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.P.Vijaya 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-A A.Y: 2023-24

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	04-12-2023		TLM1	
2.	Introduction of five Units importance	1	05-12-2023		TLM1	
3.	Introduction to heat transfer and its applications, Basic Modes of Heat Transfer	1	06-12-2023		TLM1, TLM2 TLM5	
4.	Basic laws of Heat Transfer-Steady, Unsteady and Periodic Heat Transfer	1	08-12-2023		TLM1, TLM4	
5.	General heat conduction equation in Cartesian coordinate system and its simplifications.	1	11-12-2023		TLM1	
6.	Fourier's law of heat conduction; Thermal conductivity	1	12-12-2023		TLM1, TLM2	
7.	General heat conduction equation in cylindrical coordinate system and its simplifications.	1	13-12-2023		TLM1	
8.	**Tutorial-1**	1	15-12-2023		TLM3	
9.	General heat conduction equation in spherical coordinate system and its simplifications.	1	18-12-2023		TLM1, TLM2	
10.	Heat conduction through plane wall and cylinder with constant thermal conductivity– Numerical Problems.	1	19-12-2023		TLM1, TLM2	
11.	Electrical analogy, thermal resistance, and overall heat transfer coefficient.	1	20-12-2023		TLM1, TLM2 TLM5	
12.	Numerical Problems on thermal resistance and overall heat transfer coefficient	1	22-12-2023		TLM1, TLM2	
13.	Heat transfer through composite slab and cylinder, Numerical Problems. **Tutorial-2**	1	26-12-2023		TLM1, TLM2, TLM3	
14.	Critical radius of insulation for cylinder, Sphere and Applications.	1	27-12-2023		TLM1, TLM2	
15.	Numerical Problems on critical radius of insulation, **Assignment-1 Questions.**	1	29-12-2023		TLM1 TLM2	
No. of classes required to complete UNIT-I: 15				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.	Heat flow through a plane wall, cylinder with variable thermal conductivity, Numerical Problems.	1	02-01-2024		TLM1	
2.	Derivation on Uniform Internal heat generation in slabs and cylinders	1	03-01-2024		TLM1, TLM2	
3.	Numerical Problems on Uniform Internal heat generation in slabs.	1	05-01-2024		TLM1	
4.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	08-01-2024		TLM1, TLM2	
5.	**Tutorial-3**	1	09-01-2024		TLM3	
6.	Extended surfaces and their applications; Thermal analysis of long Fins	1	10-01-2024		TLM1, TLM4	

7.	Thermal analysis of short fins with insulated tip, Fin efficiency and effectiveness	1	17-01-2024		TLM1, TLM2	
8.	Systems with negligible internal Resistance (Lumped Heat Analysis), Significance of Biot and Fourier Numbers	1	19-01-2024		TLM1, TLM2	
9.	Numerical Problems, Heisler chart solutions	1	22-01-2024		TLM1, TLM2	
10.	Basics of convective (Forced and Natural) heat transfer and Applications. Dimensional analysis and Buckingham Pi theorem applied to Forced Convection.	1	23-01-2024		TLM1, TLM2	
11.	Significance of Non-Dimensional Numbers., Dimensional analysis and Buckingham Pi theorem applied to Natural Convection. - **Tutorial-4**	1	24-01-2024		TLM3	
No. of classes required to complete UNIT-II: 11				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, Numerical Problems.	1	05-02-2024		TLM1, TLM2	
2.	Forced convection analysis in external flows (Flow over a Flat Plate): Laminar and turbulent flows.	1	06-02-2024		TLM1, TLM2	
3.	Forced convection analysis in internal flows (Flow through circular pipe): Laminar and turbulent flows.	1	07-02-2024		TLM1, TLM2	
4.	Numerical Problems on Forced Convection, Reynolds Colburn Analogy.	1	09-02-2024		TLM1, TLM2	
5.	**Tutorial-5**	1	12-02-2024		TLM3	
6.	Natural convection: Development of Hydrodynamic and thermal boundary layer along vertical plate.	1	13-02-2024		TLM1, TLM2 TLM4	
7.	Development of Hydrodynamic and thermal boundary layer along vertical plate, Numerical Problems	1	14-02-2024		TLM1, TLM2	
8.	**Tutorial-6**	1	16-02-2024		TLM3	
No. of classes required to complete UNIT-III:8				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	20-02-2024		TLM1, TLM2	
2.	Numerical problems on nucleate boiling, Critical heat flux conditions.	1	21-02-2024		TLM1, TLM2 TLM5	
3.	Condensation: Film wise and drop wise condensation, Laminar film wise condensation on Vertical plate	1	23-02-2024		TLM1, TLM2	
4.	Numerical Problems - **Tutorial-7**	1	26-02-2024		TLM3	

5.	Introduction and applications of Thermal Radiation, Emissive Power, Absorption, Reflection and Transmission and	1	27-02-2024		TLM1, TLM2	
6.	Definitions related to radiation, Concept of black and non-black bodies , Laws of black body radiation	1	28-02-2024		TLM1, TLM2	
7.	Emissivity, Kirchhoff's law, Shape Factors	1	01-03-2024		TLM1,	
8.	Radiation heat exchange between two black isothermal surfaces, Nonblack infinite parallel plates;	2	04-03-2024, 05-03-2024		TLM2	
9.	Numerical Problems - **Tutorial-8**	1	06-03-2023		TLM1, TLM2, TLM3	
No. of classes required to complete UNIT-IV:9				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	08-03-2023		TLM1, TLM2 TLM6	
2.	Applications of Heat Exchangers	1	11-03-2023		TLM1, TLM2	
3.	Overall heat transfer coefficient- Fouling factor	1	12-03-2023		TLM1, TLM2	
4.	LMTD method of Heat exchanger analysis- Parallel flow, Numerical Problems	1	13-03-2023		TLM1, TLM2 TLM4	
5.	LMTD method of Heat exchanger analysis- Counter flow, Numerical Problems – **Tutorial-9**	1	15-03-2023		TLM1, TLM2, TLM3	
6.	Correction factor for LMTD for use with Multi pass and Cross flow Heat Exchangers	1	18-03-2023		TLM1, TLM2	
7.	Effectiveness - NTU method of Heat Exchanger Analysis-Applications of Heat Exchangers	1	19-03-2023		TLM3	
8.	Effectiveness - NTU method of Heat Exchanger Analysis-Applications of Heat Exchangers	1	20-03-2023		TLM1, TLM5	
9.	**Tutorial-10**	1	22-03-2023		TLM3	
No. of classes required to complete UNIT-V: 9				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	25-03-2023		TLM6	
2.	Second two and half units	1	26-03-2023		TLM6	

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.	**Electronic cooling by natural and forced convection**	1	27-03-2023		TLM2	
4.	**Heat Transfer in Variables resistances and variable thermal conductivity**	1	29-03-2023		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 (R17 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Quiz Examination (Units-III, IV & V)	Q2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max (M1, M2) +25% of Min (M1, M2)	M=15
Quiz Marks =75% of Max (Q1, Q2) +25% 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.P.Vijay Kumar)	(Dr.P.Ravindra Kumar)	(Dr.P.Vijay Kumar)	(Dr.M.B.S.S.Reddy)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.MBSS Sreekar Reddy

Course Name & Code : CAD/CAM & 20ME18 **Regulation**: R20

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

Program/Sem/Sec : B.Tech VI Sem (A) **A.Y.:** 2023-2024

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	Develop 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	1			1									2	
CO2	1	1	2	2	3							1		3	
CO3	1	1	2	2	3							1		3	
CO4	1	1	1	1	1									2	
CO5	1	1	1		1									2	
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 .

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	04-12-2023		TLM2	
2.	Product Cycle Revised with CAD/CAM	1	06-12-2023		TLM2	
3.	Reasons for implementing CAD	1	07-12-2023		TLM1	
4.	Creating Manufacturing database & Benefits of CAD	1	11-12-2023		TLM1	
5.	Computer Graphics-Introduction , Database structure	1	13-12-2023		TLM2	
6.	Functions of a graphics package	1	14-12-2023		TLM1	
7.	Raster scan graphics	1	16-12-2023		TLM1	
8.	Transformations.	1	18-12-2023		TLM1	
9.	Problems on Translation, scaling,	1	20-12-2023		TLM1	
10.	Problems on Reflection, rotation	1	21-12-2023		TLM1	
No. of classes required to complete UNIT-I: 10				**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	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign

		Required	Completion	Completion	Methods	Weekly
11.	Geometric Modelling: Introduction	1	23-12-2023		**TLM2**	
12.	Wireframe Modelling: Entities wireframe models	1	27-12-2023		**TLM2**	
13.	Parametric representation of analytical curves	1	28-12-2023		**TLM1**	
14.	Parametric representation of analytical curves	1	30-12-2023		**TLM1**	
15.	Hermite cubic spline curve	1	03-01-2024		**TLM1**	
16.	Bezier curves and B spline curves	1	04-01-2024		**TLM3**	
17.	Problems based on synthetic curves	1	06-01-2024		**TLM1**	
18.	Surface representation: Entities	1	08-01-2024		**TLM1**	
19.	Analytical surface entities	1	10-01-2024		**TLM2**	
20.	Synthetic surface entities	1	11-01-2024		**TLM2**	
21.	Solid modelling: Introduction	1	20-01-2024		**TLM2**	
22.	Fundamentals of solid modeling, B-Rep	1	22-01-2024		**TLM1**	
23.	CSG and Sweep representation	1	24-01-2024		**TLM2**	
No. of classes required to complete UNIT-II: 13				**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
24.	Numerical control: Introduction, NC Modes	1	25-01-2024		**TLM1**	
25.	NC elements ,N C Coordinate systems	1	27-01-2024		**TLM1**	
26.	Structure of CNC machine tools	1	05-02-2024		**TLM1**	
27.	Feedback devices	1	07-02-2024		**TLM1**	
28.	Part programming: Fundamentals	1	08-02-2024		**TLM1**	
29.	Manual part programming	1	12-02-2024		**TLM1**	
30.	Example on NC manual programming	1	14-02-2024		**TLM1**	
31.	Computer Aided part programming	1	15-02-2024		**TLM1**	
32.	APT Language	1	17-02-2024		**TLM1**	
33.	Part programming example	1	19-02-2024		**TLM1**	
No. of classes required to complete UNIT-III: 10				**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
34.	Group Technology: Introduction	1	21-02-2024		**TLM1**	

35.	Coding and classification schemes-OPITZ, MICLASS and CODE system	1	22-02-2024		**TLM2**	
36.	Example on GT coding	1	24-02-2024		**TLM1**	
37.	Production Flow Analysis, Advantages and limitations	1	26-02-2024		**TLM1**	
38.	GT Machine cells, , Benefits of GT	1	28-02-2024		**TLM2**	
39.	CAPP- Retrieval and Generative	1	29-02-2024		**TLM1**	
40.	Flexible Manufacturing System: Introduction	1	02-03-2024		**TLM1**	
41.	FMS components	1	04-03-2024		**TLM1**	
42.	FMS layouts, Benefits	1	06-03-2024		**TLM1**	
43.	FMS Planning and implementation	1	07-03-2024		**TLM1**	
No. of classes required to complete UNIT-IV: 10				**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
44.	CAQC: Introduction, The computers in QC	1	14-03-2024		**TLM1**	
45.	Contact inspection methods	1	16-03-2024		**TLM1**	
46.	Non-Contact inspection methods: Optical	1	18-03-2024		**TLM1**	
47.	Non-Contact inspection methods: non optical	1	20-03-2024		**TLM1**	
48.	Computer aided testing,	1	21-03-2024		**TLM1**	
49.	CAQC with CAD/CAM	1	23-03-2024		**TLM1**	
50.	CIM Introduction	1	27-03-2024		**TLM1**	
51.	CIM integration, Implementation	1	28-03-2024		**TLM2**	
52.	Benefits of CIM, Lean manufacturing	1	30-03-2024		**TLM1**	
No. of classes required to complete UNIT-V: 09				**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
1.	Role of computer Aided Engineering in the present day Industrial Automation	2	11-03-2024 13-03-2024		**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

Academic Calander: 2023-24

Description	From	To	Weeks
B.Tech VI semester			
Commencement of class work	04-12-2023		
I phase of Instructions	04-12-2023	27-01-2024	8 weeks
I Mid examinations	29-01-2024	03-02-2024	1 week
II phase of Instructions	05-02-2024	30-03-2024	8 weeks
II Mid examinations	01-04-2024	06-04-2024	1 week
Preparation and practical's	08-04-2024	13-04-2024	1 week
Semester end examinations	15-04-2024	27-04-2024	2 weeks
Internship	29-04-2024	22-06-2024	8 weeks

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				
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.:** 2023-24

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	05-12-2023		TLM1	
2.	Introduction to Unit-1, **Bearings** –Introduction, Types	1	06-12-2023		TLM1 TLM2	
3.	Lubricating Oils Properties, Materials used for bearings and their properties	1	08-12-2023		TLM1 TLM2	
4.	**Journal Bearings** –Introduction, Types, Dimensionless parameters	1	12-12-2023		TLM1 TLM2	
5.	Design procedure of journal bearing	1	13-12-2023		TLM1	
6.	Journal bearings - problems	1	15-12-2023		TLM4	
7.	Dimensionless parameters used in the bearing design – problem	1	16-12-2023		TLM4	
8.	Tutorial-1	1	19-12-2023		TLM3	
9.	**Rolling contact bearings-types**, bearing life, Materials used and designation of rolling contact bearings	1	20-12-2023		TLM1 TLM2	
10.	Static load and dynamic load capacity	1	22-12-2023		TLM1	
11.	Selection of ball bearing - problems	1	23-12-2023		TLM4	
12.	Tutorial-2	1	26-12-2023		TLM3	
13.	Cubic mean load derivation, Reliability of bearings - problems	1	27-12-2023		TLM4	
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	29-12-2023		TLM1 TLM2	
2.	**PISTON**: Design procédure of piston	1	30-12-2023		TLM4	
3.	Piston design - problems	1	02-01-2024		TLM4	
4.	Cylinder design, cylinder liners-design	1	03-01-2024		TLM1.2	
5.	Cylinder, cylinder liners-design Problems	1	05-01-2024		TLM1.2	
6.	Tutorial-3	1	06-01-2024		TLM3	
7.	**CONNECTING ROD**: Thrust in C.R, buckling load	1	09-01-2024		TLM1 TLM2	
8.	Design Procedure of Connecting rod	1	10-01-2024		TLM4	
9.	Stresses due to whipping action on connecting rod ends- problems	1	12-01-2024		TLM4	
10.	**CRANK SHAFT:** Design of crank and crank shaft	1	16-01-2024		TLM4	

11.	Design of center crank shaft -problems Tutorial-4	1	17-01-2024		TLM4 TLM3	
No. of classes required to complete UNIT-II		11	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	19-01-2024		TLM1 TLM2	
2.	Design Procedure of flat belts - Problems	1	20-01-2024		TLM1	
3.	**PULLEYS:** Design of pulleys mild steel & cast iron	1	23-01-2024		TLM1	
4.	Design of pulleys Problems Tutorial-5	1	24-01-2024		TLM4,3	
5.	Revision	1	27-01-2024		TLM3	
Mid-I Examination from 29-12-2023 to 03-02-2024						
6.	V-belts –designation, design and selection	1	06-02-2024		TLM1,2	
7.	Design of V belts - problems	1	07-02-2024		TLM4	
8.	Design of V belts - problems	1	09-02-2024		TLM4	
9.	Design of V- grooved pulley	1	13-02-2024		TLM1	
10.	Design of V- grooved pulley Tutorial-6	1	14-02-2024		TLM4,3	
No. of classes required to complete UNIT-III		10	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	16-02-2024		TLM1 TLM2	
2.	Stresses, deflection and stiffness in springs and their derivations	1	17-02-2024		TLM1 TLM2	
3.	Springs for fatigue loading	1	20-02-2024		TLM4	
4.	Design of springs-problems, Tutorial-**7**	1	21-02-2024		TLM1,3	
5.	Spring failures, design of helical springs	1	23-02-2024		TLM1	
6.	Natural frequency of helical spring	1	24-02-2024		TLM1	
7.	Energy storage capacity in springs	1	27-02-2024		TLM1	
8.	Tension and torsion springs	1	28-02-2024		TLM1	
9.	Co-axial springs design- Problems	1	01-03-2024		TLM1	
10.	Design of leaf springs- Problems,Tutorial-8	1	02-03-2024		TLM1,3	
No. of classes required to complete UNIT-IV		10	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	05-03-2024		TLM1 TLM2	
2.	Design Analysis of gears, Estimation of centre distance, module & face width	1	06-03-2024		TLM1 TLM2	
3.	Design procedure of spur gears, Check for dynamic and wear considerations	1	12-03-2024		TLM1 TLM2	
4.	Design of spur gears -Problems	1	13-03-2024		TLM4	
5.	Design of spur gears -Problems,Tutorial-**9**	1	15-03-2024		TLM4,3	

6.	Design procedure of Helical gears, Check for dynamic and wear considerations	1	19-03-2024		TLM1	
7.	Design of Helical gears -Problems	1	20-03-2024		TLM4	
8.	Design of Helical gears -Problems, Tutorial-**10**	1	22-03-2024		TLM4,3	
No. of classes required to complete UNIT-V		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 Weekly
1.	Design of flywheels	1	23-01-2024		TLM1 TLM2	
2.	Design of Worm gear	1	16-03-2024		TLM1 TLM2	
3.	Design of Gear Box	1	23-03-2024		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**

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 (A)

ACADEMIC YEAR : 2023-24

COURSE NAME & CODE : **MODERN MACHING PROCESSES- 20ME26**

STRUCTURE : 4-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : **S.Srinivasa Reddy**

COURSE COORDINATOR : **S.Srinivasa Reddy**

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.
CO2: Understand the principles of Electro Chemical Machining Process for machining of hard materials.
CO3: Apply Electrical Discharge Machining principles for machining intricate components.
CO4: Comprehend the basic principles and applications of thermal machining processes like EBM, LBM and PAM.
CO5: Identify the need of Rapid Prototyping in manufacturing sectors.

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	04.12.2023		TLM1/TLM2	CO1	T1/R1	
2	Need for unconventional machining methods	1	07.12.2023		TLM1/TLM2	CO1	T1/R1	
3	Classification of unconventional machining processes	1	08.12.2023		TLM1/TLM2	CO1	T1/R1	
4	Considerations in process selection	1	09.12.2023		TLM1/TLM2	CO1	T1/R1	
6	Basic principle of ultrasonic machining, equipment setup and procedure,	1	11.12.2023		TLM1/TLM2	CO1	T1/R1	
7	Process variables and applications	1	13.12.2023		TLM1/TLM2	CO1	T1/R1	
9	Basic principle of Abrasive jet machining, equipment setup and procedure.	1	14.12.2023		TLM3/TLM6	CO1	T1/R1	
10	Water jet machining Basic principle, equipment setup and procedure	1	15.12.2023		TLM1/TLM2	CO1	T1/R1	
11	Process variables and applications	1	16.12.2023		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	18.12.2023		TLM1/TLM2	CO2	T1/R1	
14	ECM Process, and principles	1	21.12.2023		TLM1/TLM2	CO2	T1/R1	
15	Equipment and material removal rate	1	22.12.2023		TLM1/TLM2	CO2	T1/R1	
16	Tutorial -4	1	23.12.2023		TLM 3	CO2		
17	Electrochemical machining	1	28.12.2023		TLM1/TLM2	CO2	T1/R1	
18	Electrochemical grinding	1	29.12.2023		TLM1/TLM2	CO2	T1/R1	
19	Electrochemical deburring, Electrochemical honing	1	30.12.2023		TLM1/TLM2	CO2	T1/R1	
21	Chemical machining-principle	1	04.01.2024		TLM1/TLM2	CO2	T1/R1	

22	Maskants –Etchants, Advantages and Applications.	1	05.01.2024		TLM1/TLM2	CO2	T1/R1	
23	Maskants –Etchants, Advantages and Applications.	1	06.01.2024		TLM1/TLM2	CO2	T1/R1	
24	Rivision	1	08.01.2024		TLM1/TLM2	CO2	T1/R1	
No. of classes required to complete UNIT-II		13			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
25	EDM Principle	1	11.01.2024		TLM1/TLM2	CO3	T1/R1	
26	Process	1	12.01.2024		TLM1/TLM2	CO3	T1/R1	
28	Power circuits for EDM	1	13.01.2024		TLM1/TLM2	CO3	T1/R1	
29	Mechanics of metal removal in EDM	1	18.01.2024		TLM1/TLM2	CO3	T1/R1	
31	Process parameters	1	19.01.2024		TLM1/TLM2	CO3	T1/R1	
32	selection of tool electrode and dielectric fluid	1	20.01.2024		TLM1/TLM2	CO3	T1/R1	
33	Electric discharge wire cutting principle	1	22.01.2024		TLM1/TLM2	CO3	T1/R1	
34	Applications of EDM and Wire EDM	1	25.01.2024		TLM1/TLM2	CO3	T1/R1	
35	Rrivision	1	27.01.2024		TLM1/TLM2	CO3	T1/R1	
No. of classes required to complete UNIT-III		11			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
36	Electron Beam Machining, Principle, process	1	05.02.2024		TLM1/TLM2	CO4	T2/R3	
37	EBM Applications and Advantages	1	08.02.2024		TLM1/TLM2	CO4	T2/R3	
38	laser beam machining, Principle, process	1	09.02.2024		TLM1/TLM2	CO4	T2/R3	
40	LBM Applications and Advantages	1	10.02.2024		TLM1/TLM2	CO4	T2/R3	
41	Plasma arc machining, Principle, process	1	12.02.2024		TLM1/TLM2	CO4	T2/R3	
42	PAM Applications and Advantages	1	15.02.2024		TLM1/TLM2	CO4	T2/R3	
44	Hot machining, Process, equipment, applications	1	16.02.2024		TLM1/TLM2	CO4	T2/R3	
46	Hot machining, Process, equipment, applications	1	17.02.2024		TLM1/TLM2	CO4	T2/R3	

47	revision	1	19.02.2024		TLM1/TLM2	CO4	T2/R3	
No. of classes required to complete UNIT-IV		11			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
48	Introduction to RP fundamentals	1	22.02.2024		TLM1/TLM2	CO5	T2/R3	
49	Elements, Advantages of Rapid Prototyping	1	23.02.2024		TLM1/TLM2	CO5	T2/R3	
50	historical development, fundamentals of Rapid Prototyping	1	24.02.2024		TLM1/TLM2	CO5	T2/R3	
51	classification of Rapid prototyping	1	26.02.2024		TLM1/TLM2	CO5	T2/R3	
52	Tutorial -10	2	29.02.2024		TLM3		T2/R2	
53	Rapid Prototyping process chain	1	01.03.2024		TLM1/TLM2	CO5	T2/R3	
54	Stereo Lithography Apparatus (SLA)	1	02.03.2024		TLM1/TLM2	CO5	T2/R3	
55	solid Ground Curing (SGC)	1	04.02.2024		TLM1/TLM2	CO5	T2/R3	
56	EOS's EOSINT Systems	1	07.03.2024		TLM3/TLM2	CO5	T2/R3	
57	Applications of Rapid Prototyping	1	11.03.2024		TLM3/TLM6	CO5	T2/R3	
58	Rivion	1	15.03.2024		TLM3/TLM6	CO5	T2/R3	
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
59	Abrasive water jet aerospace applications	1	16.03.2024					
60	EDM process parameters	1	18.03.2024					
61	Rapid prototyping case study	1	21.03.2024					
62	Medical case study	1	22.03.2024					
63	Revision	1	28.03.2024					
64	Revision/quiz	1	30.03.2024					
	No. of classes required to complete	06						

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	04-12-2023	27-01-2024	8W
I Mid Examinations	**29-01-2024**	**03-02-2024**	**1W**
II Phase of Instructions	05-02-2024	30-03-2024	8W
II Mid Examinations	**01-04-2024**	**06-04-2024**	**1W**
Preparation and Practical's	08-04-2024	13-04-2024	1W
Semester End Examinations	29-04-2024	27-04-2024	2W
Internship	29-04-2024	22-06-2024	8W

EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Quiz Examination (Units-III, IV & V)	Q2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max (M1, M2) +25% of Min (M1, M2)	M=15
Quiz Marks =75% of Max (Q1, Q2) +25% of Min(Q1, Q2)	B=10
Cumulative Internal Examination (CIE): A+B+M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	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	S.Srinivasa Reddy	Dr. K Muarahari	Dr. M.B Srekar Reddy
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution

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

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

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

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. MADHAVI

Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81

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

Program/Branch/Sem : **B.Tech/MECH-A /VI** **A.Y.: 2023-24**

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
16.	Discussion of CEO's and CO's, Introduction	1	04-12-2023		-	CO1	-	
17.	Introduction: What Is AI?,	1	05-12-2023		TLM1	CO1	T1,T2	
18.	The Foundations of Artificial Intelligence	1	08-12-2023		TLM1	CO1	T1,T2	
19.	The History of Artificial Intelligence,	1	11-12-2023		TLM1	CO1	T1,T2	
20.	The State of the Art, Agents & Environments	1	12-12-2023		TLM1	CO1	T1,T2	
21.	Types of agents	1	15-12-2023		TLM2	CO1	T1,T2	
22.	Types of agents	1	16-12-2023		TLM2	CO1	T1,T2	
23.	Good Behavior: The Concept of Rationality	1	18-12-2023		TLM1	CO1	T1,T2	
24.	Omniscience vs Rational agent	1	19-12-2023		TLM1	CO1	T1,T2	
25.	The Nature of Environments	1	22-12-2023		TLM1	CO1	T1,T2	
26.	The Structure of Agents	1	23-12-2023		TLM1	CO1	T1,T2	
27.	Assignment/Quiz-2	1	26-12-2023		TLM1	CO1	-	

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
28.	Problem-Solving Agents, Example Problems	2	29-12-2023 30-12-2023		TLM1	CO2	T1,T2	
29.	searching for Solutions, Uninformed Search Strategies	1	02-01-2024		TLM1	CO2	T1,T2	
30.	Search algorithms terminologies, and Properties	1	05-01-2024		TLM1	CO2	T1,T2	
31.	Types of search algorithms and BFS	1	06-01-2024		TLM1	CO2	T1,T2	
32.	Best first search algorithm	1	06-01-2024		TLM2	CO2	T1,T2	
33.	A* Algorithm	1	08-01-2024		TLM2	CO2	T1,T2	
34.	AO* Algorithm	1	09-01-2024		TLM2	CO2	T1,T2	
35.	Local Search Algorithms	1	12-01-2024		TLM2	CO2	T1,T2	
36.	Local Search Algorithms	1	19-01-2024		TLM2	CO2	T1,T2	
37.	Searching with Nondeterministic Actions.	1	20-01-2024		TLM2	CO2	T1,T2	
38.	Assignment/Quiz-2	1	22-01-2024		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
39.	Introduction	1	23-01-2024		TLM1	CO3	T1,T2	
40.	Uniformed/Blind Search Algorithms:	2	26-01-2024		TLM1	CO3	T1,T2	
41.	Breadth-first Search	1	27-01-2024		TLM2	CO3	T1,T2	
42.	Depth-first Search,	1	05-02-2024		TLM2	CO3	T1,T2	
43.	Depth limited search	1	06-02-2024		TLM2	CO3	T1,T2	
44.	Iterative deepening depth-first search	1	09-02-2024		TLM2	CO3	T1,T2	
45.	Uniform cost search	1	12-02-2024		TLM2	CO3	T1,T2	
46.	Bidirectional Search.	1	13-02-2024		TLM2	CO3	T1,T2	

47.	Assignment/Quiz-3	1	16-02-2024		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 10					**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
48.	Introduction	1	17-02-2024		TLM1	CO4	T1,T2	
49.	Minimax algorithm	1	19-02-2024		TLM2	CO4	T1,T2	
50.	Alpha-Beta pruning	2	20-02-2024 23-02-2024		TLM2	CO4	T1,T2	
51.	Knowledge Based Agent, Architecture	1	24-02-2024		TLM1	CO4	T1,T2	
52.	Knowledge base Levels and types	1	26-02-2024		TLM1	CO4	T1,T2	
53.	Representation mappings	1	27-02-2024		TLM1	CO4	T1,T2	
54.	Inference Engine: Forward chaining/reasoning	1	01-03-2024		TLM1	CO4	T1,T2	
55.	Backward chaining/reasoning	1	02-03-2024		TLM1	CO4	T1,T2	
56.	Approaches of knowledge representation,	2	04-03-2024		TLM1	CO4	T1,T2	
57.	issues in knowledge representation	2	05-03-2024 08-03-2024		TLM1	CO4	T1,T2	
58.	Assignment/Quiz-4	1	09-03-2024		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 14					**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
59.	Introduction	1	11-03-2024		TLM1	CO5	T1,T2	
60.	Logic, Propositional Logic:	1	12-03-2024		TLM1	CO5	T1,T2	
61.	A Very Simple Logic,	1	15-03-2024		TLM1	CO4	T1,T2	
62.	Ontological Engineering	1	16-03-2024		TLM2	CO4	T1,T2	
63.	Categories, Objects and Events	1	18-03-2024		TLM2	CO5	T1,T2	
64.	Mental Events and Mental Objects	1	19-03-2024		TLM1	CO5	T1,T2	
65.	What is reasoning and Types	1	22-03-2024		TLM1	CO4	T1,T2	

66.	Types of reasoning	2	23-03-2024 25-03-2024		TLM1	CO4	T1,T2	
67.	Reasoning Systems for Categories	1	26-03-2024		TLM2	CO5	T1,T2	
68.	The Internet Shopping World	1	29-03-2024		TLM1	CO5	T1,T2	
69.	Assignment/Quiz-5	1	30-03-2024		TLM1	CO5	-	
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
70.	Turing test, Interview Questions	1	31-03-2024		**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 time problems.
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	**Ms.P. Madhavi**	**Ms.P.Madhavi**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

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

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

COURSE HANDOUT

Part-A

PROGRAM : B.Tech, VI-Sem., ME, A/S
ACADEMIC YEAR : 2023-24
COURSE NAME & CODE : Heat Transfer Lab & 20ME62
L-T-P STRUCTURE : 0-0-3
COURSE CREDITS : 2
LABORATORY INSTRUCTORS : Dr. P.Vijaya Kumar/Mr. S.Rami Reddy
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:2023-24

S. No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11	12
		Date	05 -12 - 23	12 - 12 - 23	19 -12 - 23	26 - 12 - 23	02 - 01 - 24	09 - 01 - 24	23 - 01 - 24	06 - 02 - 24	13 -02 - 24	20 - 02 - 24	27 - 02 - 24	04 -03 - 24	11 -03 - 24	18 -03 - 24
		Regd. No	CYCLE-I							CYCLE-2						
1	BATCH-I	20761A0369	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		21761A0301														
3		21761A0302														
4		21761A0303														
5		21761A0304														
6		21761A0305														
7	BATCH-2	21761A0306	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1		
8		21761A0307														
9		21761A0308														
10		21761A0309														
11		21761A0310														
12		21761A0311														
13	BATCH-3	21761A0312	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2		
14		21761A0313														
15		21761A0314														
16		21761A0315														
17		21761A0317														
18		21761A0318														
19	BATCH-4	21761A0319	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3		
20		21761A0320														
21		21761A0321														
22		21761A0322														
23		21761A0323														
24		21761A0324														
25	BATCH-5	21761A0325	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4		
26		21761A0326														
27		21761A0327														
28		21761A0328														
29		21761A0329														
30		21761A0330														

LAB INCHARGE

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: A-Sec (Friday)** **BATCH: 2** **A.Y:2023-24**

S.No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11		12
		Date	08 - 12 - 23	15 - 12 - 23	22 -12 - 23	29 - 12 - 23	05 - 01 - 24	12 - 01 - 24	19 - 01 - 24	26 - 01 - 24	09 -02 - 24	16 - 02 - 24	23 - 02 - 24	30 -02 - 24	07 -03 - 24	14 -03 - 24	21 -03 - 24
		Regd. No	CYCLE-I							CYCLE-2							
1	BATCH-I	21761A0331	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		22765A0301															
3		22765A0303															
4		22765A0304															
5		22765A0305															
6		22765A0306															
7	BATCH-2	22765A0307	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1			
8		22765A0308															
9		22765A0309															
10		22765A0310															
11		22765A0311															
12		22765A0312															
13	BATCH-3	22765A0313	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2			
14		22765A0314															
15		22765A0315															
16		22765A0316															
17		22765A0317															
18		22765A0318															
19	BATCH-4	22765A0319	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3			
20		22765A0320															
21		22765A0321															
22		22765A0322															
23		22765A0323															
24		22765A0324															
25	BATCH-5	22765A0325	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4			
26		22765A0326															
27		22765A0327															
28		22765A0328															
29		22765A0329															

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&B Sec Batch: 2021 A.Y: 2023-24

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**

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:

Course Name & Code	**:** CAD/CAM & 20ME18	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 3
Program/Sem/Sec	: B.Tech VI Sem (A)	**A.Y.:** 2023-2024

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	Develop 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	1			1									2	
CO2	1	1	2	2	3							1		3	
CO3	1	1	2	2	3							1		3	
CO4	1	1	1	1	1									2	
CO5	1	1	1		1									2	
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 .

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	04-12-2023		TLM2	
2.	Product Cycle Revised with CAD/CAM	1	06-12-2023		TLM2	
3.	Reasons for implementing CAD	1	07-12-2023		TLM1	
4.	Creating Manufacturing database & Benefits of CAD	1	11-12-2023		TLM1	
5.	Computer Graphics-Introduction , Database structure	1	13-12-2023		TLM2	
6.	Functions of a graphics package	1	14-12-2023		TLM1	
7.	Raster scan graphics	1	16-12-2023		TLM1	
8.	Transformations.	1	18-12-2023		TLM1	
9.	Problems on Translation, scaling,	1	20-12-2023		TLM1	
10.	Problems on Reflection, rotation	1	21-12-2023		TLM1	
No. of classes required to complete UNIT-I: 10				**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

11.	Geometric Modelling: Introduction	1	23-12-2023		**TLM2**	
12.	Wireframe Modelling: Entities wireframe models	1	27-12-2023		**TLM2**	
13.	Parametric representation of analytical curves	1	28-12-2023		**TLM1**	
14.	Parametric representation of analytical curves	1	30-12-2023		**TLM1**	
15.	Hermite cubic spline curve	1	03-01-2024		**TLM1**	
16.	Bezier curves and B spline curves	1	04-01-2024		**TLM3**	
17.	Problems based on synthetic curves	1	06-01-2024		**TLM1**	
18.	Surface representation: Entities	1	08-01-2024		**TLM1**	
19.	Analytical surface entities	1	10-01-2024		**TLM2**	
20.	Synthetic surface entities	1	11-01-2024		**TLM2**	
21.	Solid modelling: Introduction	1	20-01-2024		**TLM2**	
22.	Fundamentals of solid modeling, B-Rep	1	22-01-2024		**TLM1**	
23.	CSG and Sweep representation	1	24-01-2024		**TLM2**	
No. of classes required to complete UNIT-II: 13				**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
24.	Numerical control: Introduction, NC Modes	1	25-01-2024		**TLM1**	
25.	NC elements ,N C Coordinate systems	1	27-01-2024		**TLM1**	
26.	Structure of CNC machine tools	1	05-02-2024		**TLM1**	
27.	Feedback devices	1	07-02-2024		**TLM1**	
28.	Part programming: Fundamentals	1	08-02-2024		**TLM1**	
29.	Manual part programming	1	12-02-2024		**TLM1**	
30.	Example on NC manual programming	1	14-02-2024		**TLM1**	
31.	Computer Aided part programming	1	15-02-2024		**TLM1**	
32.	APT Language	1	17-02-2024		**TLM1**	
33.	Part programming example	1	19-02-2024		**TLM1**	
No. of classes required to complete UNIT-III: 10				**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
34.	Group Technology: Introduction	1	21-02-2024		**TLM1**	

35.	Coding and classification schemes-OPITZ, MICLASS and CODE system	1	22-02-2024		**TLM2**	
36.	Example on GT coding	1	24-02-2024		**TLM1**	
37.	Production Flow Analysis, Advantages and limitations	1	26-02-2024		**TLM1**	
38.	GT Machine cells, , Benefits of GT	1	28-02-2024		**TLM2**	
39.	CAPP- Retrieval and Generative	1	29-02-2024		**TLM1**	
40.	Flexible Manufacturing System: Introduction	1	02-03-2024		**TLM1**	
41.	FMS components	1	04-03-2024		**TLM1**	
42.	FMS layouts, Benefits	1	06-03-2024		**TLM1**	
43.	FMS Planning and implementation	1	07-03-2024		**TLM1**	
No. of classes required to complete UNIT-IV: 10				**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
44.	CAQC: Introduction, The computers in QC	1	14-03-2024		**TLM1**	
45.	Contact inspection methods	1	16-03-2024		**TLM1**	
46.	Non-Contact inspection methods: Optical	1	18-03-2024		**TLM1**	
47.	Non-Contact inspection methods: non optical	1	20-03-2024		**TLM1**	
48.	Computer aided testing,	1	21-03-2024		**TLM1**	
49.	CAQC with CAD/CAM	1	23-03-2024		**TLM1**	
50.	CIM Introduction	1	27-03-2024		**TLM1**	
51.	CIM integration, Implementation	1	28-03-2024		**TLM2**	
52.	Benefits of CIM, Lean manufacturing	1	30-03-2024		**TLM1**	
No. of classes required to complete UNIT-V: 09				**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
1.	Role of computer Aided Engineering in the present day Industrial Automation	2	11-03-2024 13-03-2024		**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

Academic Calander: 2023-24

Description	From	To	Weeks
B.Tech VI semester			
Commencement of class work	04-12-2023		
I phase of Instructions	04-12-2023	27-01-2024	8 weeks
I Mid examinations	29-01-2024	03-02-2024	1 week
II phase of Instructions	05-02-2024	30-03-2024	8 weeks
II Mid examinations	01-04-2024	06-04-2024	1 week
Preparation and practical's	08-04-2024	13-04-2024	1 week
Semester end examinations	15-04-2024	27-04-2024	2 weeks
Internship	29-04-2024	22-06-2024	8 weeks

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				
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: Jonnala Subba Reddy (T668), Mrs. B. Kamala Priya (T792)

Course Name & Code : Robotics and Simulation Lab & 20ME64 **Regulation**: R20
L-T-P Structure : **1-0-2** **Credits:** 02
Program/Sem/Sec : B.Tech – VI Semester – A Section **A.Y.:** 2023-24
Continuous Internal Assessment : **15** **Semester End Examination** : **35**

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 operate the robot with 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 and Official websites of concerned software mentioned

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-B

COURSE DELIVERY PLAN (LESSON PLAN): (Section – A: A1 Batch)

Schedule of Experiments: Friday (from 09.50 AM – 12.30 PM)

S.No	Batches	Regd. Nos	Total No. of Students
01	Batch A1	21761A0301 – 315, 317 – 330	29

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
01	Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	**08-12-2023**		TLM4	
Cycle-I						
02	Study the anatomy of robots	3	**15-12-2023**		TLM4	
03	Analysis of robot configuration and Simulation of Robot with 2 DOF using Robo Analyzer.	3	**22-12-2023**		TLM4	
04	Analysis of robot configuration and Simulation of Robot with 6 DOF using Robo Analyzer.	3	**29-12-2023**		TLM4	
05	D-H parametric representation of various robotic arms using Robo Analyzer	3	**05-01-2024**		TLM4	
06	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	**12-01-2024**		TLM4	
07	Simulation of SCARA, PUMA using Robo Analyzer, Class Test	3	**19-01-2024**		TLM4	
-	Republic Day	3	**26-01-2024**	**-**	-	-
I Mid Exams: 29-01-2024 to 03-02-2024						
Cycle-II						
08	Introduction to IGUS Software	3	**09-02-2024**		TLM4	
09	Introduction to IGUS Software	3	**16-02-2024**		TLM4	
10	Program for commands like a line command, circle command,	3	**23-02-2024**		TLM4	
11	Point to Point (PTP) command, Continuous path	3	**01-03-2024**		TLM4	
12	Palletizing, Loading / Unloading	3	**08-03-2024**		TLM4	
13	Revision, Applications and Class Test	3	**15-03-2024**		TLM4	
14	Viva - Voce	3	**22-03-2024**		TLM4	
15	Internal Exam	3	**29-03-2024**		TLM4	
II Mid Exams:01-04-2024 to 06-04-2024						
No. of classes required to complete; 14				**No. of classes taken:**		

Schedule of Experiments (Section – A: A2 Batch): Tuesday (From 01.30 PM to 04.30 PM)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	21761A0331, 22765A0301 – 22765A0329, 20761A0369	30

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
01	Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	**05-12-2023**		TLM4	
Cycle-I						
02	Study the anatomy of robots	3	**12-12-2023**		TLM4	
03	Analysis of robot configuration and Simulation of Robot with 2 DOF using Robo Analyzer.	3	**19-12-2023**		TLM4	
04	Analysis of robot configuration and Simulation of Robot with 6 DOF using Robo Analyzer.	3	**29-12-2023**		TLM4	
05	D-H parametric representation of various robotic arms using Robo Analyzer	3	**26-01-2024**		TLM4	
06	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	**02-01-2024**		TLM4	
07	Simulation of SCARA, PUMA using Robo Analyzer	3	**09-01-2024**		TLM4	
-	Sankranthi	3	**16-01-2024**	**-**	-	-
08	Applications and Class Test	3	**23-01-2024**		TLM4	
I Mid Exams: 29-01-2024 to 03-02-2024						
Cycle-II						
08	Introduction to IGUS Software	3	**30-01-2024**		TLM4	
09	Introduction to IGUS Software	3	**06-02-2024**		TLM4	
10	Program for commands like a line command, circle command,	3	**13-02-2024**		TLM4	
11	Point to Point (PTP) command, Continuous path	3	**20-02-2024**		TLM4	
12	Palletizing , Loading / Unloading	3	**27-02-2024**		TLM4	
13	Revision	3	**05-03-2024**		TLM4	
14	Applications and Class Test	3	**12-03-2024**		TLM4	
15	Viva - Voce	3	**19-03-2024**		TLM4	
16	Internal Exam	3	**26-03-2024**		TLM4	
II Mid Exams:01-04-2024 to 06-04-2024						
No. of classes required to complete 14				**No. of classes taken:**		

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**

Academic calendar

Commencement of VI Semester Classwork	**04-12-2023**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	04-12-2023	27-01-2024	8 W
I Mid Examinations	29-01-2024	03-02-2024	1 W
II Phase of Instructions	05-02-2024	30-03-2024	8 W
II Mid Examinations	01-04-2024	06-04-2024	1 W
Preparation and Practicals	08-04-2024	13-04-2024	1 W
Semester End Examinations	15-04-2024	27-04-2024	2 W
Internship	29-04-2024	22-06-2024	8 W
Commencement of VII Semester Classwork	**01 – 07 - 2024**		

Lab Occupancy Time Table (B.Tech VI Sem:Section – A/ S)

↓Day/Date→	**09.00 – 09.50**	**09.50 - 10.40**	**10.50 - 11.40**	**11.40 - 12.30**	**12.30 - 13.30**	**13.30 - 14.20**	**14.20 - 15.10**	**15.10 - 16.00**
Monday					**LUNCH BREAK**			
Tuesday						**VI Semester – A Section A2 Batch**		
Wednesday								
Thursday								
Friday		**VI Semester – A Section A1 Batch**						
Saturday								

Faculty – In Charges:

S.No	Class	Section	Lab Assistant	Faculty – In Charge
1	B.Tech – VI Semester	A	Mr. K.S.S.Jamala Reddy	Jonnala Subba Reddy (T668) Mrs. B. Kamala Priya (T792)

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	Jonnala Subba Reddy / Mrs. B. Kamala Priya	Jonnala Subba Reddy	Jonnala Subba Reddy	**Dr.M.B.S.Sreekara Reddy**
Designation	**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
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

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 : 2023-24

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 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			3	3	3		3
CO3.					2			3	3	3		3
CO4.					2			3	3	3		2
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	Teaching Learning Methods	HOD Sign weekly
1.	Activity-1:Role of language in Personality- How language reflects, impacts Personality – Using gender	1+2	5-12-23		TLM-1, 2& 6.	
2.	Neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code& Role-play	1+2	12-12-23		TLM-1, 2 &6.	
3.	Group Discussion	1+2	19-12-23		TLM-1, 2& 6.	
4.	Group Discussion	1+2	26-12-23		TLM-	

					1, 2& 6.	
5.	Presentations	1+2	2-1-24		TLM- 1, 2& 6.	
6.	Activity-2: Impactful Communication Extempore - Story Telling	1+2	9-1-24		TLM- 1, 2& 6.	
7.	Extempore -Group Discussion	1+2	16-1-24		TLM- 1, 2& 6.	
8.	Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing	1+2	23-1-24		TLM- 1, 2& 6.	
9.	reviews on short story/videos/book/Social Media profiling/ Pronunciation Practice	1+2	6-2-24		TLM- 1, 2& 6.	
10.	*Activity-3: Professional Skills: Career planning- job vs. career-goal setting*	1+2	13-2-24		TLM- 1, 2& 6.	
11.	SWOT Analysis	1+2	20-2-24		TLM- 1, 2& 6.	
12.	Time management – self-management – stress-management.	1+2	27-2-24		TLM- 1, 2& 6.	
13.	Presentation/Writing Report/Listening exercises	1+2	5-3-24		TLM- 1, 2& 6.	
14.	Effective Resume-Writing and presentation	1+2	12-3-24		TLM- 1, 2& 6.	
15.	Interview Skills: Mock interviews/Video samples.	1+2	19-3-24		TLM- 1, 2& 6.	
16.	Interview Skills: Mock interviews/Video samples.	1+2	26-3-24		TLM- 1, 2& 6.	
No. of classes required to complete Syllabus: 48						

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

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.

	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. R. Padma Venkat	Dr. R. Padma Venkat	Dr. R. Padma Venkat	Dr. A. Ramireddy
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

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: 2023-24

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	04-12-2023		TLM1	
2.	Introduction of five Units importance	1	05-12-2023		TLM1	
3.	Introduction to heat transfer and its applications, Basic Modes of Heat Transfer	1	06-12-2023		TLM1, TLM2 TLM5	
4.	Basic laws of Heat Transfer-Steady, Unsteady and Periodic Heat Transfer	1	08-12-2023		TLM1, TLM4	
5.	General heat conduction equation in Cartesian coordinate system and its simplifications.	1	11-12-2023		TLM1	
6.	Fourier's law of heat conduction; Thermal conductivity	1	12-12-2023		TLM1, TLM2	
7.	General heat conduction equation in cylindrical coordinate system and its simplifications.	1	13-12-2023		TLM1	
8.	**Tutorial-1**	1	15-12-2023		TLM3	
9.	General heat conduction equation in spherical coordinate system and its simplifications.	1	18-12-2023		TLM1, TLM2	
10.	Heat conduction through plane wall and cylinder with constant thermal conductivity– Numerical Problems.	1	19-12-2023		TLM1, TLM2	
11.	Electrical analogy, thermal resistance, and overall heat transfer coefficient.	1	20-12-2023		TLM1, TLM2 TLM5	
12.	Numerical Problems on thermal resistance and overall heat transfer coefficient	1	22-12-2023		TLM1, TLM2	
13.	Heat transfer through composite slab and cylinder, Numerical Problems. **Tutorial-2**	1	26-12-2023		TLM1, TLM2, TLM3	
14.	Critical radius of insulation for cylinder, Sphere and Applications.	1	27-12-2023		TLM1, TLM2	
15.	Numerical Problems on critical radius of insulation, **Assignment-1 Questions.**	1	29-12-2023		TLM1 TLM2	
No. of classes required to complete UNIT-I: 15				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.	Heat flow through a plane wall, cylinder with variable thermal conductivity, Numerical Problems.	1	02-01-2024		TLM1	
2.	Derivation on Uniform Internal heat generation in slabs and cylinders	1	03-01-2024		TLM1, TLM2	
3.	Numerical Problems on Uniform Internal heat generation in slabs.	1	05-01-2024		TLM1	
4.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	08-01-2024		TLM1, TLM2	
5.	**Tutorial-3**	1	09-01-2024		TLM3	
6.	Extended surfaces and their applications; Thermal analysis of long Fins	1	10-01-2024		TLM1, TLM4	

7.	Thermal analysis of short fins with insulated tip, Fin efficiency and effectiveness	1	17-01-2024		TLM1, TLM2	
8.	Systems with negligible internal Resistance (Lumped Heat Analysis), Significance of Biot and Fourier Numbers	1	19-01-2024		TLM1, TLM2	
9.	Numerical Problems, Heisler chart solutions	1	22-01-2024		TLM1, TLM2	
10.	Basics of convective (Forced and Natural) heat transfer and Applications. Dimensional analysis and Buckingham Pi theorem applied to Forced Convection.	1	23-01-2024		TLM1, TLM2	
11.	Significance of Non-Dimensional Numbers., Dimensional analysis and Buckingham Pi theorem applied to Natural Convection. - **Tutorial-4**	1	24-01-2024		TLM3	
No. of classes required to complete UNIT-II: 11				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, Numerical Problems.	1	05-02-2024		TLM1, TLM2	
2.	Forced convection analysis in external flows (Flow over a Flat Plate): Laminar and turbulent flows.	1	06-02-2024		TLM1, TLM2	
3.	Forced convection analysis in internal flows (Flow through circular pipe): Laminar and turbulent flows.	1	07-02-2024		TLM1, TLM2	
4.	Numerical Problems on Forced Convection, Reynolds Colburn Analogy.	1	09-02-2024		TLM1, TLM2	
5.	**Tutorial-5**	1	12-02-2024		TLM3	
6.	Natural convection: Development of Hydrodynamic and thermal boundary layer along vertical plate.	1	13-02-2024		TLM1, TLM2 TLM4	
7.	Development of Hydrodynamic and thermal boundary layer along vertical plate, Numerical Problems	1	14-02-2024		TLM1, TLM2	
8.	**Tutorial-6**	1	16-02-2024		TLM3	
No. of classes required to complete UNIT-III:8				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	20-02-2024		TLM1, TLM2	
2.	Numerical problems on nucleate boiling, Critical heat flux conditions.	1	21-02-2024		TLM1, TLM2 TLM5	
3.	Condensation: Film wise and drop wise condensation, Laminar film wise condensation on Vertical plate	1	23-02-2024		TLM1, TLM2	
4.	Numerical Problems - **Tutorial-7**	1	26-02-2024		TLM3	

5.	Introduction and applications of Thermal Radiation, Emissive Power, Absorption, Reflection and Transmission and	1	27-02-2024		TLM1, TLM2	
6.	Definitions related to radiation, Concept of black and non-black bodies , Laws of black body radiation	1	28-02-2024		TLM1, TLM2	
7.	Emissivity, Kirchhoff's law, Shape Factors	1	01-03-2024		TLM1,	
8.	Radiation heat exchange between two black isothermal surfaces, Nonblack infinite parallel plates;	2	04-03-2024, 05-03-2024		TLM2	
9.	Numerical Problems - **Tutorial-8**	1	06-03-2023		TLM1, TLM2, TLM3	
No. of classes required to complete UNIT-IV:9				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	08-03-2023		TLM1, TLM2 TLM6	
2.	Applications of Heat Exchangers	1	11-03-2023		TLM1, TLM2	
3.	Overall heat transfer coefficient- Fouling factor	1	12-03-2023		TLM1, TLM2	
4.	LMTD method of Heat exchanger analysis- Parallel flow, Numerical Problems	1	13-03-2023		TLM1, TLM2 TLM4	
5.	LMTD method of Heat exchanger analysis- Counter flow, Numerical Problems – **Tutorial-9**	1	15-03-2023		TLM1, TLM2, TLM3	
6.	Correction factor for LMTD for use with Multi pass and Cross flow Heat Exchangers	1	18-03-2023		TLM1, TLM2	
7.	Effectiveness - NTU method of Heat Exchanger Analysis-Applications of Heat Exchangers	1	19-03-2023		TLM3	
8.	Effectiveness - NTU method of Heat Exchanger Analysis-Applications of Heat Exchangers	1	20-03-2023		TLM1, TLM5	
9.	**Tutorial-10**	1	22-03-2023		TLM3	
No. of classes required to complete UNIT-V: 9				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	25-03-2023		TLM6	
2.	Second two and half units	1	26-03-2023		TLM6	

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.	**Electronic cooling by natural and forced convection**	1	27-03-2023		TLM2	
4.	**Heat Transfer in Variables resistances and variable thermal conductivity**	1	29-03-2023		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 (R17 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Quiz Examination (Units-III, IV & V)	Q2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max (M1, M2) +25% of Min (M1, M2)	M=15
Quiz Marks =75% of Max (Q1, Q2) +25% 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.P.Vijay Kumar)	(Dr.P.Ravindra Kumar)	(Dr.P.Vijay Kumar)	(Dr.M.B.S.S.Reddy)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. 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 (B)	**A.Y.:** 2023-2024

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,8_{th} 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, 20_{th} edition, May 2010.
R2	P.Radhakrishnan,S.Subramanyam&V.Raju,CAD/CAM/CIM, New Age International Publishers,3_{rd} edition 2010.
R3	Mikel P.Groover, Automaiton, Production Systems and Computer Integrated Manufacturing, Prentice Hall of India Private Ltd. New Delhi, 3_{rd} 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, 3_{rd} 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	04-12-2022		**TLM1/TLM2**	
2.	Product Cycle Revised with CAD/CAM	1	05-12-2022		**TLM1/TLM2**	
3.	Reasons for implementing CAD	1	07-12-2022		**TLM1/TLM2**	
4.	Creating Manufacturing database & Benefits of CAD	1	11-12-2022		**TLM1/TLM2**	
5.	Computer Graphics- Introduction , Database structure	1	12-12-2023		**TLM1/TLM2**	
6.	Functions of a graphics package	1	14-12-2023		**TLM1/TLM2**	
7.	Raster scan graphics	1	16-12-2023		**TLM1/TLM2**	
8.	Concatenated transformations.	1	18-12-2023		**TLM1/TLM2**	
9.	Translation, scaling, Reflection, rotation	1	19-12-2023		**TLM1/TLM2**	
10.	Problems on Transformations	1	21-12-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-I: 10				**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
11.	Geometric Modelling: Introduction	1	23-12-2023		**TLM1/TLM2**	
12.	Wireframe Modelling: Entities wireframe models	1	26-12-2023		**TLM1/TLM2**	
13.	Parametric representation of analytical curves	1	28-12-2023		**TLM1/TLM2**	
14.	Hermite cubic spline curve	1	02-01-2023		**TLM1/TLM2**	

15.	Bezier curves	1	04-01-2023		**TLM1/TLM2**	
16.	B-spline curves	1	06-01-2023		**TLM1/TLM2**	
17.	Surface representation:	1	08-01-2023		**TLM1/TLM2**	
18.	Solid modelling	1	09-01-2023		**TLM1/TLM2**	
19.	B-Rep	1	11-01-2023		**TLM1/TLM2**	
20.	CSG	1	18-01-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 10				**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
21.	Numerical control: Introduction, NC Modes, NC elements	1	20-01-2023		**TLM1/TLM2**	
22.	N C Coordinate systems	1	22-01-2023		**TLM1/TLM2**	
23.	Structure of CNC machine tools	1	25-01-2023		**TLM1/TLM2**	
24.	Spindle design, spindle drives,	1	27-01-2023		**TLM1/TLM2**	
25.	Feed drives,	1	05-02-2023		**TLM1/TLM2**	
26.	actuation systems	1	06-02-2023		**TLM1/TLM2**	
27.	CNC Part programming: fundamentals	1	08-02-2023		**TLM1/TLM2**	
28.	Manual part programming	1	12-02-2023		**TLM1/TLM2**	
29.	Computer Aided part programming	1	13-02-2023		**TLM1/TLM2**	
30.	Part programming examples	1	15-02-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-III: 10				**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
31.	Group Technology	1	17-02-2023		**TLM1/TLM2**	
32.	Coding and classification schemes- OPITZ	1	19-02-2023		**TLM1/TLM2**	
33.	MICLASS, example for coding	1	20-02-2023		**TLM1/TLM2**	
34.	CODE Systems, examples for coding	1	22-02-2023		**TLM1/TLM2**	

35.	Production Flow Analysis	1	24-02-2023		**TLM1/TLM2**	
36.	GT Machine cells, Benefits of GT	1	26-02-2023		**TLM1/TLM2**	
37.	CAPP- Retrieval and Generative	1	27-02-2023		**TLM1/TLM2**	
38.	Flexible Manufacturing System: Introduction	1	29-02-2023		**TLM1/TLM2**	
39.	FMS equipment, FMS layouts, benefits	1	02-03-2023		**TLM1/TLM2**	
40.	FMS Planning and implementation	1	04-03-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-IV: 10				**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
41.	CAQC: Introduction, The computers in QC	1	05-03-2023		**TLM1/TLM2**	
42.	Contact inspection methods	1	07-03-2023		**TLM1/TLM2**	
43.	Non-Contact inspection methods: Optical	1	11-03-2023		**TLM1/TLM2**	
44.	Computer aided testing,	1	12-03-2023		**TLM1/TLM2**	
45.	CMM	1	14-03-2023		**TLM1/TLM2**	
46.	CAQC with CAD/CAM	1	16-03-2023		**TLM1/TLM2**	
47.	CIM integration, Implementation	1	18-03-2023		**TLM1/TLM2**	
48.	Benefits of CIM	1	19-03-2023		**TLM1/TLM2**	
49.	Lean manufacturing	1	21-03-2023		**TLM1/TLM2**	
50.	Lean manufacturing benefits	1	23-03-2023		**TLM1/TLM2**	
51.	Advances in CAD/CAM	1	23-03-2023		**TLM1/TLM2**	
52.	Revision	1	28-03-2023		**TLM1/TLM2**	
53.	Revision	1	30-03-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-V: 13				**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, andanalyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineeringsciences.
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 thelimitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextualknowledge 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 andresponsibilities 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 andability 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 managementtowards 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 evaluationof 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	**Mr. A Nageswara Rao**	**Mr. 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 (CSE, IT, ECE, EEE & ME)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.B.Sudheer Kumar
Course Name & Code : 20ME19, Design of Machine Elements-II
L-T-P Structure : 2-1-0 Credits : 3
Program/Sem/Sec : B.Tech., ME.,VI-Sem., Section- B A.Y : 2023-24

PRE-REQUISITE: Mechanics of Solids, Mechanical Engineering Design-I, Dynamics of Machines.

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

COURSE OUTCOMES (COs): At the end of the course, students are 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	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	3	2	3									1			3
CO2	3	2	3		1							1			3
CO3	3	2	3									1			3
CO4	3	3	3									1			3
CO5	3	2	3									1			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:

T 1 Bhandari V.B., Design of Machine Elements, 3rd edition, TMG 2010

T 2 Sundarajamoorthy T.V, Shanmugam N., Machine Design, Anuradha Publications

BOS APPROVED REFERENCE BOOKS:

R1 Norton R.L, Design of Machinery, TMG-2004

R2 Shigley J.E. and Mischke C.R., Mechanical Engineering Design, TMG-2003

R3 Ugural A.C, Mechanical Design-An Integral Approach, TMG-2004

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to Subject, Pos, PEOs and CO's of the course	1	04/12/2023		TLM1	
2	Introduction to Unit-1, **Bearings** –Introduction, theory of lubrication, Types, materials	1	06/12/2023		TLM1	
3	**Journal Bearings** – Types, Important dimensionless parameters,	1	08/12/2023		TLM1	
4	Design procedure of journal bearing	1	09/12/2023		TLM1	
5	**Tutorial-I**	1	11/12/2023		TLM3	
6	**Rolling contact bearings-**types, bearing life, Materials and designation	1	13/12/2023		TLM1	
7	Static load and dynamic load capacity, equivalent bearing load	1	15/12/2023		TLM1	
8	**Tutorial-II**	1	16/12/2023		TLM3	
9	Cubic mean load derivation, Reliability of bearings - problems	1	18/12/2023		TLM1	
10	**Assignment -I/ Quiz-I**	1	20/12/2023		TLM6	
No. of classes required to complete UNIT-I: 10			No. of classes taken:			

UNIT-II:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to Unit-II, **Cylinder:**Cylinder liners, Design Procedure of Cylinder	1	27/12/2023		TLM1	
2	Cylinder design - problems	1	23/12/2023		TLM1	
3	Problems on cylinder design	1	29/12/2023		TLM1	
4	**PISTON** : Piston design, - design	1			TLM1	
5	**Tutorial-III**	1	30/12/2023		TLM3	
6	**CONNECTING ROD**: Thrust in C.R, buckling load	1	03/01/2024		TLM1	
7	Stresses due to whipping action on connecting rod ends-problems	1	05/01/2024		TLM1	
8	**CRANK SHAFT:** Design of crank and crank shaft	1	06/01/2024		TLM1	
9	Strength of center crank shaft - problem	1	08/01/2024		TLM1	
10	**Tutorial-IV**	1	10/01/2024		TLM3	
11	**Assignment-II/Quiz-2**	1	12/01/2024		TLM6	
No. of classes required to complete UNIT-II: 11			No. of classes taken:			

UNIT-III:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	**Introduction to Unit-III Flat belts** Introduction, Materials and Design Procedure	1	19/01/2024		TLM1	
2	Design Procedure of flat belts - Problems	1	20/01/2024		TLM1	
3	**PULLEYS:** Design of pulleys mild steel & cast iron	1	22/01/2024		TLM1	
4	Design of pulleys Problems	1	24/01/2024		TLM1	
5	**Tutorial-V**	1	27/01/2024		TLM3	
Mid-I Examination from 29-1-2024 to 03-02-2024						
6	V-belts –designation, design	1	05/02/2024		TLM1	

	and selection					
7	Design of V belts - problems	1	07/02/2024		TLM1	
8	Design of V- grooved pulley	1	09/02/2024		TLM1	
9	Design of V- grooved pulley	1	10/02/2024		TLM1	
10	V-belts –designation, design and selection	1	12/02/2024		TLM1	
11	**Tutorial-VI**	1	14/02/2024		TLM3	
12	**Assignment-III/Quiz-III**	1	16/02/2024		TLM6	
No. of classes required to complete UNIT-III: 12			No. of classes taken:			

UNIT-IV:

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	17/02/2024		TLM1	
2	Stresses, deflection and stiffness in springs and their derivations	1	19/02/2024		TLM1	
3	Design of springs-problems	1	21/02/2024		TLM1	
4	Springs for fatigue loading	1	23/02/2024		TLM1	
5	**Tutorial-VII**	1	24/02/2024		TLM3	
6	Spring failures, design of helical springs	1	26/02/2024		TLM1	
7	Natural frequency of helical spring	1	28/02/2024		TLM1	
8	Energy storage capacity in springs	1	01/03/2024		TLM1	
9	Tension and torsion springs	1	02/03/2024		TLM1	
10	Co-axial springs design-Problems	1	04/03/2024		TLM1	
11	**Tutorial-VIII**	1	06/03/2024		TLM3	
12	**Assignment-IV/Quiz-IV**	1	09/03/2024		TLM6	
No. of classes required to complete UNIT-V: 12			No. of classes taken:			

UNIT-V:

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-V GEARS**: Introduction and	1	11/03/2024		TLM1	

	terminology, Types of gears, design formulae					
2	Design Analysis of gears, Estimation of centre distance, module & face width	1	13/03/2024		TLM1	
3	Design procedure of spur gears, Check for dynamic and wear considerations	1	15/03/2024		TLM1	
4	Design of spur gears - Problems	1	16/03/2024		TLM1	
5	Design of spur gears - Problems	1	18/03/2024		TLM1	
6	Design of spur gears - Problems	1	20/03/2024		TLM1	
7	**Tutorial-IX**	1	22/03/2024		TLM3	
8	Design procedure of Helical gears, Check for dynamic and wear considerations Design of Helical gears - Problems	1	23/03/2024		TLM1	
9	Design of Helical gears - Problems	1	25/03/2024		TLM1	
10	**Tutorial-X**	1	27/03/2024		TLM3	
11	**Assignment-V/Quiz-V**	1	29/03/2024		TLM6	
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	HOD Sign Weekly
1	Design of flywheels	1	30/03/2024		TLM1 TLM2		
2	Design of epicycle gear train		30/03/2024		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

PROGRAM 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.

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**
Dr.B.Sudheer Kumar	Dr.B.Sudheer Kumar	Dr.B.Sudheer Kumar	Dr.M.B.S.Sreekar Reddy

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 : 2023-24

COURSE NAME & CODE : **MODERN MACHING PROCESSES- 20ME26**

STRUCTURE : 4-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : **A. Dhanunjay Kumar**

COURSE COORDINATOR : **S. Srinivasa Reddy**

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.
CO2: Understand the principles of Electro Chemical Machining Process for machining of hard materials.
CO3: Apply Electrical Discharge Machining principles for machining intricate components.
CO4: Comprehend the basic principles and applications of thermal machining processes like EBM, LBM and PAM.
CO5: Identify the need of Rapid Prototyping in manufacturing sectors.

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:

T 1 Pandey P.C. and shah H.S, Modern machining processes /TMH.

T Chua C.K, Leong K.F, and Lim C.S, Rapid prototyping principles and applications,

2 second edition, world scientific publishers, and 2003.

BOS APPROVED REFERENCE BOOKS:

R M K Singh, Unconventional machining process / New age international.
1

R V K Jain, Advanced machining processes /Allied publishers.
2

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	04.12.2023		TLM1/TLM2	CO1	T1/R1	
2	Need for unconventional machining methods	1	06.12.2023		TLM1/TLM2	CO1	T1/R1	
3	Classification of unconventional machining processes	1	07.12.2023		TLM1/TLM2	CO1	T1/R1	
4	Considerations in process selection	1	09.12.2023		TLM1/TLM2	CO1	T1/R1	
5	Basic principle of ultrasonic machining, equipment setup and procedure,	2	11.12.2023 13.12.2023		TLM1/TLM2	CO1	T1/R1	
6	Process variables and applications	1	14.12.2023		TLM1/TLM2	CO1	T1/R1	
7	Basic principle of Abrasive jet machining, equipment setup and procedure.	1	16.12.2023		TLM3/TLM6	CO1	T1/R1	
8	Water jet machining Basic principle, equipment setup and procedure	1	18.12.2023		TLM1/TLM2	CO1	T1/R1	
9	Process variables and applications	2	20.12.2023 21.12.2023		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
10	Electrochemical Process Introduction	1	23.12.2023		TLM1/TLM2	CO2	T1/R1	
11	ECM Process, and principles	2	27.12.2023 28.12.2023		TLM1/TLM2	CO2	T1/R1	
12	Equipment and material removal rate	1	30.12.2023		TLM1/TLM2	CO2	T1/R1	

13	Electrochemical machining	1	03.01.2024		TLM1/TLM2	CO2	T1/R1	
14	Electrochemical grinding	1	04.01.2024		TLM1/TLM2	CO2	T1/R1	
15	Electrochemical deburring, Electrochemical honing	1	06.01.2024		TLM1/TLM2	CO2	T1/R1	
16	Chemical machining-principle	1	08.01.2024		TLM1/TLM2	CO2	T1/R1	
17	Maskants –Etchants, Advantages and Applications.	1	10.01.2024		TLM1/TLM2	CO2	T1/R1	
18	Maskants –Etchants, Advantages and Applications.	1	11.01.2024		TLM1/TLM2	CO2	T1/R1	
No. of classes required to complete UNIT-II		10			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
19	EDM Principle	1	13.01.2024		TLM1/TLM2	CO3	T1/R1	
20	Process	1	18.01.2024		TLM1/TLM2	CO3	T1/R1	
21	Power circuits for EDM	2	20.01.2024 21.01.2024		TLM1/TLM2	CO3	T1/R1	
22	Mechanics of metal removal in EDM	1	23.01.2024		TLM1/TLM2	CO3	T1/R1	
23	Process parameters	2	25.01.2024 05.02.2024		TLM1/TLM2	CO3	T1/R1	
24	selection of tool electrode and dielectric fluid	1	07.02.2024		TLM1/TLM2	CO3	T1/R1	
25	Electric discharge wire cutting principle	1	08.02.2024		TLM1/TLM2	CO3	T1/R1	
26	Applications of EDM and Wire EDM	1	10.02.2024		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
27	Electron Beam Machining, Principle, process	2	12.02.2024 14.02.2024		TLM1/TLM2	CO4	T2/R3	
28	EBM Applications and Advantages	1	15.02.2024		TLM1/TLM2	CO4	T2/R3	
29	laser beam machining, Principle, process	2	17.02.2024 19.02.2024		TLM1/TLM2	CO4	T2/R3	

30	LBM Applications and Advantages	1	21.02.2024		TLM1/TLM2	CO4	T2/R3	
31	Plasma arc machining, Principle, process	2	22.02.2024 24.02.2024		TLM1/TLM2	CO4	T2/R3	
32	PAM Applications and Advantages	1	26.02.2024		TLM1/TLM2	CO4	T2/R3	
33	Hot machining, Process, equipment, applications	2	28.02.2024 29.02.2024		TLM1/TLM2	CO4	T2/R3	
No. of classes required to complete UNIT-IV		11			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
34	Introduction to RP fundamentals	2	02.03.2024 04.03.2024		TLM1/TLM2	CO5	T2/R3	
35	Elements, Advantages of Rapid Prototyping	1	06.03.2024		TLM1/TLM2	CO5	T2/R3	
36	historical development, fundamentals of Rapid Prototyping	1	09.03.2024		TLM1/TLM2	CO5	T2/R3	
37	classification of Rapid prototyping	2	11.03.2024 13.03.2024		TLM1/TLM2	CO5	T2/R3	
38	Rapid Prototyping process chain	1	14.03.2024		TLM1/TLM2	CO5	T2/R3	
39	Stereo Lithography Apparatus (SLA)	1	16.03.2024		TLM1/TLM2	CO5	T2/R3	
40	solid Ground Curing (SGC)	1	18.03.2024		TLM1/TLM2	CO5	T2/R3	
41	EOS's EOSINT Systems	2	20.03.2024 21.03.2024		TLM3/TLM2	CO5	T2/R3	
42	Applications of Rapid Prototyping	1	23.03.2024		TLM3/TLM6	CO5	T2/R3	
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
43	Abrasive water jet aerospace applications	1	25.03.2024					
44	EDM process parameters	1	27.03.2024					
45	Rapid prototyping case study	1	28.03.2024					
46	Medical case study	1	30.03.2024					

Teaching Learning Methods					
TLM 1	Chalk and Talk	**TLM 4**	Problem Solving	**TLM7**	Seminars or GD
TLM 2	PPT	**TLM 5**	Programming	**TLM8**	Lab Demo
TLM 3	Tutorial	**TLM 6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions	04-12-2023	27-01-2024	8W
I Mid Examinations	**29-01-2024**	**03-02-2024**	**1W**
II Phase of Instructions	05-02-2024	30-03-2024	8W
II Mid Examinations	**01-04-2024**	**06-04-2024**	**1W**
Preparation and Practical's	08-04-2024	13-04-2024	1W
Semester End Examinations	29-04-2024	27-04-2024	2W
Internship	29-04-2024	22-06-2024	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.

A.Dhanunjay Kumar	S.Srinivasa Reddy	Dr. K Muarahari	Dr. M.B.S.S. Sreekar Reddy
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. MADHAVI
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : 3-0-0 **Credits:**3
Program/Branch/Sem : B.Tech/MECH-B /VI **A.Y.: 2023-24**

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 programming.	1	06-12-2023		-	CO1	-	
2.	Introduction: What Is AI?,	1	07-12-2023		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	08-12-2023		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	13-12-2023		TLM1	CO1	T1,T2	
5.	The State of the Art, Agents & Environments	1	14-12-2023		TLM1	CO1	T1,T2	
6.	EanEnvironments Environments Types of agents	1	15-12-2023		TLM2	CO1	T1,T2	
7.	Types of agents	1	16-12-2023		TLM2	CO1	T1,T2	
8.	Good Behavior: The Concept of Rationality	1	20-12-2023		TLM1	CO1	T1,T2	
9.	Omniscience vs Rational agent	1	21-12-2023		TLM1	CO1	T1,T2	
10.	The Nature of Environments	1	22-12-2023		TLM1	CO1	T1,T2	
11.	The Structure of Agents	1	23-12-2023		TLM1	CO1	T1,T2	
12.	Assignment/Quiz-2	1	27-12-2023		TLM1	CO1	-	
No. of classes required to complete UNIT-I: 12					**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

	Problem-Solving Agents, Example Problems	2	28-12-2023 29-12-2023		TLM1	CO2	T1,T2	
14.	searching for Solutions, Uninformed Search Strategies	1	30-12-2023		TLM1	CO2	T1,T2	
15.	Search algorithms terminologies, and Properties	1	03-01-2024		TLM1	CO2	T1,T2	
16.	Types of search algorithms	2	04-01-2024 05-01-2024		TLM1	CO2	T1,T2	
17.	Best first search algorithm	1	06-01-2024		TLM2	CO2	T1,T2	
18.	A* Algorithm	1	10-01-2024		TLM2	CO2	T1,T2	
19.	AO* Algorithm	1	11-01-2024		TLM2	CO2	T1,T2	
20.	Local Search Algorithms	1	12-01-2024		TLM2	CO2	T1,T2	
21.	Local Search Algorithms	1	17-01-2024		TLM2	CO2	T1,T2	
22.	Searching with Nondeterministic Actions.	1	18-01-2024		TLM2	CO2	T1,T2	
23.	Assignment/Quiz-2	1	19-01-2024		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II: 13					**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
24.	Introduction	1	20-01-2024		TLM1	CO3	T1,T2	
25.	Uniformed/Blind Search Algorithms:	2	24-01-2024 25-01-2024		TLM1	CO3	T1,T2	
26.	Breadth-first Search	1	27-01-2024		TLM2	CO3	T1,T2	
27.	Depth-first Search,	1	01-02-2024		TLM2	CO3	T1,T2	
28.	Depth limited search	1	02-02-2024		TLM2	CO3	T1,T2	
29.	Iterative deepening depth-first search	1	03-02-2024		TLM2	CO3	T1,T2	
30.	Uniform cost search	1	07-02-2024		TLM2	CO3	T1,T2	
31.	Bidirectional Search.	1	08-02-2024		TLM2	CO3	T1,T2	
32.	Assignment/Quiz-3	1	09-02-2024		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 10					**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

	Introduction	1	14-02-2024		TLM1	CO4	T1,T2	
34.	Minimax algorithm	1	15-02-2024		TLM2	CO4	T1,T2	
35.	Alpha-Beta pruning	2	16-02-2024 17-02-2024		TLM2	CO4	T1,T2	
36.	Knowledge Based Agent, Architecture	1	21-02-2024		TLM1	CO4	T1,T2	
37.	Knowledge base Levels and types	2	22-02-2024 23-02-2024		TLM1	CO4	T1,T2	
38.	Representation mappings	1	24-02-2024		TLM1	CO4	T1,T2	
39.	Inference Engine: Forward chaining/reasoning	1	28-02-2024		TLM1	CO4	T1,T2	
40.	Backward chaining/reasoning	1	29-02-2024		TLM1	CO4	T1,T2	
41.	Approaches of knowledge representation,	2	01-03-2024 02-03-2024		TLM1	CO4	T1,T2	
42.	issues in knowledge representation	2	06-03-2024 07-03-2024		TLM1	CO4	T1,T2	
43.	Assignment/Quiz-4	1	08-03-2024		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
44.	Introduction	1	13-03-2024		TLM1	CO5	T1,T2	
45.	Logic, Propositional Logic:	1	14-03-2024		TLM1	CO5	T1,T2	
46.	A Very Simple Logic,	1	15-03-2024		TLM1	CO4	T1,T2	
47.	Ontological Engineering	1	16-03-2024		TLM2	CO4	T1,T2	
48.	Categories, Objects and Events	1	20-03-2024		TLM2	CO5	T1,T2	
49.	Mental Events and Mental Objects	1	21-03-2024		TLM1	CO5	T1,T2	
50.	What is reasoning and Types	1	22-03-2024		TLM1	CO4	T1,T2	
51.	Types of reasoning	2	23-03-2024 27-03-2024		TLM1	CO4	T1,T2	
52.	Reasoning Systems for Categories	1	28-03-2024		TLM2	CO5	T1,T2	
53.	The Internet Shopping World	1	29-03-2024		TLM1	CO5	T1,T2	
54.	Assignment/Quiz-5	1	30-03-2024		TLM1	CO5	-	
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
55.	Turing test, Interview Questions	1	31-03-2024		**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	**Ms. P. Madhavi**	**Ms. P.Madhavi**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited , Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech, VI-Sem., ME, B/S
ACADEMIC YEAR : 2023-24
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.Sai Babu
LABORATORY INCHARGE : K.Lakshmi Prasad
PREREQUISITE SUBJECT: Thermodynamics, Thermal Engineering

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: B-Sec (Monday) BATCH: 1 A.Y:2023-24

S. No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11	12
		Date	04 -12 - 23	11 - 12 - 23	18 -12 - 23	25 - 12 - 23	08 - 01 - 24	22 - 01 - 24	05 - 02 - 24	12 - 02 - 24	19 -02 - 24	26 - 02 - 24	04 - 03 - 24	11 -03 - 24	18 -03 - 24	25 -03 - 24
		Regd. No	CYCLE-I							CYCLE-2						
1	BATCH-1	21761A0333	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		21761A0334														
3		21761A0335														
4		21761A0336														
5		21761A0337														
6		21761A0338														
7	BATCH-2	21761A0339	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1		
8		21761A0340														
9		21761A0341														
10		21761A0342														
11		21761A0343														
12		21761A0344														
13	BATCH-3	21761A0345	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2		
14		21761A0346														
15		21761A0348														
16		21761A0349														
17		21761A0350														
18		21761A0351														
19	BATCH-4	21761A0352	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3		
20		21761A0353														
21		21761A0354														
22		21761A0355														
23		21761A0356														
24		21761A0358														
25	BATCH-5	21761A0359	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4		
26		21761A0360														
27		21761A0362														
28		22765A0330														
29		22765A0331														
30		22765A0332														

LAB INCHARGE

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: B-Sec (Friday)** **BATCH: 2** **A.Y:2023-24**

S.No	Batch	EXP. No	0	1	2	3	4	5		6	7	8	9	10	11		12
		Date	08 - 12 - 23	15 - 12 - 23	22 -12 - 23	29 - 12 - 23	05 - 01 - 24	12 - 01 - 24	19 - 01 - 24	09 - 02 - 24	16 -02 - 24	23 - 02 - 24	01 - 03 - 24	08 -03 - 24	15 -03 - 24	22 -03 - 24	29 -03 - 24
		Regd. No	CYCLE-I							CYCLE-2							
1	BATCH-I	22765A0333	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		22765A0334															
3		22765A0335															
4		22765A0336															
5		22765A0337															
6		22765A0338															
7	BATCH-2	22765A0339	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1		HT-2	HT-3	HT-4	HT-5	HT-1			
8		22765A0340															
9		22765A0341															
10		22765A0342															
11		22765A0343															
12		22765A0344															
13	BATCH-3	22765A0345	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2		HT-3	HT-4	HT-5	HT-1	HT-2			
14		22765A0346															
15		22765A0347															
16		22765A0348															
17		22765A0349															
18		22765A0350															
19	BATCH-4	22765A0351	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3		HT-4	HT-5	HT-1	HT-2	HT-3			
20		22765A0352															
21		22765A0353															
22		22765A0354															
23		22765A0355															
24		22765A0356															
25	BATCH-5	22765A0357	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4		HT-5	HT-1	HT-2	HT-3	HT-4			
26		22765A0358															
27		22765A0359															
28		22765A0360															
29		22765A0361															
30		22765A0362															

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&B Sec Batch: 2021 A.Y: 2023-24

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.A Nageswara Rao, Mrs.B.Kamala Priya, Mr.S.Umamaheswara Reddy

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.:** 2023-24

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	21761A0334-362, 22765A0330-362	60

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	06-12-2023		TLM4	
Cycle-I						
2.	Design and Assembly Modeling of Knuckle joint using CAD software	3	13-12-2023		TLM4	
3.	Design and Assembly Modeling of Universal Coupling using CAD software	3	20-12-2023		TLM4	
4.	Design and Assembly Modeling of Piston, Connecting Rod parts using CAD software	3	27-12-2023		TLM4	
5.	Analysis of trusses using ANSYS	3	03-01-2024		TLM4	
6.	Analysis of Beams using ANSYS	3	10-01-2024		TLM4	
7.	Analysis of 3D solids using ANSYS	3	17-01-2024		TLM4	
8.	Steady state heat transfer analysis using ANSYS	3	24-01-2024		TLM4	
Cycle-II						
9.	Estimation of natural frequencies and mode shapes for simple problems using ANSYS	3	07-02-2024		TLM4	
10.	Development of NC code using CAM packages	3	14-02-2024		TLM4	
11.	Machining of simple components on CNC Turning by transferring NC Code from CAM package	3	21-02-2024		TLM4	
12.	**Additional Experiments:** Machining of Simple components on CNC-Mill by transferring NC Code from CAM Package	3	28-02-2024		TLM4	
13.	Robot programming, simulation, and execution	3	06-03-2024		TLM4	
14.	Revision	3	13-03-2024		TLM4	
15.	Revision	3	20-03-2024		TLM4	
16.	Internal Exam	3	27-03-2024		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, Mr.S.Umamaheswara Reddy	**Mr.A.Nageswara Rao**	**Mr.J.Subba Reddy**	**Dr.M.B.S.Sreekara Reddy**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Ch.Siva Sankara Babu, Mr.A. Nageswara rao

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/B **A.Y.:** 2023-24

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: B2 Batch): Monday

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B2	22765A0333 - 22765A0362	30

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
	Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	04-12-2023		TLM4	
Cycle-I						
	Study the anatomy of robots	3	11-12-2023		TLM4	
	Analysis of robot configuration and Simulation of Robot with 2 DOF using Robo Analyzer.	3	18-12-2023		TLM4	
	Analysis of robot configuration and Simulation of Robot with 6 DOF using Robo Analyzer.	3	01-01-2024		TLM4	
	D-H parametric representation of various robotic arms using Robo Analyzer	3	08-01-2024		TLM4	
	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	22-01-2024		TLM4	
I Mid Exams : 29-01-2024 to 03-02-2024						
Cycle-II						
	Simulation of SCARA, PUMA using Robo Aanlyzer	3	05-02-2024		TLM4	
	Introduction to IGUS Software	3	12-02-2024		TLM4	
	Introduction to IGUS Software	3	19-02-2024		TLM4	
	Program for commands like a line command, circle command, Point to Point (PTP) command	3	26-02-2024		TLM4	
	Palletizing	3	04-03-2024		TLM4	
	Loading / Unloading		11-03-2024			
	Revision	3	18-03-2024		TLM4	
	Internal Exam	3	25-03-2024		TLM4	
II Mid Exams:01-04-2024 to 06-04-2024						
No. of classes required to complete: 11				**No. of classes taken:**		

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

S.No	Batches	Regd. Nos	Total No. of Students

1	Batch B1	21761A0333-21761A0362, 22765A0330-22765A0332 and 20761A0369	31

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
	Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	08-12-2023		TLM4	
Cycle-I						
	Study the anatomy of robots.	3	15-12-2023		TLM4	
	Analysis of robot configuration and Simulation of Robot with 2 Dof using Robo Analyzer.	3	22-12-2023		TLM4	
	Analysis of robot configuration and Simulation of Robot with 6 Dof using Robo Analyzer.	3	29-12-2023		TLM4	
	D-H parametric representation of various robotic arms using Robo Analyzer	3	05-01-2024		TLM4	
	Forward Kinematics Analysis of Robot using Robo Analyzer	3	12-01-2024		TLM4	
	Inverse Kinematics Analysis of Robot using Robo Analyzer	3	19-01-2024			
Cycle-II						
	Simulation of SCARA, PUMA using Robo Aanlyzer	3	09-02-2024		TLM4	
	Introduction to IGUS Software	3	16-02-2024		TLM4	
	Program for commands like a line command, circle command	3	23-02-2024		TLM4	
	Program for Point to Point (PTP) command	3	01-03-2024		TLM4	
	Palletizing, Loading / Unloading	3	15-03-2024		TLM4	
	Revision	3	22-03-2024		TLM4	
	Internal Exam	3	29-03-2024		TLM4	
No. of classes required to complete: 13				**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	Dr.Siva Sankara Babu Ch / Mr. A.Nageswara Rao	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
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

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 : 2023-24

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			3	3	3		3
CO3.					2			3	3	3		3
CO4.					2			3	3	3		2
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	Teaching Learning Methods	HOD Sign weekly
1.	Activity-1:Role of language in Personality- How language reflects, impacts Personality – Using gender	1+2	5-12-23		TLM-1, 2& 6.	
2.	Neutral language in MNCs – being Culturally-Sensitive-Personality Traits - Grooming & Dress code& Role-play	1+2	12-12-23		TLM-1, 2 &6.	
3.	Group Discussion	1+2	19-12-23		TLM-1, 2& 6.	
4.	Group Discussion	1+2	26-12-23		TLM-1, 2& 6.	
5.	Presentations	1+2	2-1-24		TLM-1, 2& 6.	

	Activity-2: Impactful Communication Extempore - Story Telling	1+2	9-1-24		TLM-1, 2& 6.	
7.	Extempore -Group Discussion	1+2	16-1-24		TLM-1, 2& 6.	
8.	Elocution on Interpretation of given quotes/ Critical Appreciation and Textual Analysis/ Writing	1+2	23-1-24		TLM-1, 2& 6.	
9.	reviews on short story/videos/book/Social Media profiling/ Pronunciation Practice	1+2	6-2-24		TLM-1, 2& 6.	
10.	Activity-3: Professional Skills: Career planning- job vs. career-goal setting	1+2	13-2-24		TLM-1, 2& 6.	
11.	SWOT Analysis	1+2	20-2-24		TLM-1, 2& 6.	
12.	Time management – self-management – stress-management.	1+2	27-2-24		TLM-1, 2& 6.	
13.	Presentation/Writing Report/Listening exercises	1+2	5-3-24		TLM-1, 2& 6.	
14.	Effective Resume-Writing and presentation	1+2	12-3-24		TLM-1, 2& 6.	
15.	Interview Skills: Mock interviews/Video samples.	1+2	19-3-24		TLM-1, 2& 6.	
16.	Interview Skills: Mock interviews/Video samples.	1+2	26-3-24		TLM-1, 2& 6.	
No. of classes required to complete Syllabus: 48						

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

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.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. R. Padma Venkat**	**Dr. R. Padma Venkat**	**Dr. R. Padma Venkat**	**Dr. A. Ramireddy**
Signature				