negligible internal Resistance (Lumped Heat Analysis), Significance of Biot and Fourier Numbers	1	25-01-2025		TLM1, TLM2 TLM4	
13.	Numerical Problems, Heisler chart solutions **Tutorial-5**	1	25-01-2025		TLM3	
14.	Basics of convective (Forced and Natural) heat transfer and Applications. Dimensional analysis and Buckingham Pi theorem applied to Forced Convection.	1	27-01-2025		TLM1, TLM2	
15.	Significance of Non-Dimensional Numbers.	1	29-01-2025		TLM3	
16.	Dimensional analysis and Buckingham Pi theorem applied to Natural Convection.	1	30-01-2025		TLM1	
17.	Derivation of Buckingham Pi theorem applied to forced convection **Tutorial 6**	1	01-02-2025		TLM3	
18.	Revision of the above two units.	1	01-02-2025		TLM1	
No. of classes required to complete UNIT-II: 18				No. of classes taken:		

UNIT-III: CONVECTION

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.	Forced Convection heat transfer – Planes and cylinders, pipes	1	10-02-2025		TLM1, TLM2, TLM4	
2.	Numerical Problems on boundary layers.	1	12-02-2025		TLM1	
3.	Forced convection analysis in external flows (Flow over a Flat Plate): Laminar and turbulent flows.	1	13-02-2025		TLM1, TLM2	
4.	Numerical Problems on flow through pipes. **Tutorial -7**	1	15-02-2025		TLM3	
5.	Forced convection analysis in internal flows (Flow through circular pipe): Laminar and turbulent flows.	1	15-02-2025		TLM1, TLM2	
6.	Numerical Problems on Forced Convection, Reynolds Colburn	1	17-02-2025		TLM1, TLM2	

	Analogy.					
7.	Natural convection: heat transfer in vertical and horizontal surfaces.	1	19-02-2025		TLM1, TLM2 TLM4	
8.	Development of Hydrodynamic and thermal boundary layer along horizontal plate,	1	20-02-2025		TLM1, TLM2	
9.	Forced convection in Vertical and horizontal plates	1	22-02-2025		TLM1	
10.	Numerical Problems **Tutorial -8**	1	22-02-2025		TLM3	
11.	Numerical Problems	1	24-02-2025		TLM1	
No. of classes required to complete UNIT-III:11				No. of classes taken:		

UNIT-IV: BOILING AND CONDENSATION, THERMAL RADIATION

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 boiling heat transfer and applications, Pool Boiling, Different regimes of boiling; Critical heat flux.	1	26-02-2025		TLM1, TLM2	
2.	Numerical problems with nucleating boiling, Critical heat flux conditions.	1	27-02-2025		TLM1, TLM2 TLM5	
3.	Condensation: Film wise and drop wise condensation, Laminar film wise condensation on Vertical plate	1	01-03-2025		TLM1, TLM2	
4.	Numerical Problems - **Tutorial-9**	1	01-03-2025		TLM3	
5.	Introduction and applications of Thermal Radiation, Emissive Power, Absorption, Reflection and Transmission and	1	24-03-2025		TLM1, TLM2, TLM4	
6.	Definitions related to radiation, Concept of black and non-black bodies, Laws of black body radiation	1	26-03-2025		TLM1, TLM2, TLM4	
7.	Emissivity, Kirchhoff's law, Shape Factors	1	27-03-2025		TLM2, TLM4	
8.	Radiation heat exchange between two black isothermal surfaces, Nonblack infinite parallel plates;	2	29-03-2025		TLM1,	
9.	Numerical Problems - **Tutorial-12**	1	29-03-2025		TLM3	
No. of classes required to complete UNIT-IV:10				No. of classes taken:		

UNIT-V: HEAT EXCHANGERS

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-Classification of heat exchangers - Flow arrangement, Temperature distribution,	1	03-03-2025		TLM1, TLM2 TLM6	
2.	Applications of Heat Exchangers	1	05-03-2025		TLM1, TLM2	
3.	Overall heat transfer coefficient-Fouling factor	1	06-03-2025		TLM1, TLM2	
4.	Derivation on LMTD method of Heat exchanger analysis-	1	10-03-2025		TLM1, TLM2 TLM4	
5.	Parallel flow, Numerical Problems	1	12-03-2025		TLM1,	

6.	Derivation on LMTD method of Heat exchanger analysis- Counter flow,	1	13-03-2025		TLM1, TLM2, TLM4	
7.	Numerical Problems – Counter flow HE – **Tutorial 10**	1	15-03-2025		TLM3	
8.	Correction factor for LMTD for use with Multi pass and Cross flow Heat Exchangers	1	15-03-2025		TLM1, TLM2	
9.	Derivation - Effectiveness - NTU method of Heat Exchanger Analysis – parallel flow arrangement - Applications	1	17-03-2025		TLM1, TLM2, TLM4	
10.	Effectiveness - NTU method of Heat Exchanger Analysis – parallel flow arrangement problems	1	19-03-2025		TLM1, TLM2	
11.	Counter flow - Effectiveness - NTU method of Heat Exchanger Analysis- Applications of Heat Exchangers	1	20-03-2025		TLM1, TLM4 TLM5	
12.	Cross flow - Effectiveness - NTU method of Heat Exchanger Analysis- Applications of Heat Exchangers-	1	22-03-2025		TLM1	
13.	**Tutorial-11**	1	22-03-2025		TLM3	
No. of classes required to complete UNIT-V: 13				No. of classes taken:		

S.No.	Revision and recap of the Contents	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	First two and half units	1	31-03-2025		TLM5,6	
2.	Second two and half units	1	02-04-2025		TLM5,6	

S.No.	Content Beyond the Syllabus	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
3.	PCB Cooling	1	03-04-2025		TLM2	
4.	Unsteady state thermal analysis	1	05-04-2025		TLM2	

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

PART-C

Evaluation Process (R20 Regulations):

Evaluation Task	Marks
Assignment- Cycle I	A1=5
I-Mid Examination (Units-I, II half of III unit)	M1=15
I-Quiz Examination (Units-I, II half of III unit)	Q1=10
Assignment- Cycle - II	A3=5
II-Mid Examination (half of Unit-III, IV & V)	M2=15
II-Quiz Examination (half of Unit-III, IV & V)	Q2=10
Mid Marks =80% of Max (M1, M2) +20% of Min (M1, M2)	M=15
Quiz Marks =80% of Max (Q1, Q2) +20% of Min (Q1, Q2)	B=10
Cumulative Internal Examination (CIE): A+B+M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFC 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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Dr.P.Ravindra Kumar)	(Dr.P.Ravindra Kumar)	(Dr.P.Vijay Kumar)	(Dr.M.B.S.S.Reddy)

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Venkateswara Reddy, Assistant Professor

Course Name & Code	**:** CAD/CAM & 20ME18	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	: B.Tech VI Sem (B)	**A.Y.:** 2024-2025

PREREQUISITE: Design of Machine Elements -I, Machine Tools and Metrology

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to familiarize the principles of geometric modeling, numerical control and part programming.

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

CO1	Comprehend the principles of CAD/CAM for design and manufacturing **(Understanding -L2)**
CO2	Formulate mathematical equations for geometrical entities like curves, surface, and solids. **(Applying -L3)**
CO3	Write the program for part profiles to accomplish numerical control machining. **(Applying -L3)**
CO4	Discuss the codes for different parts using GT and apply in automated manufacturing systems. **(Understanding -L2)**
CO5	Contrast CAQC techniques and comprehend the applications of Computer Integrated Manufacturing. **(Understanding -L2)**

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	1			2										2	
CO2	1	1	2	2	1							1		3	
CO3	1	1	1		1							1		3	
CO4		2		1										2	
CO5	1				1									3	
1 - Low						**2 –**Medium							**3 -** High		

TEXTBOOKS:

T1 P.N Rao ,CAD/CAM Principle and applications, Tata McGraw Hill Education Private Ltd, New Delhi,8th edition 2013.

T2 Ibrahim Zeid, Mastering CAD/CAM, TATA McGraw-Hill publishing CO.Ltd, NewDelhi 2011.

REFERENCE BOOKS:

R1	Mikel P.Groover and Emory W.Zimmers, CAD/CAM-Prentice Hall of India Private Ltd. New Delhi, 20th edition, May 2010.
R2	P.Radhakrishnan,S.Subramanyam&V.Raju,CAD/CAM/CIM, New Age International Publishers,3rd edition 2010.
R3	Mikel P.Groover, Automaiton, Production Systems and Computer Integrated Manufacturing, Prentice Hall of India Private Ltd. New Delhi, 3rd edition, May 2008.
R4	Ibrahim Zeid and R. Sivasubramanian, CAD/CAM theory and practice, Tata McGraw Hill Publishing Co. Ltd,New Delhi 2009.
R5	Tien-Chienchang, Richard A.Wysk and HSU-Pin (Ben) Wang, —Computer Aided Manufacturing, 3rd Edition, 2006

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	1	03-12-2024		**TLM1/TLM2**	
2.	Product Cycle Revised with CAD/CAM	1	04-12-2024		**TLM1/TLM2**	
3.	Reasons for implementing CAD	1	05-12-2024		**TLM1/TLM2**	
4.	Creating Manufacturing database & Benefits of CAD	1	07-12-2024		**TLM1/TLM2**	
5.	Computer Graphics- Introduction	1	10-12-2024		**TLM1/TLM2**	
6.	Database structure	1	11-12-2024		**TLM1/TLM2**	
7.	Functions of a graphics package	1	12-12-2024		**TLM1/TLM2**	
8.	Raster scan graphics	1	14-12-2024		**TLM1/TLM2**	
9.	Concatenated transformations.	1	17-12-2024		**TLM1/TLM2**	
10.	Translation, scaling,	1	18-12-2024		**TLM1/TLM2**	
11.	Reflection, rotation	1	19-12-2024		**TLM1/TLM2**	
12.	Problems on Transformations	1	21-12-2024		**TLM1/TLM2**	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: GEOMETRIC MODELING: REPRESENTATION OF CURVES, REPRESENTATION OF 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
13.	Geometric Modelling: Introduction	1	24-12-2024		**TLM1/TLM2**	
14.	Wireframe Modelling: Entities wireframe models	1	26-12-2024		**TLM1/TLM2**	
15.	Parametric representation of analytical curves	1	28-12-2024		**TLM1/TLM2**	
16.	Parametric representation of	1	31-12-2024		**TLM1/TLM2**	

	analytical curves					
17.	Hermite cubic spline curve	1	02-01-2025		**TLM1/TLM2**	
18.	Bezier curves	1	04-01-2025		**TLM1/TLM2**	
19.	B-spline curves, Characteristics of Curves	1	07-01-2025		**TLM1/TLM2**	
20.	Problems	1	08-01-2025		**TLM1/TLM2**	
21.	Surface representation, Entities	1	09-01-2025		**TLM1/TLM2**	
22.	Solid modelling	1	11-01-2025		**TLM1/TLM2**	
23.	B-Rep	1	18-01-2025		**TLM1/TLM2**	
24.	CSG	1	21-01-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

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
25.	Numerical control: Introduction	1	22-01-2025		**TLM1/TLM2**	
26.	NC Modes, NC elements	1	23-01-2025		**TLM1/TLM2**	
27.	N C Coordinate systems	1	25-01-2025		**TLM1/TLM2**	
28.	Structure of CNC machine tools	1	28-01-2025		**TLM1/TLM2**	
29.	Spindle design, spindle drives	1	29-01-2025		**TLM1/TLM2**	
30.	Feed drives, actuation systems	1	30-01-2025		**TLM1/TLM2**	
31.	CNC Part programming	1	01-02-2025		**TLM1/TLM2**	
32.	fundamentals	1	11-02-2025		**TLM1/TLM2**	
33.	Manual part programming	1	12-02-2025		**TLM1/TLM2**	
34.	Computer Aided part programming	1	13-02-2025		**TLM1/TLM2**	
35.	Part programming examples	1	15-02-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

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
36.	Group Technology	1	18-02-2025		**TLM1/TLM2**	
37.	Coding and classification schemes- OPITZ	1	19-02-2025		**TLM1/TLM2**	
38.	MICLASS, example for coding	1	20-02-2025		**TLM1/TLM2**	
39.	CODE Systems, examples for coding	1	22-02-2025		**TLM1/TLM2**	
40.	Production Flow Analysis	1	22-02-2025		**TLM1/TLM2**	
41.	Advantages and limitations	1	25-02-2025		**TLM1/TLM2**	
42.	GT Machine cells, Benefits of GT	1	27-02-2025		**TLM1/TLM2**	
43.	CAPP- Retrieval and Generative	1	01-03-2025		**TLM1/TLM2**	
44.	Flexible Manufacturing System: Introduction	1	04-03-2025		**TLM1/TLM2**	
45.	FMS equipment, FMS layouts, benefits	1	05-03-2025		**TLM1/TLM2**	
46.	FMS Planning and implementation	1	06-03-2025		**TLM1/TLM2**	
47.	FMS Planning and implementation	1	08-03-2025		**TLM1/TLM2**	

No. of classes required to complete UNIT-IV: 12	No. of classes taken:

UNIT-V: COMPUTER AIDED QUALITY CONTROL, COMPUTER INTEGRATEDMANUFACTURING 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
48.	CAQC: Introduction, The computers in QC	1	11-03-2025		**TLM1/TLM2**	
49.	Contact inspection methods	1	12-03-2025		**TLM1/TLM2**	
50.	Non-Contact inspection methods: Optical	1	13-03-2025		**TLM1/TLM2**	
51.	Non-Contact inspection methods: non optical	1	15-03-2025		**TLM1/TLM2**	
52.	Computer aided testing,	1	18-03-2025		**TLM1/TLM2**	
53.	CAQC with CAD/CAM	1	19-03-2025		**TLM1/TLM2**	
54.	CAQC with CAD/CAM	1	20-03-2025		**TLM1/TLM2**	
55.	CIM Introduction	1	22-03-2025		**TLM1/TLM2**	
56.	CIM integration, Implementation	1	25-03-2025		**TLM1/TLM2**	
57.	Benefits of CIM	1	26-03-2025		**TLM1/TLM2**	
58.	Lean manufacturing	1	27-03-2025		**TLM1/TLM2**	
59.	Lean manufacturing	1	29-03-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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
60.	3D printing	1	01-04-2025		**TLM1/TLM2**	
61.	3D features	1	02-04-2025		**TLM1/TLM2**	
62.	Generative design	1	03-04-2025		**TLM1/TLM2**	
63.	Additive manufacturing optimization	1	05-04-2025		**TLM1/TLM2**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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 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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**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.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage

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

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**
Signature				
Name of the Faculty	**Mr.K.Venkateswara Reddy**	**Dr.A.Nageswara Rao**	**Mr.J.Subba Reddy**	**Dr.M.B.S.Sreekara Reddy**

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. S. Srinivasa Reddy
Course Name & Code : Design of Machine Elements-II & 20 ME19
L-T-P Structure : 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VI/B **A.Y.:** 2024-25
PREREQUISITE: Design of Machine Elements-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to understand and apply the standard procedure available for the design of mechanical components and IC engine components.

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

CO1	Select suitable bearings under different load, speed, and life conditions**. (Applying - L3)**
CO2	Design internal combustion engine components for safe and continuous operation. **(Applying - L3)**
CO3	Select the belt and rope drives for elevators, cranes, and hoisting machinery. **(Applying - L3)**
CO4	Design the springs under static and dynamic loads. **(Applying - L3)**
CO5	Estimate the performance parameters of the gears for various loading conditions. **(Applying - L3)**

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	2	2	3	1	1							1	1	1	3
CO2	1	2	3	1	2							1	2		3
CO3	3	2	3		1	1						1		1	3
CO4	3	2	3	2	1				1			1		-	3
CO5	3	2	3	2	2	1			1			1		1	3
1 - Low							**2** –Medium						**3** - High		

TEXTBOOKS:

T1 Bhandari V.B, Design of Machine Elements, 3rd Edition, TataMcGraw-Hill2010.

T2 Sundararajamoorthy T. V, Shanmugam. N, "Machine Design", Anuradha Publications, Chennai, 2003.

REFERENCE BOOKS:

R1 Norton R.L—Design of Machinery, TataMcGraw-Hill Book Co, 2004.

R2 Shigley J.E and Mischke C.R.—Mechanical Engineering Design‖, TataMcGraw-Hill, 2003

HANDBOOKSTOBEALLOWED

1 Design Data book by PSG College of Technology, Coimbatore.
Design Data Hand book for Mechanical Engineering by Mahadevan.K and K.Balaveera Reddy.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: SLIDING CONTACT BEARINGS & ROLLING CONTACT BEARINGS

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 Subject, CEO's and CO's	1	03-12-2024		TLM1	
2.	Introduction to Unit-1, **Bearings** –Introduction, Types	1	04-12-2024		TLM1 TLM2	
3.	Lubricating Oils Properties, Materials used for bearings and their properties	1	04-12-2024		TLM1 TLM2	
4.	**Journal Bearings** –Introduction, Types, Dimensionless parameters	1	07-12-2024		TLM1 TLM2	
5.	Design procedure of journal bearing	1	10-12-2024		TLM1	
6.	Journal bearings - problems	1	11-12-2024		TLM1.2	
7.	Dimensionless parameters used in the bearing design – problem	1	11-12-2024		TLM1.2	
8.	Tutorial-**1**	1	14-12-2024		TLM3	
9.	**Rolling contact bearings-types**, bearing life, Materials used and designation of rolling contact bearings	1	17-12-2024		TLM1 TLM2	
10.	Static load and dynamic load capacity	1	18-12-2024		TLM1	
11.	Selection of ball bearing - problems	1	18-12-2024		TLM1.2	
12.	Tutorial-**2**	1	21-12-2024		TLM3	
13.	Cubic mean load derivation, Reliability of bearings - problems	1	03-12-2024		TLM1.2	
No. of classes required to complete UNIT-I		13	No. of classes taken:			

UNIT-II: IC ENGINE COMPONENTS: PISTON, CONNECTING ROD AND CRANK SHAFT

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 Unit-II, Engine Parts and working	1	24-12-2024		TLM1 TLM2	
2.	**PISTON**: Design procédure of piston	1	28-12-2024		TLM1.2	
3.	Piston design - problems	1	31-12-2024		TLM1.2	
4.	Piston design - problems	1	01-01-2025		TLM1.2	
5.	Cylinder design, cylinder liners-design	1	01-01-2025		TLM1.2	
6.	Cylinder, cylinder liners-design Problems	1	04-01-2025		TLM1.2	
7.	Tutorial-**3**	1	07-01-2025		TLM3	
8.	**CONNECTING ROD**: Thrust in C.R, buckling load	1	08-01-2025		TLM1 TLM2	
9.	Design Procedure of Connecting rod	1	08-01-2025		TLM1.2	
10.	Stresses due to whipping action on connecting rod ends- problems	1	11-01-2025		TLM1.2	
11.	**CRANK SHAFT:** Design of crank and crank shaft	1	18-01-2025		TLM1.2	
12.	Design of center crank shaft -problems	1	21-01-2025		TLM1,2	
13.	Tutorial-**4**	1	22-01-2025		TLM3	
No. of classes required to complete UNIT-II		13	No. of classes taken:			

UNIT-III: FLAT BELTS & PULLEYS &V-BELTS & V-GROOVED PULLEYS

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 Unit-III** **Flat belts** Introduction, Materials and Design Procedure	1	22-01-2025		TLM1 TLM2	
2.	Design Procedure of flat belts - Problems	1	25-01-2025		TLM1	
3.	**PULLEYS:** Design of pulleys mild steel & cast iron	1	28-01-2025		TLM1	
4.	Design of pulleys mild steel & cast iron	1	29-01-2025		TLM1	
5.	Design of pulleys Problems	1	29-01-2025		TLM1	
6.	Tutorial-**5** Revision	1	01-02-2025		TLM3	
7.	**Mid-I Examination from 03-02-2025 to 08-02-2025**					
8.	V-belts –designation, design and selection	1	11-02-2025		TLM1,2	
9.	Design of V belts - problems	1	12-02-2025		TLM1,2	
10.	Design of V belts - problems	1	12-02-2025		TLM1,2	
11.	Design of V- grooved pulley	1	15-02-2025		TLM1	
12.	Design of V- grooved pulley	1	18-02-2025		TLM1,2	
13.	Tutorial-**6**	1	19-02-2025		TLM3	
No. of classes required to complete UNIT-III		13	No. of classes taken:			

UNIT-IV: SPRINGS:

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 Unit-IV** **SPRINGS:** Introduction, classification	1	19-02-2025		TLM1 TLM2	
2.	Stresses, deflection and stiffness in springs and their derivations	1	22-02-2025		TLM1 TLM2	
3.	Springs for fatigue loading	1	25-02-2025		TLM1,2	
4.	Design of springs-problems	1	01-03-2025		TLM1	
5.	Tutorial-**7**	1	04-03-2025		TLM3	
6.	Spring failures, design of helical springs	1	05-03-2025		TLM1	
7.	Natural frequency of helical spring	1	05-03-2025		TLM1	
8.	Energy storage capacity in springs	1	08-03-2025		TLM1	
9.	Tension and torsion springs	1	11-03-2025		TLM1	
10.	Co-axial springs design- Problems	1	12-03-2025		TLM1	
11.	Design of leaf springs- Problems	1	12-03-2025		TLM1	
12.	Tutorial-**8**	1	15-03-2025		TLM3	
No. of classes required to complete UNIT-IV		12	No. of classes taken:			

UNIT-V: SPUR & HELICAL GEARS

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.	**GEARS**: **Introduction** and terminology, Types of gears, design formulae	1	18-03-2025		TLM1 TLM2	
2.	Design formulae	1	19-03-2025		TLM1 TLM2	
3.	Design Analysis of gears, Estimation of centre distance, module & face width	1	19-03-2025		TLM1 TLM2	
4.	Design procedure of spur gears, Check for dynamic and wear considerations	1	22-03-2025		TLM1 TLM2	
5.	Design of spur gears -Problems	1	25-03-2025		TLM1,2	
6.	Design of spur gears -Problems	1	26-03-2025		TLM1,2	

7.	Tutorial-**9**	1	26-03-2025		TLM3	
8.	Design procedure of Helical gears, Check for dynamic and wear considerations	1	29-03-2025		TLM1	
9.	Design of Helical gears -Problems	1	01-04-2025		TLM1,2	
10.	Design of Helical gears -Problems,	1	02-04-2025		TLM1,2	
11.	Tutorial-**10**	1	02-04-2025		TLM3	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

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
1.	Design of flywheels	1	22-01-2025		TLM1 TLM2	
2.	Design of Worm gear	1	05-04-2025		TLM1 TLM2	
3.	Design of Gear Box	1	05-04-2025		TLM1 TLM2	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

PO 1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	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	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	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.
PO 6	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	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	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	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	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 multi-disciplinary environments.
PO 12	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 or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Signature				
Name of the Faculty	Mr. S. Srinivasa Reddy	Mr. B. Sudheer Kumar		Dr. M.B.S Sreekara Reddy
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(An Autonomous Institution since 2010)
Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
L.B. Reddy Nagar, Mylavaram, NTR District, Andhra Pradesh - 521230

COURSE HANDOUT

PROGRAM : B.Tech., VI-Sem., MECH (B)

ACADEMIC YEAR : 2024-25

COURSE NAME & CODE : **MODERN MACHING PROCESSES- 20ME21**

STRUCTURE : 4-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : **S.Srinivasa Reddy**

COURSE COORDINATOR : **Dr. K Muarahari**

PRE-REQUISITE: PRODUCTION TECHNOLOGY, MACHINE TOOLS&METAL CUTTING

COURSE OBJECTIVE: The main objective of this course is to familiarize with unconventional machining processes and rapid prototyping.

COURSE OUTCOMES (CO)

CO 1: Assort appropriate unconventional machining processes for machining materials and to develop relevant industrial solutions for machining materials. **(Understanding - L2)**

CO 2: Understand the principles of Electro Chemical Machining Process for machining of materials. **(Understanding - L2)**

CO 3: Comprehend Electrical Discharge Machining principles for machining intricate components. **(Understanding - L2)**

CO 4: Differentiate the basic principles and applications of thermal machining processes like EBM, LBM and PAM. **(Understanding - L2)**

CO 5: Identify the appropriate Rapid Prototyping Processes for manufacturing various components**. (Understanding - L2)**

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**2**	**2**	**2**		**3**									**2**	
CO2	**3**	**2**	**3**		**3**									**3**	
CO3	**3**	**2**	**3**		**3**								**2**	**3**	
CO4	**3**	**2**	**3**		**3**								**2**	**3**	
CO5	**3**	**2**	**3**		**3**									**3**	

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight(Low), **2 -** Moderate(Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Pandey P.C. and shah H.S, Modern machining processes /TMH.

T2 Chua C.K, Leong K.F, and Lim C.S, Rapid prototyping principles and applications, second edition, world scientific publishers, and 2003.

BOS APPROVED REFERENCE BOOKS:

R1 M K Singh, Unconventional machining process / New age international.

R2 V K Jain, Advanced machining processes /Allied publishers.

R3 N.Hopkinson ,R.J.MHaque &P.M. Dickens Rapid Manufacturing, John Wiley &sons,2006.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : INTRODUCTION & MECHANICAL PROCESSES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Introduction of MMP and Course Co's and Po's	1	2-12-24		TLM1/TLM2	CO1	T1/R1	
2	Need for unconventional machining methods	1	3-12-24		TLM1/TLM2	CO1	T1/R1	
3	Classification of unconventional machining processes	1	4-12-24		TLM1/TLM2	CO1	T1/R1	
4	Considerations in process selection	1	6-12-24		TLM1/TLM2	CO1	T1/R1	
5	Basic principle of ultrasonic machining, equipment setup and procedure,	1	9-12-24		TLM1/TLM2	CO1	T1/R1	
6	Process variables and applications	1	10-12-24		TLM1/TLM2	CO1	T1/R1	
7	Basic principle of Abrasive jet machining, equipment setup and procedure.	1	11-12-24		TLM3/TLM6	CO1	T1/R1	
8	Water jet machining Basic principle, equipment setup and procedure	1	16-12-24		TLM1/TLM2	CO1	T1/R1	
9	Process variables and applications	1	17-12-24		TLM1/TLM2	CO1	T1/R1	
10	Rivision	1	18-12-24		TLM1/TLM2	CO1	T1/R1	
11	Assignment & Quiz	1	21-12-24		TLM1/TLM2	CO1	T1/R1	
No. of classes required to complete UNIT-I		11			No. of classes taken:			

UNIT-II : ELECTRO CHEMICAL PROCESSES &CHEMICAL MACHINING

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
12	Electrochemical Process Introduction	1	23-12-24		TLM1/TLM2	CO2	T1/R1	
13	ECM Process, and principles	1	24-12-24		TLM1/TLM2	CO2	T1/R1	
14	Equipment and material removal rate	1	28-12-24		TLM1/TLM2	CO2	T1/R1	
15	Equipment and material removal rate	1	30-12-24		TLM 3	CO2		
16	Electrochemical machining	1	31-12-24		TLM1/TLM2	CO2	T1/R1	
17	Electrochemical grinding	1	4-01-25		TLM1/TLM2	CO2	T1/R1	
18	Electrochemical deburring, Electrochemical honing	1	6-01-25		TLM1/TLM2	CO2	T1/R1	
19	Chemical machining-principle	1	7-01-25		TLM1/TLM2	CO2	T1/R1	
20	Maskants –Etchants, Advantages and Applications.	1	8-01-25		TLM1/TLM2	CO2	T1/R1	
21	Maskants –Etchants, Advantages and Applications.	1	13-01-25		TLM1/TLM2	CO2	T1/R1	
22	Rivision	1	18-01-25		TLM1/TLM2	CO2	T1/R1	
23	Assignment & Quiz	1	20-01-25		TLM1/TLM2	CO2	T1/R1	
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III: ELECTRICAL DISCHARGE MACHINING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
24	EDM Principle	1	21-01-25		TLM1/TLM2	CO3	T1/R1	
25	Process	1	22-01-25		TLM1/TLM2	CO3	T1/R1	
26	Power circuits for EDM	1	25-01-25		TLM1/TLM2	CO3	T1/R1	
27	Mechanics of metal removal in EDM	1	27-01-25		TLM1/TLM2	CO3	T1/R1	
28	Process parameters	1	28-01-25		TLM1/TLM2	CO3	T1/R1	
29	selection of tool electrode and dielectric fluid	1	29-01-25		TLM1/TLM2	CO3	T1/R1	
30	Electric discharge wire cutting principle	1	01-02-25		TLM1/TLM2	CO3	T1/R1	

31	Applications of EDM and Wire EDM	1	10-02-25		TLM1/TLM2	CO3	T1/R1	
32	Rivision	1	11-02-25		TLM1/TLM2	CO3	T1/R1	
33	Assignment & Quiz	1	12-02-25		TLM1/TLM2	CO3	T1/R1	
No. of classes required to complete UNIT-III		10			No. of classes taken:			

UNIT-IV : ELECTRON BEAM, LASER BEAM AND PLASMA ARC MACHINING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
34	Electron Beam Machining, Principle, process	1	15-02-25		TLM1/TLM2	CO4	T2/R3	
35	EBM Applications and Advantages	1	17-02-25		TLM1/TLM2	CO4	T2/R3	
36	laser beam machining, Principle, process	1	18-02-25		TLM1/TLM2	CO4	T2/R3	
37	LBM Applications and Advantages	1	19-02-25		TLM1/TLM2	CO4	T2/R3	
38	Plasma arc machining, Principle, process	1	22-02-25		TLM1/TLM2	CO4	T2/R3	
39	PAM Applications and Advantages	1	24-02-25		TLM1/TLM2	CO4	T2/R3	
40	Hot machining, Process, equipment, applications	1	25-02-25		TLM1/TLM2	CO4	T2/R3	
41	Hot machining, Process, equipment, applications	1	1-03-25		TLM1/TLM2	CO4	T2/R3	
42	revision	1	03-03-25		TLM1/TLM2	CO4	T2/R3	
43	Assignment & Quiz	1	04-03-25					
No. of classes required to complete UNIT-IV		10			No. of classes taken:			

UNIT-V : RAPID PROTOTYPING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
44	Introduction to RP fundamentals	1	05-03-25		TLM1/TLM2	CO5	T2/R3	
45	Elements, Advantages of Rapid Prototyping	1	10-03-25		TLM1/TLM2	CO5	T2/R3	
46	historical development, fundamentals of Rapid Prototyping	1	11-03-25		TLM1/TLM2	CO5	T2/R3	
47	classification of Rapid prototyping	1	12-03-25		TLM1/TLM2	CO5	T2/R3	
48	classification of Rapid prototyping	1	15-03-25		TLM3		T2/R2	
49	Rapid Prototyping process chain	1	17-03-25		TLM1/TLM2	CO5	T2/R3	

50	Stereo Lithography Apparatus (SLA)	1	18-03-25		TLM1/TLM2	CO5	T2/R3	
51	solid Ground Curing (SGC)	1	19-03-25		TLM1/TLM2	CO5	T2/R3	
52	EOS's EOSINT Systems	1	22-03-25		TLM3/TLM2	CO5	T2/R3	
53	Applications of Rapid Prototyping	1	24-03-25		TLM3/TLM6	CO5	T2/R3	
54	Rivision	1	25-03-25		TLM3/TLM6	CO5	T2/R3	
55	Assignment & Quiz	1	26-03-25					
No. of classes required to complete UNIT-V		12			No. of classes taken:			

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
56	Abrasive water jet aerospace applications	1	29-03-25					
57	EDM process parameters	1	31-03-25					
58	Revision	1	2-04-25					
59	Assignment & Quiz	1	5-04-25					
No. of classes required to complete		04						

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions	02-12-2024	01-02-2025	8W
I Mid Examinations	**03-02-2025**	**08-02-2025**	**1W**
II Phase of Instructions	10-02-2025	05-04-2025	8W
II Mid Examinations	**07-04-2025**	**12-04-2025**	**1W**
Preparation and Practical's	14-04-2025	19-04-2025	1W
Semester End Examinations	**21-04-2025**	**03-05-2025**	2W
Internship	05-05-2025	28-06-2025	8W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment–1	1	A1=5
Assignment–2	2	A2=5
I-Mid Examination	1,2	B1=20
Online Quiz-Q1	1,2	Q1-10
Assignment – 3	3	A3=5
Assignment– 4	4	A4=5
Assignment – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Online Quiz-Q2	3,4,5	Q2-10
Evaluation of Assignment Marks: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Online Quiz Marks: Q=(Q1+Q2)/2	1,2,3,4,5	Q=10
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Attendance		C= 5
Cumulative Internal Examination : A+Q+B+C	**1,2,3,4,5**	**40**
Semester End Examinations	**1,2,3,4,5**	**60**
Total Marks: 40+60	**1,2,3,4,5**	**100**

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

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

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

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

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

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

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

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

1. To apply the principles of thermal sciences to design and develop various thermal systems.

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.

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.

S.Srinivasa Reddy	Dr. K Muarahari	Mr.J.Subba Reddy	Dr. M.B Srekar Reddy
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms.G.DIVYA
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : 3-0-0 **Credits:**3
Program/Branch/Sem : B.Tech/ME- A/B/VI **A.Y.: 2024-25**

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

Course Outcomes: At the end of this course, the student will be able to

CO1	Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**
CO2	Apply the basic principles of AI in problem solving. **(Apply-L3).**
CO3	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(Understand-L2)**

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

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

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach",3rd edition, Prentice Hall, 2009. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmelen, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction to	1	02-12-2024		-	CO1	-	
2.	Introduction: What Is AI?,	1	04-12-2024		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	05-12-2024		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	06-12-2024		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	09-12-2024		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	11-12-2024		TLM1	CO1	T1,T2	
7.	Types of agents	1	12-12-2024		TLM2	CO1	T1,T2	
8.	Types of agents	1	13-12-2024		TLM2	CO1	T1,T2	
9.	Types of agents	1	16-12-2024		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	18-12-2024		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	19-12-2024		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	20-12-2024		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	23-12-2024		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	26-12-2024		TLM1	CO1	-	
No. of classes required to complete UNIT-I: 14					**No. of classes taken:**			

UNIT-II : PROBLEM SOLVING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	1	27-12-2024		TLM1	CO2	T1,T2	

16.	searching for Solutions, Uninformed Search Strategies	1	30-07-2024		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	02-01-2025		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	03-01-2025		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	06-01-2025		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	08-01-2025		TLM2	CO2	T1,T2	
21.	A* Algorithm	1	09-01-2025		TLM2	CO2	T1,T2	
22.	AO* Algorithm	1	10-01-2025		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	16-01-2025		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	17-01-2025		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	20-01-2025		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	22-01-2025		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II: 12					**No. of classes taken:**			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	23-01-2025		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	1	24-01-2025		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	27-01-2025		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	29-01-2025		TLM2	CO3	T1,T2	
31.	Depth limited search	1	30-01-2025		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	31-01-2024		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	10-02-2025		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	12-02-2025		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	13-02-2025		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 09					**No. of classes taken:**			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	14-02-2025		TLM1	CO4	T1,T2	
37.	Minimax algorithm	2	17-02-2025 19-02-2025		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	2	20-02-2025 21-02-2025		TLM2	CO4	T1,T2	

39.	Knowledge Based Agent, Architecture	2	24-02-2025 26-02-2025		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	27-02-2025		TLM1	CO4	T1,T2	
41.	Representation mappings	1	28-03-2025		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	03-02-2025		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	05-03-2025		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	06-03-2025		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	2	07-03-2025 10-03-2025		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	12-03-2025		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 15					**No. of classes taken:**			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	13-03-2025		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	1	17-03-2025		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	19-03-2025		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	20-03-2025		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	1	21-03-2025		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	24-03-2025		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	26-03-2025		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	27-03-2025		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	1	28-03-2025		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	02-04-2025		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	03-04-2025		TLM1	CO5	-	
No. of classes required to complete UNIT-V:11					**No. of classes taken:**			

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	04-04-2025		**TLM1**			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam /MOOCS)
TLM3	Tutorial	**TLM6**	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):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**G.Divya**	**G.Divya**	**Dr.V.Surya Narayana**	**Dr. O. Rama Devi**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Ch. Poorna Venkata Srinivasa Rao
Course Name & Code : CYBER SECURITY AND DIGITAL FORENSICS & 201T84
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech-ME – VI /A&B
A.Y. : 2024-25

PRE-REQUISITE: Understanding of digital logic, operating system concepts, Computer hardware knowledge.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The Objective of the course is to provide the basic concepts of cyber security and digital Forensics which help to protect ourselves from various kinds of cyber-attacks. Digital forensics is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relaxation to computer crime. It enables students to gain experience to do independent study and research

CO1	Understand the implementation of cybercrime. **(Understand - L2)**
CO2	Identify key Tools and Methods used in Cybercrime. **(Remember- L1)**
CO3	Under the Concepts of Cyber Forensics. **(Understand- L2)**
CO4	Apply Cyber Forensics in collection of digital evidence and sources of evidence **(Apply- L3)**
CO5	Analyze the cyber forensics tools for present and future**(Analyze- 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
CO1	1	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	3	1	-	-	-	-	-	1	-	-	-
CO3	1	-	-	1	3	1	-	-	-	-	-	1	-	-	-
CO4	1	1	-	3	1	-	-	-	-	-	-	1	-	-	-
CO5	-	-	1	-	3	1	-	1	-	-	-	1	-	-	-
1 - Low **2 –**Medium **3 -** High															

TEXT BOOKS:

1. Dejey, Dr.Murugan, "cyber Forensics", Oxford University Press, India, 2018

2. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY,2011

REFERENCE BOOKS:

1. Michael Simpson, Kent Blackman and James e. Corley, "Hands on Ethical Hacking and Network Defense", Cengage, 2019
2. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi
3. Alfred Basta, Nadine Basta, Mary Brown and Ravindra Kumar "Cyber Security and Cyber Laws", Cengage, 2018

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): SECTION B

UNIT-I: Introduction to Cybercrime

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
1	Introduction to CSDF	1	02-12-2024		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	04-12-2024		**TLM1**	CO1	
3	Cybercrime and Information Security	1	05-12-2024		**TLM2**	CO1	
4	Cybercriminals	1	06-12-2024		**TLM7**	CO1	
5	Classifications of Cybercrime	1	09-12-2024		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	2	11-12-2024 12-12-2024		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	13-12-2024 16-12-2024		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	2	18-12-2024 19-12-2024		**TLM2**	CO1	
9	Unit-I Assignment Test	1	20-12-2024		**TLM6**	CO1	
No. of classes required to complete UNIT-I		12	No. of classes taken:				

UNIT-II: Tools and Methods

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
10	Proxy Servers and Anonymizers	1	23-12-2024		**TLM2**	CO2	
11	Phishing, Password Cracking	2	26-12-2024 27-12-2024		**TLM7**	CO2	
12	Key loggers and Spywares Virus and Worms	1	02-01-2025		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	03-01-2025		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	06-01-2025 08-01-2025		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	1	09-01-2025		**TLM2**	CO2	
16	Unit-II Assignment Test	1	10-01-2025		**TLM6**	CO2	
No. of classes required to complete UNIT-2		09	No. of classes taken:				

UNIT – III: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
17	Cyber Forensics Definition	1	17-01-2025		**TLM2**	CO3	
18	Disk Forensics	2	20-01-2025 22-01-2025		**TLM1**	CO3	
19	Network Forensics	1	23-01-2025		**TLM2**	CO3	
20	Wireless Forensics	1	24-01-2025		**TLM2**	CO3	
21	Database Forensics	2	27-01-2025		**TLM2**	CO3	
22	Malware Forensics	1	29-01-2025		**TLM2**	CO3	

23	Mobile Forensics	1	30-01-2025		**TLM2**	CO3	
24	Email Forensics	1	31-01-2025		**TLM1**	CO3	
25	Unit-III Assignment Test	1	10-02-2025		**TLM6**	CO3	
No. of classes required to complete UNIT-3		11	No. of classes taken:				

UNIT-IV: Digital Evidence

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
26	Introduction to Digital Evidence and Evidence Collection procedure	2	12-02-2025 13-02-2025		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	14-02-2025 20-02-2025		**TLM7**	CO4	
28	File System Windows Registry	2	21-02-2025 24-02-2025		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	27-02-2025 28-02-2025		**TLM2**	CO4	
30	Linux Artifact	2	03-03-2025 05-03-2025		**TLM1**	CO4	
31	Digital evidence on the internet	2	06-03-2025 07-03-2025		**TLM3**	CO4	
32	Impediments to collection of Digital Evidence	1	10-03-2025		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	12-03-2025 13-03-2025		**TLM2**	CO4	
34	Unit-IV Assignment Test	1	17-03-2025		**TLM6**	CO4	
No. of classes required to complete UNIT-4		16	No. of classes taken:				

UNIT-V: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
35	The Present and The Future Forensics Tools	1	19-03-2025		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	1	20-03-2025		**TLM5**	CO5	
37	Tools for Integrity Verification and Hashing	1	21-03-2025		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	1	24-03-2025		**TLM5**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	26-03-2025 27-03-2025		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	1	02-04-2025		**TLM2**	CO5	
41	Unit -5 Assignment Test.	1	03-04-2025		**TLM6**	CO5	
No. of classes required to complete UNIT-5		8	No. of classes taken:				

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
1.	Cloud Security, Using AI/ML to Analyze	1	04-04-2025		TLM2	
2.	Cyber Threats	1	05-04-2025		TLM2	

TLM1	Chalk and Talk - 8	**TLM6**	Assignment / Quiz - 5
TLM2	PPT - 24	**TLM7**	Seminar / Group Discussion - 3
TLM3	Tutorial -1	**TLM8**	Lab Demo
TLM4	Demonstration (Lab/Field Visit)	**TLM9**	Case Study
TLM5	ICT (NPTEL/Swayam Prabha/MOOCS) - 2		

Part – C

EVALUATION PROCESS:

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+A	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	02-12-2024		
I Phase of Instructions	02-12-2024	01-02-2025	9W
I Mid Examinations	03-02-2025	08-02-2025	1W
II Phase of Instructions	10-02-2025	05-04-2025	8W
II Mid Examinations	07-04-2025	12-04-2025	1W
Preparation and Practical's	14-04-2025	19-04-2025	1W
Semester End Examinations	21-04-2025	03-05-2025	2W

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Pursue a successful career in the area of Information Technology or its allied fields.
PEO 2	Exhibit sound knowledge in the fundamentals of Information Technology and apply practical experience with programming techniques to solve real world problems.
PEO 3	Able to demonstrate self-learning, life-long learning and work in teams on multidisciplinary projects.
PEO 4	Able to understand the professional code of ethics and demonstrate ethical behavior, effective communication and team work and leadership skills in their job.

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solution sin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1 Organize, Analyze and Interpret the data to extract meaningful conclusions.

PSO2 Design, Implement and Evaluate a computer-based system to meet desired needs.

PSO3 Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. Ch.Poorna Venkata Srinivasa Rao	Mr. Ch.Poorna Venkata Srinivasa Rao	Mr. G.Rajendra	Dr.B.Srinivasa Rao
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
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L B Reddy Nagar, Mylavaram-522 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech, VI-Sem., ME, B/S
ACADEMIC YEAR : 2024-25
COURSE NAME & CODE : Heat Transfer Lab & 20ME62
L-T-P STRUCTURE : 0-0-3
COURSE CREDITS : 2
LABORATORY INSTRUCTORS : Dr. P.Ravindra Kumar/ Mr.K.Lakshmi Prasad
LABORATORY INCHARGE : Mr.K.Lakshmi Prasad
PREREQUISITE SUBJECT: Thermodynamics, Applied Thermodynamics

COURSE EDUCATIONAL OBJECTIVES:

The objective of this course is to understand the modes of heat transfer in various heat transfer equipment used for different applications by conducting experiments.

Course Outcomes:

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

CO1: Estimate the thermal conductivity of different materials and powders. (Applying - L3)
CO2: Estimate the value of heat transfer coefficient in free and forced convection. (Applying - L3)
CO3: Validate the Stefan Boltzmann's constant and estimate emissivity of grey body. (Applying - L3)
CO4: Compare the parallel and counter flow heat exchanger performance characteristics. (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
CO1	3	2	2	3	-	-	-	2	2	1	-	1	3	-	1
CO2	3	2	2	3	-	-	-	2	2	1	-	1	3	-	1
CO3	2	1	2	3	-	-	-	2	2	1	-	1	3	-	1
CO4	1	3	2	3	-	-	-	2	2	1	-	1	3	-	1

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXTBOOKS:

Lab Manuals, Heat and Mass Transfer Data Book, 6th Edition, New Age International Publishers

Part-B

COURSE: B.Tech BRANCH: MECHANICAL ENGG. SECTION: B-Sec (Monday) BATCH: 1 A.Y:2024-25

S. No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11	12
		Date	02 -12 - 24	09 -12 - 24	16 -12 - 24	23 - 12 - 24	30 - 12 - 24	06 - 01 - 25	20 - 01 - 25	27 - 01 - 25	10 - 02 - 25	17 - 02 - 25	24 - 02 - 25	03 - 03 - 25	10 - 03 –25 17 – 03 -25	24 - 04 –25 31 – 04 -25
		Regd. No	CYCLE-I							CYCLE-2						
1	BATCH-I	21761A0349	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	Repetition	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION/Experiment beyond the Syllabus	INTERNAL LAB TEST
2		22761A0321														
3		22761A0322														
4		22761A0323														
5		22761A0324														
6		22761A0325														
7	BATCH-2	22761A0326	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1		
8		22761A0327														
9		22761A0328														
10		22761A0329														
11		22761A0332														
13	BATCH-3	22761A0333	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2		
14		22761A0334														
15		22761A0335														
16		22761A0337														
17		22761A0338														
18		22761A0339														
19	BATCH-4	23765A0339	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3		
20		23765A0340														
22		23765A0341														
22		23765A0342														
23		23765A0343														
24		23765A0344														
25	BATCH-5	23765A0345	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4		
26		23765A0346														
27		23765A0347														
28		23765A0348														
29		23765A0349														

LAB INCHARGE

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: B-Sec (Thursday)** **BATCH: 2** **A.Y:2024-25**

S.No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11		12
		Date	05 -12 - 24	12 -12 - 24	19 -12 - 24	26 - 12 - 24	02 - 01 - 25	09 - 01 - 25	23 - 01 - 25	30 - 01 - 25	13 - 02 - 25	20 - 02 - 25	27 - 02 - 25	06 - 03 - 25	13 - 03 - 25	27 - 03 - 25	03 - 04 - 25
		Regd. No	CYCLE-I							CYCLE-2							
1	BATCH-I	23765A0350	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION	Experiment beyond the syllabus	INTERNAL LAB TEST
2		23765A0351															
3		23765A0352															
4		23765A0353															
5		23765A0354															
6	BATCH-2	23765A0355	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1			
7		23765A0356															
8		23765A0357															
10		23765A0358															
11		23765A0359															
13	BATCH-3	23765A0360	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2			
14		23765A0361															
15		23765A0362															
16		23765A0363															
		23765A0364															
17		23765A0365															
19	BATCH-4	23765A0366	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3			
20		23765A0367															
22		23765A0368															
22		23765A0369															
23		23765A0370															
24		23765A0371															
25	BATCH-5	23765A0372	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4			
26		23765A0373															
27		23765A0374															
28		23765A0375															
29		23765A0376															
30		23765A0377															

LAB INCHARGE

MYLAVARAM
DEPARTMENT OF MECHANICAL ENGINEERING
HEAT TRANSFER LABORATORY
LIST OF EXPERIMENTS

Course: B Tech Branch: Mech Sem: VI Section: A&B Sec Batch: 2022 A.Y: 2024-25

S.No	Cycle	Exp Code	Name of the Experiment
1	CYCLE-I	DEMONSTRATION	DEMONSTRATION
2		HT-1	Determination of thermal conductivity of metallic bar (Brass).
3		HT-2	Estimate thermal conductivity of insulating powder (Asbestos).
4		HT-3	Find thermal conductivity of lagged pipe (Glass wool).
5		HT-4	Calculation of Transient Heat Conduction (Unsteady state Heat Conduction).
6		HT-5	Test on Pin-Fin Apparatus.
8	CYCLE-II	HT-1	Determination of Convective Heat Transfer Co-efficient of air in Natural Convection.
9		HT-2	Estimate the convective heat Transfer coefficient of air in forced convection.
10		HT-3	Heat Pipe Demonstration
11		HT-4	Test on Tube in Tube Parallel Flow Heat Exchanger.
12		HT-5	Test on Tube in Tube Counter Flow Heat Exchanger.
13		**(Content Beyond the Syllabus)**	**Test on Emissivity Measurement Apparatus.**
14		REPETITION	**REPETITION.**
15		INTERNAL	**INTERNAL LAB TEST.**

LAB INCHARGE

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

Part - C
EVALUATION PROCESS:

Evaluation Task	**COs**	**Marks**
Day to Day Evaluation	1	A=5

Record	2	B=5
Internal Examination	3	C=5
Cumulative Internal Marks : A+B+C	**1,2,3**	**A+B+C=15**
Semester End Examinations	**1,2,3**	**D=35**
Total Marks: A+B+C+D	**1,2,3**	**50**

PROGRAMME OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES:

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
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 or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Venkateswara Reddy, Dr.A.Dhanunjay Kumar, Ms.P.Mounika

Course Name & Code : CAD/CAM LAB & 20ME63 **Regulation**:R20

L-T-P Structure : **0-0-3** **Credits:** 1.5

Program/Sem/Sec : B.Tech/VI/B **A.Y.:** 2024-25

PREREQUISITE: Computer Aided Machine Drawing, CAD/CAM

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to design, assemble, analyze and manufacture engineering components using computer aided tools.

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

CO1	Design and assemble the mechanical components using CAD Software. **(Analyzing - L4)**
CO2	Apply finite element analysis for components using analysis software. **(Applying - L3)**
CO3	Develop NC code for different part profiles and perform machining on CNC Machine tools. **(Applying - L3)**
CO4	Simulate part program to perform various operations on CNC machine. **(Applying - L3)**

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	1			2										2	
CO2	1	1	2	2	1							1		3	
CO3	1	1	1		1							1		3	
CO4		2		1										2	
1 - Low					**2** –Medium							**3** - High			

SOFTWARE PACKAGES: CATIA /ANSYS / Iron CAD etc.

REFERENCES:

- Lab Manuals

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments (Section – B)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	22761A0321-339, 23765A0339-377	54

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 CAD/CAM Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	06-12-2024		TLM4	
Cycle-I						
2.	Design and Assembly Modeling of Knuckle joint using CAD software	3	13-12-2024		TLM4	
3.	Design and Assembly Modeling of Universal Coupling using CAD software	3	20-12-2024		TLM4	
4.	Design and Assembly Modeling of Piston, Connecting Rod parts using CAD software	3	27-12-2024		TLM4	
5.	Analysis of trusses using ANSYS	3	03-01-2025		TLM4	
6.	Analysis of Beams using ANSYS	3	10-01-2025		TLM4	
7.	Analysis of 3D solids using ANSYS	3	17-01-2025		TLM4	
8.	Steady state heat transfer analysis using ANSYS	3	24-01-2025		TLM4	
Cycle-II						
9.	Estimation of natural frequencies and mode shapes for simple problems using ANSYS	3	31-01-2025		TLM4	
10.	Development of NC code using CAM packages	3	14-02-2025		TLM4	
11.	Machining of simple components on CNC Turning by transferring NC Code from CAM package	3	21-02-2025		TLM4	
12.	**Additional Experiments:** Machining of Simple components on CNC-Mill by transferring NC Code from CAM Package	3	28-02-2025		TLM4	
13.	Robot programming, simulation, and execution	3	07-03-2025		TLM4	
14.	Revision	3	21-03-2025		TLM4	
15.	Revision	3	28-03-2025		TLM4	
16.	Internal Exam	3	04-04-2025		TLM4	
No. of classes required to complete:				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination: A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

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	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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				
Signature	**Mr.K.Venkateswara Reddy** **Dr.A.Dhanunjay Kumar** **Ms.P.Mounika**	**Mr.A.Nageswara Rao**	**Mr.J.Subba Reddy**	**Dr.M.B.S.Sreekara Reddy**

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. J. Subba Reddy, Associate Professor,

Mrs. B. Kamala Priya, Asst. Professor

Course Name & Code	**:** ROBOTICS AND SIMULATION LAB & 20ME64	**Regulations**	: R20
L-T-P Structure	**: 1-0-2**	**Credits**	**:** 2
Program/Sem/Sec	: B.Tech/VI/B Sec	**A.Y.**	**:** 2024-25

PREREQUISITE: Engineering Mechanics, Theory of Machines, Robotics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to demonstrate and analysis of various types of robots.

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

CO1	Simulate forward and inverse kinematic movements of a robot using Robo Analyzer and MATLAB. **(Understanding - L2)**
CO2	Perform the demo operations on SCARA and PUMA using Robo analyzer software. **(Applying - L3)**
CO3	Experiment the robot operations like palletizing, gluing, spray painting, polishing, loading and Unloading. **(Applying - L3)**
CO4	Develop Robot Programmes to use to control commands. **(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
CO1	2	1			3							2		3	
CO2	1	2	2		3							2		3	
CO3	3	3		2	3							3			3
CO4	1	1			3							2			3
1 - Low **2 –**Medium **3 -** High															

SOFTWARE PACKAGES: ARISTO ROBOT, C Prog, Robo Analyzer, MAT Lab

REFERENCE:

- Lab Manuals, Softwares

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments (Section – B: B1 Batch): Thursday (01.00 PM to 04.00 PM)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	22761A0321 – 329, 332 – 335, 337 -339, 23765A0329 – 349	27

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 Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	05-12-2024		TLM4	
Cycle-I						
2.	Study the anatomy of robots	3	12-12-2024		TLM4	
3.	Analysis of robot configuration and Simulation of Robot with 2 DOF using Robo Analyzer.	3	19-12-2024		TLM4	
4.	Analysis of robot configuration and Simulation of Robot with 6 DOF using Robo Analyzer.	3	26-12-2024		TLM4	
5.	D-H parametric representation of various robotic arms using Robo Analyzer	3	02-01-2025		TLM4	
6.	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	09-01-2025		TLM4	
7.	Simulation of SCARA, PUMA using Robo Analyzer	3	23-01-2025		TLM4	
8.	Introduction to IGUS Software	3	30-01-2025		TLM4	
I Mid Exams: 03-02-2025 to 08-02-2025						
Cycle-II						
9.	Introduction to IGUS Software	3	13-02-2025		TLM4	
10.	Program for commands like a line command, circle command, Point to Point (PTP) command	3	20-02-2025		TLM4	
11.	Palletizing and depalletizing	3	27-02-2025		TLM4	
12.	Loading / Unloading Operations	3	06-03-2025		TLM4	
13.	Gluing, Painting, Polishing operations	3	13-03-2025		TLM4	
14.	Letter writing - Programme	3	20-03-2025		TLM4	
15.	Internal Exam	3	27-03-2025		TLM4	
16.	Internal Exam	3	03-04-2025		TLM4	
II Mid Exams:07-04-2025 to 12-04-2025						
No. of classes required to complete 14				**No. of classes taken:**		

Schedule of Experiments (Section – B: B2 Batch): Monday (09.00 AM – 12.00 Noon)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B2	23765A0350 – 373, 375 - 377	27

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 Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	02-12-2024		TLM4	
Cycle-I						
2.	Study the anatomy of robots.	3	09-12-2024		TLM4	
3.	Analysis of robot configuration and Simulation of Robot with 2 Dof using Robo Analyzer.	3	16-12-2024		TLM4	
4.	Analysis of robot configuration and Simulation of Robot with 6 Dof using Robo Analyzer.	3	23-12-2024		TLM4	
5.	D-H parametric representation of various robotic arms using Robo Analyzer	3	30-12-2024		TLM4	
6.	Forward Kinematics Analysis of Robot using Robo Analyzer	3	06-01-2025		TLM4	
7.	Inverse Kinematics Analysis of Robot using Robo Analyzer	3	20-01-2025		TLM4	
8.	Simulation of SCARA, PUMA using Robo Aanlyzer	3	27-01-2025		TLM4	
I Mid Exams: 03-02-2025 to 08-02-2025						
Cycle-II						
9.	Introduction to IGUS Software	3	10-02-2025		TLM4	
10.	Program for commands like a line command, circle command, Point to Point (PTP) command	3	17-02-2025		TLM4	
11.	Palletizing and depalletizing	3	24-02-2025		TLM4	
12.	Loading / Unloading Operations	3	03-03-2025		TLM4	
13.	Gluing, Painting, Polishing operations	3	10-03-2025		TLM4	
14.	Letter writing - Programme	3	17-03-2025		TLM4	
15.	Pending work	3	24-03-2025		TLM4	
16.	Internal Exam	3	31-03-2025		TLM4	
	II Mid Exams: 07-04-2025 to 12-04-2025					
No. of classes required to complete: 14				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination: A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

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	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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.

Signature				
Name of the Faculty	Mr. J. Subba Reddy / Mrs. B. Kamala Priya	Mr. J. Subba Reddy	Mr. J. Subba Reddy	Dr.M.B.S.Sreekara Reddy
	Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, (AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
ISO 21001 : 2018, 50001 : 2018, 14001: 2015 Certified Institution
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FRESHMAN ENGINEERING DEPARTMENT
COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. R. Padma Venkat
Course Name & Code **:** Soft Skills & 20HSS1
L-T-P Structure **:** 1-0-2 **Credits:** 02
Program/Sem/Sec : B. Tech- VI SEM –MECH B
Academic Year **:** 2024-25

PREREQUISITE: NIL

Course Educational Objectives:

The Soft Skills Laboratory course equips students with required behavioral, interpersonal & Intrapersonal skills, communication skills, leadership skills etc. It aims at training undergraduate students on soft skills leading to enhanced self-confidence, esteem, and acceptability in professional circles.

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

CO1	To Develop self-awareness and personality traits for professional growth.	L2
CO2	Work effectively in multi-disciplinary and heterogeneous teams through knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.	L3
CO3	Communicate through verbal/oral communication with good listening skills and empathy.	L3
CO4	Apply skills required to qualify in recruitment tests, Interviews & other professional assignments.	L3

COURSE ARTICULATION MATRIX
(Correlation between COs & POs)

Course Outcomes / PO's →	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1.					2			3	3	3		2
CO2.		2			2			3	3	3		3
CO3.					2			3	3	3		3
CO4.					2			3	3	3		
1 = Slight (Low)				**2= Moderate (Medium)**						**3 = Substantial (High)**		

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Soft skills Lab

List of Activities:

1.Personality Development Skills

Role of language in Personality – How language reflects, impacts Personality – Using gender- neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code

Activities: Group Discussion/Role play/Presentations (authentic materials: Newspapers, pamphlets and News Clippings)

2.Impactful Communication

Activities: Extempore / Story Telling/ Group Discussion (Case studies/Current affairs etc.)/ Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing reviews on short story/videos/book/Social Media profiling/ Pronunciation Practice

3.Professional Skills:

Career Planning- job vs. career- goal setting- SWOT Analysis-Time management – self-management – stress-management.

Activities: SWOT analysis of the self/Goal Setting-Presentation/Writing Report/Listening exercises/Effective Resume-Writing and presentation/ Interview Skills: Mock interviews/Video samples.

REFERENCES:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001
2. Adrian Furnham, Personality and Intelligence at Work, Psyc 2. hology Press, 2008.
3. M.Ashraf Rizvi, "Effective Technical Communication", 1 st edition, Tata cGrawHill, 2005.
4. Ace of Soft skills Gopalaswamy Ramesh, Pearson Education India, 2018
5. Soft Skills for the Workplace, Good heart - Willcox Publisher · 2020.
6. How to Win Friends and Influence People, Dale Carnegie · 2020

Software: Walden InfoTech

COURSE DELIVERY PLAN (LESSON PLAN)

S. No.	Topics to be covered	No. of Classes Required	Actual Date of Completion	HOD Sign
1.	Activity-1 :Role of language in Personality- How language reflects, impacts Personality – Using gender	1+2	3-12-24	
2.	neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code& Role-play	1+2	10-12-24	
3.	Group Discussion	1+2	17-12-24	
4.	Group Discussion	1+2	24-12-24	
5.	Presentations	1+2	31-12-24	
6.	Activity-2: Impactful Communication Extempore - Story Telling	1+2	7-1-25	
7.	Extempore -Group Discussion	1+2	21-1-25	
8.	Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing. Reviews on short story/videos/book/Social Media profiling/ Pronunciation Practice	1+2	28-1-25	
9.	Activity-3: Professional Skills: Career Planning- job vs. career- goal setting.	1+2	11-2-25	
10.	SWOT Analysis. Time management – self- management – stress-management.	1+2	18-2-25	

11.	Presentation/Writing Report/Listening exercises	1+2	25-2-25	
12.	Effective Resume-Writing and presentation	1+2	4-3-25	
13.	Effective Resume-Writing and presentation	1+2	11-3-25	
14.	Interview Skills: Mock Interviews/Video samples.	1+2	18-3-25	
15.	Interview Skills: Mock Interviews/Video samples.	1+2	25-3-25	
16.	Lab Internal Exam	1+2	1-4-25	
No. of classes required to complete Syllabus: 51				

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. R. PadmaVenkat	Dr. R. PadmaVenkat	Dr. R. PadmaVenkat	Dr. A. Rami Reddy
Signature				