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 : Dr.P.Ravindra Kumar
Course Name & Code : 20ME17
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., Mech Engg., VI-Sem., Sections- A A.Y : 2021-22

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	26-12-2022		TLM1	
2.	Introduction of five Units importance	1	27-12-2022		TLM1	
3.	Introduction to heat transfer and its applications, Basic Modes of Heat Transfer	1	28-12-2022		TLM1, TLM2 TLM5	
4.	Basic laws of Heat Transfer-Steady, Unsteady and Periodic Heat Transfer	1	29-12-2022		TLM1, TLM4	
5.	General heat conduction equation in Cartesian coordinate system and its simplifications.	1	31-12-2022		TLM1	
6.	Fourier's law of heat conduction; Thermal conductivity	1	2-01-2023		TLM1, TLM2	
7.	General heat conduction equation in cylindrical coordinate system and its simplifications.	1	3-01-2023		TLM1	
8.	**Tutorial-1**	1	4-01-2023		TLM3	
9.	General heat conduction equation in spherical coordinate system and its simplifications.	1	5-01-2023		TLM1, TLM2	
10.	Heat conduction through plane wall and cylinder with constant thermal conductivity– Numerical Problems.	1	7-01-2023		TLM1, TLM2	
11.	Electrical analogy, thermal resistance, and overall heat transfer coefficient.	1	9-01-2023		TLM1, TLM2 TLM5	

12.	Numerical Problems on thermal resistance and overall heat transfer coefficient	1	10-01-2023		TLM1, TLM2	
13.	Heat transfer through composite slab and cylinder, Numerical Problems. **Tutorial-2**	1	11-01-2023		TLM1, TLM2	
14.	Critical radius of insulation for cylinder, Sphere and Applications.	1	18-01-2023		TLM1, TLM2	
15.	Numerical Problems on critical radius of insulation, **Assignment-1 Questions.**	1	19-01-2023		TLM1 TLM2	
16.	**Tutorial-3 – Numerical Problems**	1	21-01-2023		TLM3	
No. of classes required to complete UNIT-I: 16				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 with variable thermal conductivity, Numerical Problems.	1	23-01-2023		TLM1	
2.	Heat flow through the cylinder with variable thermal conductivity, Numerical Problems.	1	24-01-2023		TLM1	
3.	Derivation on Uniform Internal heat generation in slabs and cylinders	1	25-01-2023		TLM1, TLM2	
4.	Numerical Problems on Uniform Internal heat generation in slabs.	1	28-01-2023		TLM1	
5.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	29-01-2023		TLM1, TLM2	
6.	**Tutorial-4**	1	30-01-2023		TLM3	
7.	Extended surfaces and their applications; Thermal analysis of long Fins	1	31-1-2023		TLM1, TLM4	
8.	Thermal analysis of short fins with insulated tip, Fin efficiency and effectiveness	1	01-02-2023		TLM1, TLM2	
9.	Numerical Problems	1	02-02-2023		TLM1, TLM2	
10.	Numerical Problems - **Tutorial-5**	1	04-02-2023		TLM3	
11.	Systems with negligible internal Resistance (Lumped Heat Analysis), Significance of Biot and Fourier Numbers	1	06-02-2023		TLM1, TLM2	
12.	Numerical Problems	1	07-02-2023		TLM1, TLM2	
13.	Heisler chart solutions	1	08-02-2023		TLM1, TLM2	
14.	Heisler chart solutions – Numerical Problems **Tutorial-6**	1	09-02-2023		TLM1, TLM2	
15.	Basics of convective (Forced and Natural) heat transfer and Applications.	1	13-02-2023		TLM1, TLM2	
16.	Dimensional analysis and Buckingham Pi theorem applied to Forced Convection.	1	14-02-2023		TLM1, TLM2	

17.	Significance of Non-Dimensional Numbers.	1	15-02-2023		TLM1, TLM2	
18.	Dimensional analysis and Buckingham Pi theorem applied to Natural Convection. - **Tutorial-7**	1	16-02-2023		TLM3	
No. of classes required to complete UNIT-II: 18				No. of classes taken:		

UNIT-III: CONVECTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Forced Convection heat transfer - Introduction The concept of boundary layer; Velocity and Thermal Boundary Layers	1	27-02-2023		TLM1, TLM2	
2.	Numerical Problems.	1	28-02-2023		TLM1,	
3.	**Tutorial-8**	1	01-03-2023		TLM3	
4.	Forced convection analysis in external flows (Flow over a Flat Plate): Laminar and turbulent flows.	1	02-03-2023		TLM1, TLM2	
5.	Forced convection analysis in internal flows (Flow through circular pipe): Laminar and turbulent flows.	1	04-03-2023		TLM1, TLM2	
6.	Numerical Problems on Forced Convection.	1	06-03-2023		TLM1, TLM2	
7.	Reynolds Colburn Analogy.	1	07-03-2023		TLM1	
8.	**Tutorial-9**	1	8-03-2023		TLM3	
9.	Natural convection: Development of Hydrodynamic and thermal boundary layer along vertical plate.	1	9-03-2023		TLM1, TLM2 TLM4	
10.	Development of Hydrodynamic and thermal boundary layer along vertical plate.	1	11-03-2023		TLM1, TLM2	
11.	Numerical Problems	1	13-03-2023		TLM1, TLM2	
12.	**Tutorial-10**	1	14-03-2023		TLM3	
No. of classes required to complete UNIT-III:12				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.	1	15-03-2023		TLM1, TLM2	
2.	Pool Boiling, Different regimes of boiling; Critical heat flux.	1	16-03-2023		TLM1, TLM2 TLM5	
3.	Numerical problems on nucleate boiling	1	18-03-2023		TLM1,	
4.	Critical heat flux conditions.	1	20-03-2023		TLM2	
5.	Condensation: Film wise and drop wise condensation	1	21-03-2023		TLM1, TLM2	
6.	Laminar film wise condensation on Vertical plate	1	23-03-2023		TLM1,	

7.	Numerical Problems - **Tutorial-11**	1	25-03-2023		TLM3	
8.	Introduction and applications of Thermal Radiation	1	27-03-2023		TLM1, TLM2	
9.	Emissive Power, Absorption, Reflection and Transmission and	1	28-03-2023		TLM1, TLM2	
10.	Definitions related to radiation	1	29-03-2023		TLM2	
11.	Concept of black and non-black bodies	1	1-04-2023		TLM1, TLM2	
12.	Laws of black body radiation	1	3-04-2023		TLM5	
13.	Emissivity, Kirchhoff's law	1	5-04-2023		TLM1,	
14.	Shape Factors	1	06-04-2023		TLM2	
15.	Radiation heat exchange between two black isothermal surfaces,	1	08-04-2023		TLM1, TLM2	
16.	Nonblack infinite parallel plates;	1	10-04-2023		TLM1, TLM2	
No. of classes required to complete UNIT-IV:16				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	11-04-2023		TLM1, TLM2 TLM6	
2.	Applications of Heat Exchangers	1	12-04-2023		TLM1, TLM2	
3.	Overall heat transfer coefficient- Fouling factor	1	13-04-2023		TLM1, TLM2	
4.	LMTD method of Heat exchanger analysis- Parallel flow, Numerical Problems	1	15-04-2023		TLM1, TLM2 TLM4	
5.	LMTD method of Heat exchanger analysis- Counter flow, Numerical Problems - **Tutorial-12**	1	17-04-2023		TLM1, TLM2	
6.	Correction factor for LMTD for use with Multi pass and Cross flow Heat Exchangers	1	18-04-2023		TLM1, TLM2	
7.	Effectiveness - NTU method of Heat Exchanger Analysis-Applications of Heat Exchangers	1	19-04-2023		TLM3	
8.	Effectiveness - NTU method of Heat Exchanger Analysis-Applications of Heat Exchangers	1	20-04-2023		TLM1, TLM5	
9.	**Tutorial-13**	1	22-04-2023		TLM3	
No. of classes required to complete UNIT-V: 9				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 (R17 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
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=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
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=20
Quiz Marks =75% of Max (Q1, Q2) +25% of Min(Q1, Q2)	B=10
Cumulative Internal Examination (CIE): A+B+M+Q	40
Semester End Examination (SEE)	60
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.Ravindra Kumar)	(Dr.P.Ravindra Kumar)	(Dr.P.Vijay Kumar)	(Dr.S.Pichi Reddy)

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

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

Course Name & Code	**:** CAD/CAM & 20ME18	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	: B.Tech VI Sem (A)	**A.Y.:** 2022-2023

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

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

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

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

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

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

TEXTBOOKS:

T1	P.N Rao ,CAD/CAM Principle and applications, Tata McGraw Hill Education Private Ltd, New Delhi,8th edition 2013.
T2	Ibrahim Zeid, Mastering CAD/CAM, TATA McGraw-Hill publishing CO.Ltd, NewDelhi 2011.

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: FUNDAMENTALS OF CAD, COMPUTER GRAPHICS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to CAD/CAM	1	27-12-2022		**TLM1/TLM2**	
2.	Product Cycle Revised with CAD/CAM	1	28-12-2022		**TLM1/TLM2**	
3.	Reasons for implementing CAD	1	29-12-2022		**TLM1/TLM2**	
4.	Creating Manufacturing database & Benefits of CAD	1	30-12-2022		**TLM1/TLM2**	
5.	Tutorial-I	1	31-12-2022		**TLM1/TLM2**	
6.	Computer Graphics- Introduction , Database structure	1	03-01-2023		**TLM1/TLM2**	
7.	Functions of a graphics package	1	04-01-2023		**TLM1/TLM2**	
8.	Raster scan graphics	1	05-01-2023		**TLM1/TLM2**	
9.	Concatenated transformations.	1	06-01-2023		**TLM1/TLM2**	
10.	Translation, scaling,	1	07-01-2023		**TLM1/TLM2**	
11.	Reflection, rotation	1	10-01-2023		**TLM1/TLM2**	
12.	Problems on Transformations	1	11-01-2023		**TLM1/TLM2**	
13.	Tutorial-II	1	12-01-2023		**TLM1/TLM2**	

No. of classes required to complete UNIT-I: 13	No. of classes taken:

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

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Geometric Modelling: Introduction	1	18-01-2023		**TLM1/TLM2**	
15.	Wireframe Modelling: Entities wireframe models	1	19-01-2023		**TLM1/TLM2**	
16.	Parametric representation of analytical curves	1	20-01-2023		**TLM1/TLM2**	
17.	Parametric representation of analytical curves	1	21-01-2023		**TLM1/TLM2**	
18.	Hermite cubic spline curve	1	24-01-2023		**TLM1/TLM2**	
19.	Bezier curves	1	25-01-2023		**TLM1/TLM2**	
20.	B-spline curves	1	27-01-2023		**TLM1/TLM2**	
21.	Characteristics of Curves, Problems	1	28-01-2023		**TLM1/TLM2**	
22.	Tutorial-III	1	31-01-2023		**TLM1/TLM2**	
23.	Surface representation: Entities	1	01-02-2023		**TLM1/TLM2**	
24.	Solid modelling	1	02-02-2023		**TLM1/TLM2**	
25.	B-Rep	1	03-02-2023		**TLM1/TLM2**	
26.	CSG	1	04-02-2023		**TLM1/TLM2**	
27.	Tutorial-IV	1	07-02-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

UNIT-III: COMPUTER NUMERICAL CONTROL, PART PROGRAMMING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Numerical control: Introduction, NC Modes	1	08-02-2023		**TLM1/TLM2**	
29.	NC elements	1	09-02-2023		**TLM1/TLM2**	
30.	N C Coordinate systems	1	10-02-2023		**TLM1/TLM2**	
31.	Structure of CNC machine tools	1	11-02-2023		**TLM1/TLM2**	
32.	Spindle design	1	14-02-2023		**TLM1/TLM2**	
33.	spindle drives,	1	15-02-2023		**TLM1/TLM2**	
34.	Feed drives,	1	16-02-2023		**TLM1/TLM2**	
35.	actuation systems	1	17-02-2023		**TLM1/TLM2**	
36.	Tutorial-V	1	28-02-2023		**TLM1/TLM2**	
37.	CNC Part programming: fundamentals	1	01-03-2023		**TLM1/TLM2**	

38.	Manual part programming	1	02-03-2023		**TLM1/TLM2**	
39.	Computer Aided part programming	1	03-03-2023		**TLM1/TLM2**	
40.	Part programming examples	1	04-03-2023		**TLM1/TLM2**	
41.	examples	1	08-03-2023		**TLM1/TLM2**	
42.	Tutorial-VI	1	09-03-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-III: 15				**No. of classes taken:**		

UNIT-IV: GROUP TECHNOLOGY, FLEXIBLE MANUFACTURING SYSTEM

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Group Technology	1	10-03-2023		**TLM1/TLM2**	
44.	Coding and classification schemes- OPITZ	1	11-03-2023		**TLM1/TLM2**	
45.	MICLASS, example for coding	1	14-03-2023		**TLM1/TLM2**	
46.	CODE Systems, examples for coding	1	15-03-2023		**TLM1/TLM2**	
47.	Production Flow Analysis	1	16-03-2023		**TLM1/TLM2**	
48.	Advantages and limitations	1	17-03-2023		**TLM1/TLM2**	
49.	GT Machine cells, Benefits of GT	1	18-03-2023		**TLM1/TLM2**	
50.	CAPP- Retrieval and Generative	1	21-03-2023		**TLM1/TLM2**	
51.	Tutorial-VII	1	23-03-2023		**TLM1/TLM2**	
52.	Flexible Manufacturing System: Introduction	1	24-03-2023		**TLM1/TLM2**	
53.	FMS equipment, FMS layouts, benefits	1	25-03-2023		**TLM1/TLM2**	
54.	FMS Planning and implementation	1	28-03-2023		**TLM1/TLM2**	
55.	FMS Planning and implementation	1	29-03-2023		**TLM1/TLM2**	
56.	Tutorial-VIII	1	31-03-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: COMPUTER AIDED QUALITY CONTROL, COMPUTER INTEGRATED MANUFACTURING SYSTEMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
57.	CAQC: Introduction, The computers in QC	1	01-04-2023		**TLM1/TLM2**	
58.	Contact inspection methods	1	04-04-2023		**TLM1/TLM2**	
59.	Non-Contact inspection methods: Optical	1	05-04-2023		**TLM1/TLM2**	
60.	Non-Contact inspection methods: non optical	1	06-04-2023		**TLM1/TLM2**	
61.	Computer aided testing,	1	08-04-2023		**TLM1/TLM2**	

62.	CAQC with CAD/CAM	1	11-04-2023		**TLM1/TLM2**	
63.	CAQC with CAD/CAM	1	12-04-2023		**TLM1/TLM2**	
64.	Tutorial-IX	1	13-04-2023		**TLM1/TLM2**	
65.	CIM Introduction	1	14-04-2023		**TLM1/TLM2**	
66.	CIM integration, Implementation	1	15-04-2023		**TLM1/TLM2**	
67.	Benefits of CIM	1	18-04-2023		**TLM1/TLM2**	
68.	Lean manufacturing	1	19-04-2023		**TLM1/TLM2**	
69.	Lean manufacturing	1	20-04-2023		**TLM1/TLM2**	
70.	Tutorial-X	1	21-04-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	**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)

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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.:** 2022-23
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	26-12-2022		TLM1	
2.	Introduction to Unit-1, **Bearings** –Introduction, Types	1	27-12-2022		TLM1 TLM2	
3.	Lubricating Oils Properties, Materials used for bearings and their properties	1	29-12-2022		TLM1 TLM2	
4.	**Journal Bearings** –Introduction, Types, Dimensionless parameters	1	30-12-2022		TLM1 TLM2	
5.	Design procedure of journal bearing	1	31-12-2022		TLM1	
6.	Journal bearings - problems	1	02-01-2023		TLM4	
7.	Dimensionless parameters used in the bearing design – problem	1	03-01-2023		TLM4	
8.	Tutorial-1	1	05-01-2023		TLM3	
9.	**Rolling contact bearings-types**, bearing life, Materials used and designation of rolling contact bearings	1	06-01-2023		TLM1 TLM2	
10.	Static load and dynamic load capacity	1	07-01-2023		TLM1	
11.	Selection of ball bearing - problems	1	09-01-2023		TLM4	
12.	Selection of roller bearing - problems	1	10-01-2023		TLM4	
13.	Tutorial-2	1	12-01-2023		TLM3	
14.	Cubic mean load derivation, Reliability of bearings - problems	1	16-01-2023		TLM4	
15.	Assignment -1/ Quiz-1	1	17-01-2023		TLM6	
No. of classes required to complete UNIT-I		15	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	19-01-2023		TLM1 TLM2	
2.	**PISTON**: Design procédure of piston	1	20-01-2023		TLM4	
3.	Piston design - problems	1	21-01-2023		TLM4	
4.	Piston design - problems	1	23-01-2023		TLM4	
5.	Cylinder design, cylinder liners-design	1	24-01-2023		TLM1.2	
6.	Cylinder, cylinder liners-design Problems	1	27-01-2023		TLM1.2	
7.	Tutorial-3	1	28-01-2023		TLM3	
8.	**CONNECTING ROD**: Thrust in C.R, buckling load	1	30-01-2023		TLM1 TLM2	

9.	Design Procedure of Connecting rod	1	31-01-2023		TLM4	
10.	Stresses due to whipping action on connecting rod ends- problems	1	02-02-2023		TLM4	
11.	Stresses due to whipping action on connecting rod ends- problems	1	03-02-2023		TLM4	
12.	**CRANK SHAFT:** Design of crank and crank shaft	1	04-02-2023		TLM1 TLM2	
13.	Design of center crank shaft -problem	1	06-02-2023		TLM4	
14.	Tutorial-4	1	07-02-2023		TLM3	
15.	Assignment-2/Quiz-2	1	09-02-2023		TLM6	
No. of classes required to complete UNIT-I		15	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	10-02-2023		TLM1 TLM2	
2.	Design Procedure of flat belts - Problems	1	13-02-2023		TLM1	
3.	**PULLEYS:** Design of pulleys mild steel & cast iron	1	14-02-2023		TLM1	
4.	Design of pulleys Problems	1	16-02-2023		TLM1	
5.	Tutorial-5	1	17-02-2023		TLM3	
Mid-I Examination from 20-2-2023 to 25-02-2023						
6.	V-belts –designation, design and selection	1	27-02-2023			
7.	Design of V belts - problems	1	28-02-2023		TLM1 TLM2	
8.	Design of V belts - problems	1	02-03-2023		TLM1	
9.	Design of V belts - problems	1	03-03-2023		TLM4	
10.	Design of V- grooved pulley	1	04-03-2023		TLM1	
11.	Design of V- grooved pulley	1	06-03-2023		TLM1	
12.	Tutorial-6	1	07-03-2023		TLM1	
13.	Assignment-3/Quiz-3	1	09-03-2023		TLM6	
No. of classes required to complete UNIT-I		13	No. of classes taken:			

UNIT-IV: SPRINGS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**Introduction to Unit-IV** **SPRINGS:** Introduction, classification	1	13-03-2023		TLM1 TLM2	
2.	Stresses, deflection and stiffness in springs and their derivations	1	14-03-2023		TLM1 TLM2	
3.	Design of springs-problems	1	16-03-2023		TLM4	
4.	Springs for fatigue loading	1	17-03-2023		TLM1	
5.	Tutorial-**7**	1	18-03-2023		TLM3	
6.	Spring failures, design of helical springs	1	20-03-2023		TLM1	
7.	Natural frequency of helical spring	1	21-03-2023		TLM1	

8.	Energy storage capacity in springs	1	23-03-2023		TLM1	
9.	Tension and torsion springs	1	24-03-2023		TLM1	
10.	Co-axial springs design- Problems	1	25-03-2023		TLM1	
11.	Design of leaf springs- Problems	1	27-03-2023		TLM1	
12.	Tutorial-8	1	28-03-2023		TLM3	
13.	Assignment-4/Quiz-4	1	31-03-2023		TLM6	
No. of classes required to complete UNIT-I		13	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.	**Introduction to Unit-V** **GEARS**: **Introduction** and terminology, Types of gears, design formulae	1	01-04-2023		TLM1 TLM2	
2.	Design Analysis of gears, Estimation of centre distance, module & face width	1	03-04-2023		TLM1 TLM2	
3.	Design procedure of spur gears, Check for dynamic and wear considerations	1	04-04-2023		TLM1 TLM2	
4.	Design of spur gears -Problems	1	06-04-2023		TLM4	
5.	Design of spur gears -Problems	1	10-04-2023		TLM1	
6.	Design of spur gears -Problems	1	11-04-2023		TLM3	
7.	Tutorial-IX	1	13-04-2023		TLM1	
8.	Design procedure of Helical gears, Check for dynamic and wear considerations	1	14-04-2023		TLM1	
9.	Design of Helical gears -Problems	1	15-04-2023		TLM4	
10.	Design of Helical gears -Problems	1	17-04-2023		TLM4	
11.	Tutorial-X	1	18-04-2023		TLM3	
12.	Assignment-V/Quiz-V	1	22-04-2023		TLM6	
No. of classes required to complete UNIT-I		13	No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of centre crank	1	09-02-2023		TLM1 TLM2	
2.	Design of flywheels	1	10-02-2023		TLM1 TLM2	
3.	Design of Worm gear	1	20-04-2023		TLM1 TLM2	
4.	Design of Gear Box	1	21-04-2023		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 (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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. S. Pichi Reddy
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

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COURSE HANDOUT

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

ACADEMIC YEAR : 2022-23

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

STRUCTURE : 3-0-0

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	26.12.2022		TLM1/TLM2	CO1	T1/R1	
2	Need for unconventional machining methods	1	27.12.2022		TLM1/TLM2	CO1	T1/R1	
3	Classification of unconventional machining processes	1	28.12.2022		TLM1/TLM2	CO1	T1/R1	
4	Considerations in process selection	1	2812.2022		TLM1/TLM2	CO1	T1/R1	
5	Tutorial -1	1	30.12.2023		TLM 3		T1/R1	
6	Basic principle of ultrasonic machining, equipment setup and procedure,	1	02.01.2023		TLM1/TLM2	CO1	T1/R1	
7	Process variables and applications	1	03.01.2023		TLM1/TLM2	CO1	T1/R1	
8	Tutorial -2	1	04.01.2023					
9	Basic principle of Abrasive jet machining, equipment setup and procedure.	1	04.01.2023		TLM3/TLM6	CO1	T1/R1	
10	Water jet machining Basic principle, equipment setup and procedure	1	06.01.2023		TLM1/TLM2	CO1	T1/R1	
11	Process variables and applications	1	09.01.2023		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	11.01.2023		TLM1/TLM2	CO2	T1/R1	
13	Tutorial -3	1	11.01.2023		TLM 3	CO2	T1/R1	
14	ECM Process, and principles	1	18.01.2023		TLM1/TLM2	CO2	T1/R1	
15	Equipment and material removal rate	1	18.01.2023		TLM1/TLM2	CO2	T1/R1	
16	Tutorial -4	1	20.01.2023		TLM 3	CO2		
17	Electrochemical machining	1	23.01.2023		TLM1/TLM2	CO2	T1/R1	
18	Electrochemical grinding	1	24.01.2023		TLM1/TLM2	CO2	T1/R1	
19	Electrochemical deburring, Electrochemical honing	1	25.01.2023		TLM1/TLM2	CO2	T1/R1	
20	Tutorial -5	1	25.01.2023		TLM 3	CO2	T1/R1	
21	Chemical machining-principle	1	27.02.2023		TLM1/TLM2	CO2	T1/R1	
22	Maskants –Etchants, Advantages and Applications.	1	30.02.2023		TLM1/TLM2	CO2	T1/R1	
23	Maskants –Etchants, Advantages and Applications.	1	31.02.2023		TLM1/TLM2	CO2	T1/R1	
24	Rivision	1	01.02.2023		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	03.02.2023		TLM1/TLM2	CO3	T1/R1	
26	Process	1	06.02.2023		TLM1/TLM2	CO3	T1/R1	
27	Tutorial -6	1	07.02.2023		TLM 3	CO3		
28	Power circuits for EDM	1	08.02.2023		TLM1/TLM2	CO3	T1/R1	
29	Mechanics of metal removal in EDM	1	08.02.2023		TLM1/TLM2	CO3	T1/R1	
30	Tutorial -7	1	09.02.2023		TLM 3	CO3		
31	Process parameters	1	13.02.2023		TLM1/TLM2	CO3	T1/R1	
32	selection of tool electrode and dielectric fluid	1	14.02.2023		TLM1/TLM2	CO3	T1/R1	

33	Electric discharge wire cutting principle	1	15.02.2023		TLM1/TLM2	CO3	T1/R1	
34	Applications of EDM and Wire EDM	1	15.02.2023		TLM1/TLM2	CO3	T1/R1	
35	Rrivision	1	17.02.2023		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	27.022023		TLM1/TLM2	CO4	T2/R3	
37	EBM Applications and Advantages	1	28.02.2023		TLM1/TLM2	CO4	T2/R3	
38	laser beam machining, Principle, process	1	01..3.2023		TLM1/TLM2	CO4	T2/R3	
39	Tutorial -8	1	0303.2023		TLM 3			
40	LBM Applications and Advantages	1	06.03.2023		TLM1/TLM2	CO4	T2/R3	
41	Plasma arc machining, Principle, process	1	07.03.2023		TLM1/TLM2	CO4	T2/R3	
42	PAM Applications and Advantages	1	10.03.2023		TLM1/TLM2	CO4	T2/R3	
43	Tutorial -9	1	13.03.2023		TLM3		T2/R2	
44	Hot machining, Process, equipment, applications	1	14.03.2023		TLM1/TLM2	CO4	T2/R3	
46	Hot machining, Process, equipment, applications	1	15.03.2023		TLM1/TLM2	CO4	T2/R3	
47	revision	1	20.03.2023		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	21.03.2023		TLM1/TLM2	CO5	T2/R3	
49	Elements, Advantages of Rapid Prototyping	1	24.03.2023		TLM1/TLM2	CO5	T2/R3	

50	historical development, fundamentals of Rapid Prototyping	1	27.03.2023		TLM1/TLM2	CO5	T2/R3	
51	classification of Rapid prototyping	1	28.03.2023		TLM1/TLM2	CO5	T2/R3	
52	Tutorial -10	2	29..03.2023		TLM3		T2/R2	
53	Rapid Prototyping process chain	1	31.03.2023		TLM1/TLM2	CO5	T2/R3	
54	Stereo Lithography Apparatus (SLA)	1	03.04.2023		TLM1/TLM2	CO5	T2/R3	
55	solid Ground Curing (SGC)	1	04.04.2023		TLM1/TLM2	CO5	T2/R3	
56	EOS's EOSINT Systems	1	10.04.2023		TLM3/TLM2	CO5	T2/R3	
57	Applications of Rapid Prototyping	1	11.04.2023		TLM3/TLM6	CO5	T2/R3	
58	Rivion	1	12.04.2023		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	17.04.2023					
60	EDM process parameters	1	18.04.2023					
61	Rapid prototyping case study	1	19.04.2023					
62	Medical case study	1	21.04.2023					

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	26-12-2022	18-02-2023	8W
I Mid Examinations	20-02-2023	25-02-2023	1W
II Phase of Instructions	27-02-2023	22-04-2023	8W
II Mid Examinations	24-04-2023	29-04-2023	1W
Preparation and Practicals	01-05-2023	06-05-2023	1W

Semester End Examinations	08-05-2023	20-05-2023	2W

EVALUATION PROCESS:

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

PROGRAMME EDUCATIONAL OBJECTIVES:

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

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

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

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

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

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

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

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

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

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

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

S.Srinivasa Reddy	S.Srinivasa Reddy	J,subba reddy	Dr. S. Pitchi Reddy
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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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 ELECTRICAL AND ELECTRONICS ENGINEERING

PART-A

Name of Course Instructor: Mr P.Rathnakar Kumar
Course Name & Code **:** Electric Vehicles-20EE84
L-T-P Structure **:** 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech., VI-Sem., MECH –A section **A.Y :** 2022-23

PREREQUISITE: Basic Electrical Engineering

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student to acquire Knowledge on basic concepts related to mechanics, kinetics and dynamics of electric vehicles, technical characteristics and properties of batteries. It also introduces the concepts of different configurations of drive trains.

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

CO1	Illustrate propulsion system for an electric vehicle. (**Understand-L2**)
CO2	Understand characteristics and properties of batteries. (**Understand-L2**)
CO3	Analyze ratings and requirements of electrical machines. (**Understand-L2**)
CO4	Analyze mechanism of electrical vehicle drive train. (**Understand-L2**)
CO5	Understand configuration of hybrid electric vehicles**. (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	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

Text book(s) and/or required materials

i. IqbalHussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011.
ii. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

Reference Books:

i. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
ii. SandeepDhameja, "Electric Vehicle Battery Systems", Newnes, 2000
http://nptel.ac.in/courses/108103009/

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: ELECTRIC VEHICLES

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 the subject and Course Outcomes	1	26-12-2022		TLM1	
2.	Components	1	29-12-2022		TLM1	
3.	Vehicle Mechanics	1	30-12-2022		TLM1	
4.	Roadway Fundamentals	1	31-12-2022		TLM1	
5.	Roadway Fundamentals	1	02-01-2023		TLM1	
6.	Vehicle Kinetics	1	05-01-2023		TLM1	
7.	Dynamics of vehicle motion	1	06-01-2023		TLM1	
8.	Dynamics of vehicle motion	1	07-01-2023		TLM1	
9.	Propulsion system design.	1	09-01-2023		TLM1	
10.	Propulsion system design.	1	19-01-2023		TLM1	
No. of classes required to complete UNIT-I		10				

UNIT-II : BATTERY

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	Basics-Types	1	20-01-2023		TLM1	
12	Parameters	1	21-01-2023		TLM1	
13	Capacity	1	23-01-2023		TLM1	
14	Discharge Rate	1	27-01-2023		TLM1	
15	Sate of charge	1	28-01-2023		TLM1	
16	State of Discharge	1	30-01-2023		TLM1	

17	Depth od Discharge		30-01-2023		TLM1	
18	Technical Characteristics	1	02-02-2023		TLM1	
19	Battery pack Design	1	03-02-2023		TLM2	
20	Battery pack Design	1	04-02-2023		TLM3	
21	Properties of Batteries	1	06-02-2023		TLM3	
No. of classes required to complete UNIT-II		10				

UNIT-III : DC & AC ELECTRICAL MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22	Motor & Engine rating, requirements	1	09-02-2023		TLM1	
23	Motor & Engine rating, requirements	1	10-02-2023		TLM1	
25	DC machines	1	11-02-2023		TLM1	
26.	DC machines	1	13-02-2023		TLM1	
27.	Three phase A.C. Machines	1	16-02-2023		TLM1	
29.	Three phase A.C. Machines	1	17-02-2023		TLM1	
30.	Induction Machines	1	27-02-2023		TLM1	
31	Permanent magnet machines	1	02-03-2023		TLM1	
32	Permanent magnet machines	1	03-03-2023		TLM1	
33.	Switched reluctance machines	1	04-03-2023		TLM1	
No. of classes required to complete UNIT-III		11				

UNIT-IV : ELECTRIC VEHICLE DRIVE TRAIN

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	Transmission Configuration	1	06-03-2023		TLM1	
35	Transmission Configuration	1	09-03-2023		TLM1	
36	Components	1	10-03-2023		TLM1	
37	gears	1	13-03-2023		TLM1	
38	differential	1	16-03-2023		TLM1	

39	clutch	1	17-03-2023		TLM1	
40	brakes	1	18-03-2023		TLM2	
41	Regenerative braking	1	20-03-2023		TLM1	
42	Regenerative braking	1	23-03-2023		TLM1	
43	Motor sizing	1	24-03-2023		TLM1	
44	Motor sizing	1	25-03-2023		TLM3	
No. of classes required to complete UNIT-IV		11				

UNIT-V: HYBRID ELECTRIC VEHICLES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45	Types	1	27-03-2023		TLM1	
46	Series	1	31-03-2023		TLM1	
47	Parallel and series	1	03-04-2023		TLM1	
48	Parallel configuration	1	06-04-2023		TLM1	
49	Design	1	10-04-2023		TLM1	
50	Drive train	1	15-04-2023		TLM2	
51	Sizing of components	1	17-04-2023		TLM2	
52	Revision	1	20-04-2023		TLM2	
53	Revision	1	21-04-2023		TLM2	
No. of classes required to complete UNIT-V		9				

CONTENT BEYOND SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods
1		1	20-4-23		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 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 modeling 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 ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO4	Design controllers for electrical and electronic systems to improve their performance.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr P.Rathnakar Kumar**	**Mr P.Rathnakar Kumar**	**Dr.G.Nageswara Rao**	**Dr.J.S.Vara Prasad**
Signature				

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

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Dr. P.Ravindra Kumar/ Mr. S. Uma Maheswara Reddy
Course Name & Code : Heat Transfer LAB & 20ME62
L-T-P Structure : 0-0-2 **Credits :** 1
Program/Sem/Sec : B.Tech., MECH., VI-Sem., Section- A **A.Y :** 2022-23

PRE-REQUISITE: HEAT TRANSFER

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to understand the modes of heat transfer for different heat transfer equipment.

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

CO 1	Estimate the thermal conductivity of different materials and powders
CO 2	Experiment both free and forced convection to predict heat transfer coefficient.
CO 3	Validate the Stefan Boltzmann Constant and estimate emissivity of grey body.
CO 4	Compare parallel and counter flow heat exchanger performance characteristics.

MATERIAL:T1 Lab Manual

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: A-Sec (Wednesday)** **BATCH: 2** **A.Y:2022-23**

S.No	Batch	EXP. No	0	1	2	3	4	5	6	7	8	9	10	11	12
		Date	28/12	04/01	11/01	18/01	25/01	01/02	08/02	15/ 02	01/03	15/03	29/03	12/04	19/04
		Regd.No	CYCLE-I							CYCLE-2					
1	BATCH-I	20761A0334	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6
2		20761A0335	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6
3		20761A0336	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6
4		20761A0337	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6
5		20761A0338	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6
6		20761A0339	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6
7	BATCH-2	20761A0340	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1
8		20761A0341	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1
9		20761A0342	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1
10		20761A0343	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1
11		20761A0344	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1
12		20761A0345	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1
13	BATCH-3	20761A0346	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2
14		20761A0347	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2
15		21765A0301	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2
16		21765A0302	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2
17		21765A0303	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2
18		21765A0304	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: A-Sec (Wednesday)** **BATCH: 2** **A.Y:2022-23**

S.No	Batch	EXP. No	0	1	2	3	4	5	6	7	8	9	10	11	12
		Date	28/12	04/01	11/01	18/01	25/01	01/02	08/02	15/ 02	01/03	15/03	29/03	12/04	19/04
		Regd.No	CYCLE-I							CYCLE-2					
19	BATCH-4	21765A0305	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3
20		21765A0306	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3
21		21765A0307	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3
22		21765A0308	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3
23		21765A0309	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3
24	BATCH-5	21765A0310	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4
25		21765A0311	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4
26		21765A0312	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4
27		21765A0313	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4
28		21765A0314	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4
29	BATCH-6	21765A0315	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5
30		21765A0316	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5
31		21765A0317	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5
32		21765A0318	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5
33		21765A0319	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: A-Sec (Thursday)** **BATCH: 1** **A.Y:2022-23**

S.No	Batch	EXP. No	0	1	2	3	4	5	6	7	8	9	10	11	12	13
		Date	29/12	05/01	12/01	19/01	02/02	09/02	16/02	02/ 03	09/03	16/03	23/03	06/04	13/04	20/04
		Regd.No	CYCLE-I							CYCLE-2						
1	BATCH-I	20761A0301	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	Repetition
2		20761A0302	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	
3		20761A0303	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	
4		20761A0304	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	
5		20761A0305	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	
6		20761A0306	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	
7	BATCH-2	20761A0307	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	
8		20761A0308	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	
9		20761A0309	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	
10		20761A0310	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	
11		20761A0311	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	
12		20761A0312	DEMO	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	
13	BATCH-3	20761A0313	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	
14		20761A0314	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	
15		20761A0315	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	
16		20761A0316	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	
17		20761A0317	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	
18		20761A0318	DEMO	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: A-Sec (Thursday)** **BATCH: 1** **A.Y:2022-23**

S.No	Batch	EXP. No	0	1	2	3	4	5	6	7	8	9	10	11	12	13
		Date	29/12	05/01	12/01	19/01	02/02	09/02	16/02	02/ 03	09/03	16/03	23/03	06/04	13/04	20/04
		Regd.No	CYCLE-I							CYCLE-2						
19	BATCH-4	20761A0319	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	Repetition
20		20761A0320	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	
21		20761A0321	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	
22		20761A0322	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	
23		20761A0323	DEMO	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	
24	BATCH-5	20761A0324	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	
25		20761A0325	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	
26		20761A0326	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	
27		20761A0327	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	
28		20761A0328	DEMO	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	
29	BATCH-6	20761A0329	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	
30		20761A0330	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	
31		20761A0331	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	
32		20761A0332	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	
33		20761A0333	DEMO	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	HT-6	HT-1	HT-2	HT-3	HT-4	HT-5	

LIST OF EXPERIMENTS

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

LAB INCHARGE

LAB SCHEDULE

SECTION: A BATCH-I (THURSDAY)					
BATCH-I	**BATCH-2**	**BATCH-3**	**BATCH-4**	**BATCH-5**	**BATCH-6**
20761A0301	20761A0307	20761A0313	20761A0319	20761A0324	20761A0329
20761A0302	20761A0308	20761A0314	20761A0320	20761A0325	20761A0330
20761A0303	20761A0309	20761A0315	20761A0321	20761A0326	20761A0331
20761A0304	20761A0310	20761A0316	20761A0322	20761A0327	20761A0332
20761A0305	20761A0311	20761A0317	20761A0323	20761A0328	20761A0333
20761A0306	20761A0312	20761A0318			

SECTION: A BATCH-2 (WEDNESDAY)					
BATCH-I	**BATCH-2**	**BATCH-3**	**BATCH-4**	**BATCH-5**	**BATCH-6**
20761A0334	20761A0340	20761A0346	21765A0305	21765A0310	21765A0315
20761A0335	20761A0341	20761A0347	21765A0306	21765A0311	21765A0316
20761A0336	20761A0342	21765A0301	21765A0307	21765A0312	21765A0317
20761A0337	20761A0343	21765A0302	21765A0308	21765A0313	21765A0318
20761A0338	20761A0344	21765A0303	21765A0309	21765A0314	21765A0319
20761A0339	20761A0345	21765A0304			

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

PROGRAMME OUTCOMES (POs):

PO 1	An ability to apply knowledge of Mathematics, Sciences and Engineering fundamentals to find the solution to real time Mechanical Engineering problems.
PO 2	An ability to identify and formulate mathematical models to analyze complex engineering problems.

PO 3	An ability to design a mechanical systems/ process to meet the desired needs within realistic constraints such as economic, environmental, societal, health & safety.
PO 4	An ability to design and conduct experiments, perform analysis, interpretation of data and synthesis of information to provide valid conclusions.
PO 5	An ability to develop the model and analyze the Mechanical systems using modern software tools.
PO 6	An ability to understand societal, health, safety, legal, cultural issues and the consequent responsibilities relevant to engineering practice.
PO 7	An ability to understand the impact of engineering solutions in societal, environmental context and demonstrate the knowledge for sustainable development.
PO 8	An ability to understand the professional ethics to follow the norms of engineering practice.
PO 9	An ability to function effectively as an individual and as a member / leader in diverse technical teams.
PO 10	An ability to communicate effectively with the engineering community and society through reports & presentations.
PO 11	An ability to apply management principles to organise the multidisciplinary projects.
PO 12	An ability to understand the need of independent and lifelong learning so as to address day to day technological changes.

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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. P.Ravindra Kumar / Mr. S.Uma Maheswara Reddy	Dr. P. Ravindra Kumar	DR. P. Vijay Kumar	Dr.S.Pichi Reddy

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L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.A.Nageswara Rao, Mr.K.Venkateswara Reddy, Mr.A.Danunjay Kumar

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/A **A.Y.:** 2022-23

PREREQUISITE: Computer Aided Machine Drawing, CAD/CAM

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

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

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

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

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

SOFTWARE PACKAGES: CATIA /ANSYS / Iron CAD etc.

REFERENCES:

- Lab Manuals

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments (Section – A)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	20761A0301-20761A0347, 21765A0301-21765A0319	66

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	26-12-2022		TLM4	
Cycle-I						
2.	Design and Assembly Modeling of Knuckle joint using CAD software	3	02-01-2023		TLM4	
3.	Design and Assembly Modeling of Universal Coupling using CAD software	3	09-01-2023		TLM4	
4.	Design and Assembly Modeling of Piston, Connecting Rod parts using CAD software	3	23-01-2023		TLM4	
5.	Analysis of trusses using ANSYS	3	30-01-2023		TLM4	
6.	Analysis of Beams using ANSYS	3	06-02-2023		TLM4	
Cycle-II						
7.	Analysis of 3D solids using ANSYS	3	13-02-2023		TLM4	
8.	Steady state heat transfer analysis using ANSYS	3	27-02-2023		TLM4	
9.	Estimation of natural frequencies and mode shapes for simple problems using ANSYS	3	06-03-2023		TLM4	
10.	Development of NC code using CAM packages	3	13-03-2023		TLM4	
11.	Machining of simple components on CNC Turning by transferring NC Code from CAM package	3	20-03-2023		TLM4	
12.	Machining of Simple components on CNC-Mill by transferring NC Code from CAM Package	3	27-03-2023		TLM4	
13.	Robot programming, simulation, and execution	3	03-04-2023		TLM4	
14.	Revision	3	10-04-2023		TLM4	
15.	Internal Exam	3	17-04-2023		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				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Venkateswara Reddy, Mr.V.Sankar 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/A **A.Y.:** 2022-23
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 – A: B1 Batch)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	20761A0301-20761A0333	33

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
17.	Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory	3	28-12-2022		TLM4	
Cycle-I						
18.	Study the anatomy of robots.	3	04-01-2023		TLM4	
19.	Analysis of robot configuration and Simulation of Robot with 2 Dof using Robo Analyzer.	3	11-01-2023		TLM4	
20.	Analysis of robot configuration and Simulation of Robot with 6 Dof using Robo Analyzer.	3	18-01-2023		TLM4	
21.	D-H parametric representation of various robotic arms using Robo Analyzer	3	25-01-2023		TLM4	
22.	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	01-02-2023		TLM4	
Cycle-II						
23.	Simulation of SCARA, PUMA using Robo Aanlyzer	3	08-02-2023		TLM4	
24.	Introduction to IGUS Software	3	15-02-2023		TLM4	
25.	Introduction to IGUS Software	3	01-03-2023		TLM4	
26.	Program for commands like a line command, circle command	3	08-03-2023		TLM4	
27.	Program for Point to Point (PTP) command	3	15-03-2023		TLM4	
28.	Palletizing, Spray painting	3	29-03-2023		TLM4	
29.	Loading / Unloading	3	05-04-2023		TLM4	
30.	Revision	3	12-04-2023		TLM4	
31.	Internal Exam	3	19-04-2023		TLM4	
No. of classes required to complete:				**No. of classes taken:**		

Schedule of Experiments (Section – A: B2 Batch)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B2	20761A0334-20761A0347, 21765A0301-21765A0319	33

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Robotics and Simulation Lab, Demonstration of	3	29-12-2022		TLM4	

	all experiments, CEOs, and COs of the Laboratory					
Cycle-I						
2.	Study the anatomy of robots.	3	05-01-2023		TLM4	
3.	Analysis of robot configuration and Simulation of Robot with 2 Dof using Robo Analyzer.	3	12-01-2023		TLM4	
4.	Analysis of robot configuration and Simulation of Robot with 6 Dof using Robo Analyzer.	3	19-01-2023		TLM4	
5.	D-H parametric representation of various robotic arms using Robo Analyzer	3	02-02-2023		TLM4	
6.	Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer	3	09-02-2023		TLM4	
Cycle-II						
7.	Simulation of SCARA, PUMA using Robo Aanlyzer	3	16-02-2023		TLM4	
8.	Introduction to IGUS Software	3	02-03-2023		TLM4	
9.	Program for commands like a line command, circle command	3	09-03-2023		TLM4	
10.	Program for Point to Point (PTP) command	3	16-03-2023		TLM4	
11.	Palletizing, Spray painting	3	23-03-2023		TLM4	
12.	Loading / Unloading	3	06-04-2023		TLM4	
13.	Revision	3	13-04-2023		TLM4	
14.	Internal Exam	3	20-04-2023		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				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

Name of Course Instructor : Dr. Sujith Kumar Rath& Mr. B Sagar
Course Name & Code : Soft skills & soft skills Laboratory (20HSS1)
L-T-P Structure : 0-0-1+2 Credit : 2
Program/Sem/Sec : B.Tech.,MECH-A&B , VI-Sem., A.Y: 2022-23

Course Description & Objectives:

The Soft Skills Laboratory course equips students with required behavioural, 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	**Infer** the self awareness and personality **(Understand – L2)**
CO2	Work effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.**(Apply – L3)**
CO3	Communicate through verbal/oral communication and improve the listening skills**(Apply – L3)**
CO4	**Relate** thecritical & lateral thinking while dealing with personal/social/professional issues. **(Apply – L3)**

Course Content:

Personality Development Skills

Role of language in Personality – How language reflects, impactsPersonality – Using gender-neutral language in MNCs – being culturally-sensitive-Personality Traits- Grooming & Dress code

Activities: Group Discussion/Role play/Presentations (authentic materials: News papers, pamphlets and news clippings)

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

ProfessionalSkills:

Career Planning- job vs. career- goal setting- SWOT analysis-Timemanagement – 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.

REFERENCEBOOKS:

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

MECH-A

S.No.	No. of Lecture Hours	Date	Planned Topics	Actual Date	HOD Sign Weekly
1	1	30-12-22	Role of language in personality		
2	2	30-12-22	Extempore		
3	1	06-01-23	How language reflects, impacts Personality		
4	2	06-01-23	Story Telling		
5	1	20-01-23	Using gender-neutral language in MNCs		
6	2	20-01-23	Case Studies		
7	1	27-01-23	Being culturally-sensitive-Personality Traits- Grooming & Dress code		
8	2	27-01-23	Using authentic materials: News papers, pamphlets and news clippings		
9	1	03-02-23	Career Planning		
10	2	03-02-23	Public Speaking		
11	1	10-02-23	Job vs. career- goal setting		
12	2	10-02-23	Critical Appreciation and Textual Analysis		
13	1	17-02-23	SWOT analysis		
14	2	17-02-23	Writing a review on a given short story/videos/book		
15	1	03-03-23	Time management		
16	2	03-03-23	Empathetic speaking		

17	1	10-03-23	Self-management		
18	2	10-03-23	Telephonic conversation		
19	1	17-03-23	Stress-management		
20	2	17-03-23	Situation based dialogues		
21	1	24-03-23	Effective Resume-Writing and presentation		
22	2	24-03-23	Listening to dialogues and analyzing		
23	1	31-03-23	Interview Skills		
24	2	31-03-23	Pronunciation Practice		
25	1	21-04-23	Body Language, Postures, Gestures, Eye contact		
26	2	21-04-23	Mock interviews		

MECH-B

S.No.	No. of Lecture Hours	Date	Planned Topics	Actual Date	HOD Sign Weekly
1	1	31-12-22	Role of language in personality		
2	2	27-12-22	Extempore		
3	1	07-01-23	How language reflects, impacts Personality		
4	2	03-01-23	Story Telling		
5	1	21-01-23	Using gender-neutral language in MNCs		
6	2	10-01-23	Case Studies		
7	1	28-01-23	Being culturally-sensitive-Personality Traits- Grooming & Dress code		
8	2	24-01-23	Using authentic materials: News papers, pamphlets and news clippings		
9	1	04-02-23	Career Planning		
10	2	31-01-23	Public Speaking		
11	1	11-02-23	Job vs. career- goal setting		
12	2	07-02-23	Critical Appreciation and Textual Analysis		

13	1	04-03-23	SWOT analysis		
14	2	28-02-23	Writing a review on a given short story/videos/book		
15	1	11-03-23	Time management		
16	2	07-03-23	Empathetic speaking		
17	1	18-03-23	Self-management		
18	2	14-03-23	Telephonic conversation		
19	1	25-03-23	Stress-management		
20	2	21-03-23	Situation based dialogues		
21	1	01-04-23	Effective Resume-Writing and presentation		
22	2	04-04-23	Listening to dialogues and analyzing		
23	1	08-04-23	Interview Skills		
24	2	11-04-23	Pronunciation Practice		
25	1	15-04-23	Body Language, Postures, Gestures, Eye contact		
26	2	18-04-23	Mock interviews		

Signature of Faculty

Signature of HOD

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

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.K.Dilip Kumar
Course Name & Code : 20ME17
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., Mech Engg., VI-Sem., Sections- B A.Y : 2022-23

PRE-REQUISITE: Applied Mathematics, Thermodynamics, Thermal Engineering and Fluid Mechanics.

COURSE EDUCATIONAL OBJECTIVES (CEOs):
To learn the physical mechanisms on modes of heat transfer, differential equations in heat transfer and the significance of Non Dimensional Numbers in heat transfer applications.

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

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

TEXT BOOKS:

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

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

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

REFERENCE BOOKS:

R1	M.Necati Ozisik, Heat Transfer- A basic Approach,4th Edition, McGraw-Hill book company, 1985
R2	P.K.Nag, Heat and Mass Transfer- TMH 2nd Edition, 2007 P.S.Ghoshdastidar Heat Transfer - Oxford Higher Education 6th Edition 2011. C.P.Kothandaraman and Subramanian, Heat and Mass Transfer, New Age International Publications 7th Edition 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	26-12-2022		TLM1	
2.	Introduction of five Units importance	1	27-12-2022		TLM1	
3.	Introduction to heat transfer and its applications,	1	28-12-2022		TLM1, TLM2	
4.	Basic modes and its physical mechanisms in heat transfer.	1	31-12-2022		TLM5	
5.	Steady, unsteady and periodic heat transfer	1	2-01-2023		TLM1, TLM4	
6.	Significance of thermal conductivity in heat conduction.	1	3-01-2023		TLM1, TLM4	
7.	General heat conduction equation in Cartesian coordinate system	1	4-01-2023		TLM1	
8.	Cartesian coordinate system and its simplifications.	1	5-01-2023		TLM1	
9.	Fourier's law of heat conduction; Numerical Problems.	1	7-01-2023		TLM1, TLM2	
10.	General heat conduction equation in cylindrical coordinate system	1	9-01-2023		TLM1	
11.	Cylindrical coordinate system and its simplifications.	1	10-01-2023		TLM1	
12.	Cylindrical coordinate system and its simplifications.	1	11-01-2023		TLM3	
13.	General heat conduction equation in spherical coordinate system and its simplifications.	1	18-01-2023		TLM1, TLM2	
14.	Heat flow through plane wall and cylinder with constant thermal conductivity– Numerical Problems.	1	19-01-2023		TLM1, TLM2	
15.	Electrical analogy, thermal resistance and overall heat transfer coefficient.	1	21-01-2023		TLM1, TLM2 TLM5	
16.	Numerical Problems on thermal resistance and overall heat transfer coefficient	1	12-01-2023		TLM1, TLM2	
17.	Heat transfer through composite wall and cylinder, Numerical Problems.	1	23-01-2023		TLM1, TLM2	
18.	Critical radius of insulation for cylinder and Applications.	1	24-01-2023		TLM1, TLM4	
19.	Numerical Problems on critical radius of insulation, **Assignment-1 Questions.**	1	25-01-2023		TLM1 TLM6	
20.	Numerical Problems on critical radius of insulation, **Assignment-1 Questions.**	1	28-01-2023		TLM3	
No. of classes required to complete UNIT-I:				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 with variable thermal conductivity, Numerical Problems.	1	30-01-2023		TLM1	
2.	Heat flow through the cylinder with variable thermal conductivity, Numerical Problems.	1	31-1-2023		TLM1	
3.	Derivation on Uniform Internal heat generation in slabs and cylinders	1	01-02-2023		TLM1, TLM2	
4.	Numerical Problems on Uniform Internal heat generation in slabs.	1	02-02-2023		TLM1	
5.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	04-02-2023		TLM1, TLM2	
6.	Numerical Problems on Uniform Internal heat generation in cylinders.	1	06-02-2023		TLM3	
7.	Extended surfaces and their applications;	1	07-02-2023		TLM1, TLM4	
8.	Thermal analysis of long Fins	1	08-02-2023		TLM1, TLM4	
9.	Thermal analysis of short fins with insulated tip,	1	09-02-2023		TLM1, TLM2	
10.	Fin efficiency and effectiveness	1	11-02-2023		TLM1, TLM4	
11.	system with negligible internal Resistance (Lumped Heat Analysis), Significance of Biot and Fourier Numbers	1	13-02-2023		TLM1, TLM2	
12.	Biot and Fourier Numbers-systems with finite surface and internal resistance using Heisler Chart.	1	14-02-2023		TLM1, TLM2	
No. of classes required to complete UNIT-II:				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.	Basics of convective (Forced and Natural) heat transfer and Applications.	1	15-02-2023		TLM1, TLM2	
2.	Dimensional analysis	1	16-02-2023		TLM1, TLM2	
3.	Buckingham Pi theorem applied to Forced Convection.	1	20-02-2023		TLM1, TLM4	
4.	Significance of Non Dimensional Numbers.	1	21-02-2023		TLM1, TLM2	
5.	The concept of boundary layer; Velocity	1	22-02-2023		TLM1,	
6.	Thermal Boundary Layers	1	23-02-2023		TLM2	
7.	Numerical Problems.	1	25-02-2023		TLM5	
8.	Numerical Problems.	1	27-02-2023		TLM3	
9.	Forced convection analysis in external flows (Flow over a Flat Plate): Laminar and turbulent flows.	1	28-02-2023		TLM1, TLM2	
10.	Forced convection analysis in internal flows (Flow through circular pipe): Laminar and turbulent flows.	1	1-03-2023		TLM1, TLM2	
11.	Numerical Problems on Forced Convection.	1	02-03-2023		TLM1,	

					TLM2	
12.	Reynolds Colburn Analogy.	1	04-03-2023		TLM1	
13.	Natural convection: Development of Hydrodynamic and thermal boundary layer along vertical plate.	1	06-03-2023		TLM1, TLM2 TLM4	
14.	Empirical correlations for Vertical plate,	1	07-03-2023		TLM1, TLM2 TLM4	
15.	Empirical correlations for Vertical, Cylinder	1	9-03-2023		TLM1, TLM2 TLM4	
16.	Empirical correlations for Horizontal Cylinder	1	11-03-2023		TLM1, TLM2 TLM4	
17.	Natural convection cooling in electronic equipment.	1	13-03-2023		TLM1, TLM2 TLM4	
18.	Heat pipe	1	14-03-2023		TLM1, TLM2 TLM4	
No. of classes required to complete UNIT-III:				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.	1	15-03-2023		TLM1, TLM2	
2.	Pool Boiling, Different regimes of boiling; Critical heat flux.	1	16-03-2023		TLM1, TLM2 TLM5	
3.	Numerical problems on nucleate boiling	1	18-03-2023		TLM1,	
4.	Critical heat flux conditions.	1	20-03-2023		TLM2	
5.	Condensation: Film wise and Drop wise condensation	1	21-03-2023		TLM1, TLM2	
6.	Laminar film wise condensation on Vertical plate	1	23-03-2023		TLM1,	
7.	Numerical Problems	1	25-03-2023		TLM2	
8.	Introduction and applications of Thermal Radiation	1	27-03-2023		TLM1, TLM2	
9.	Emissive Power, Absorption, Reflection and Transmission and	1	28-03-2023		TLM1, TLM2	
10.	Definitions related to Radiation	1	29-03-2023		TLM4	
11.	Concept of black and non-black bodies	1	1-04-2023		TLM1, TLM2	
12.	Laws of black body radiation	1	3-04-2023		TLM5	
13.	Emissivity, Kirchhoff's law	1	5-04-2023		TLM1,	
14.	Shape Factors	1	06-04-2023		TLM2	
15.	Radiation heat exchange between	1	08-04-2023		TLM1,	

	two black isothermal surfaces,				TLM2	
16.	Nonblack infinite parallel plates;	1	10-04-2023		TLM1, TLM2	
No. of classes required to complete UNIT-IV:				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	11-04-2023		TLM1, TLM2 TLM6	
2.	Applications of Heat Exchangers	1	12-04-2023		TLM1, TLM2	
3.	Overall heat transfer coefficient-Fouling factor	1	13-04-2023		TLM1, TLM2	
4.	LMTD method of Heat exchanger analysis- Parallel flow, Numerical Problems	1	15-04-2023		TLM1, TLM2 TLM4	
5.	LMTD method of Heat exchanger analysis- Counter flow, Numerical Problems	1	17-04-2023		TLM1, TLM2	
6.	Correction factor for LMTD for use with Multi pass and Cross flow Heat Exchangers	1	18-04-2023		TLM1, TLM2	
7.	Effectiveness - NTU method of Heat Exchanger analysis-Applications of Heat Exchangers	1	19-04-2023		TLM3	
8.	Effectiveness - NTU method of Heat Exchanger analysis-Applications of Heat Exchangers	1	20-04-2023		TLM1, TLM5	
No. of classes required to complete UNIT-V:				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 (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
Attendance	B=5
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+Q	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 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.K.Dilip Kumar)	(Dr.P.Ravindra Kumar)	(Dr.P.Vijay Kumar)	(Dr.S.Pichi Reddy)

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr M B S Sreekara Reddy, Associate Professor

Course Name & Code	**:** CAD/CAM & 20ME18	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 3
Program/Sem/Sec	: B.Tech VI Sem (B)	**A.Y.:** 2022-2023

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

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

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

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

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

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

TEXTBOOKS:

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

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

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: FUNDAMENTALS OF CAD, COMPUTER GRAPHICS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to CAD/CAM	1	26-12-2022		**TLM1/TLM2**	
2.	Product Cycle Revised with CAD/CAM	1	27-12-2022		**TLM1/TLM2**	
3.	Tutorial 1	1	28-12-2022		**TLM3**	
4.	Reasons for implementing CAD	1	30-12-2022		**TLM1/TLM2**	
5.	Creating Manufacturing database & Benefits of CAD	1	31-12-2022		**TLM1/TLM2**	
6.	Computer Graphics- Introduction , Database structure	1	02-01-2023		**TLM1/TLM2**	
7.	Functions of a graphics package	1	03-01-2023		**TLM1/TLM2**	
8.	Tutorial 2	1	04-01-2023		**TLM3**	
9.	Raster scan graphics	1	06-01-2023		**TLM1/TLM2**	
10.	Transformations.	1	07-01-2023		**TLM1/TLM2**	
11.	Translation, scaling,	1	09-01-2023		**TLM1/TLM2**	
12.	Reflection, rotation	1	10-01-2023		**TLM1/TLM2**	
13.	Problems on Transformations- Tutorial 3	1	11-01-2023		**TLM3**	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

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

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Geometric Modelling: Introduction	1	18-01-2023		**TLM1/TLM2**	
15.	Wireframe Modelling: Entities wireframe models	1	20-01-2023		**TLM1/TLM2**	
16.	Parametric representation of analytical curves	1	21-01-2023		**TLM1/TLM2**	

17.	Parametric representation of analytical curves	1	23-01-2023		**TLM1/TLM2**	
18.	Hermite cubic spline curve	1	24-01-2023		**TLM1/TLM2**	
19.	Tutorial 4	1	25-01-2023		**TLM3**	
20.	Bezier curves	1	27-01-2023		**TLM1/TLM2**	
21.	B-spline curves	1	28-01-2023		**TLM1/TLM2**	
22.	Characteristics of Curves, Problems	1	30-01-2023		**TLM1/TLM2**	
23.	Surface representation: Entities	1	31-01-2023		**TLM1/TLM2**	
24.	Tutorial 5	1	01-02-2023		**TLM3**	
25.	Solid modelling: Representation	1	03-02-2023		**TLM1/TLM2**	
26.	B-Rep	1	04-02-2023		**TLM1/TLM2**	
27.	CSG	1	06-02-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

UNIT-III: COMPUTER NUMERICAL CONTROL, PART PROGRAMMING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Numerical control: Introduction, NC Modes	1	07-02-2023		**TLM1/TLM2**	
29.	Tutorial 6	1	08-02-2023		**TLM3**	
30.	NC elements ,N C Coordinate systems	1	10-02-2023		**TLM1/TLM2**	
31.	Structure of CNC machine tools	1	13-02-2023		**TLM1/TLM2**	
32.	Spindle design	1	14-02-2023		**TLM1/TLM2**	
33.	Tutorial 7	1	15-02-2023		**TLM3**	
34.	spindle drives,	1	17-02-2023		**TLM1/TLM2**	
35.	Feed drives,	1	27-02-2023		**TLM1/TLM2**	
36.	actuation systems	1	28-02-2023		**TLM1/TLM2**	
37.	Tutorial 8	1	01-03-2023		**TLM3**	
38.	CNC Part programming: fundamentals	1	03-03-2023		**TLM1/TLM2**	
39.	Manual part programming	1	04-03-2023		**TLM1/TLM2**	
40.	Computer Aided part programming	1	06-03-2023		**TLM1/TLM2**	
41.	Part programming examples	1	07-03-2023		**TLM1/TLM2**	
42.	Examples	1	10-03-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-III: 15				**No. of classes taken:**		

UNIT-IV: GROUP TECHNOLOGY, FLEXIBLE MANUFACTURING SYSTEM

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Group Technology	1	13-03-2023		**TLM1/TLM2**	
44.	Coding and classification schemes-OPITZ	1	14-03-2023		**TLM1/TLM2**	
45.	Tutorial 9	1	15-03-2023		**TLM3**	
46.	MICLASS, example for coding	1	17-03-2023		**TLM1/TLM2**	

47.	CODE Systems, examples for coding	1	18-03-2023		**TLM1/TLM2**	
48.	Production Flow Analysis	1	20-03-2023		**TLM1/TLM2**	
49.	Advantages and limitations	1	21-03-2023		**TLM1/TLM2**	
50.	GT Machine cells, Benefits of GT	1	24-03-2023		**TLM1/TLM2**	
51.	CAPP- Retrieval and Generative	1	25-03-2023		**TLM1/TLM2**	
52.	Flexible Manufacturing System: Introduction	1	27-03-2023		**TLM1/TLM2**	
53.	FMS equipment, FMS layouts, benefits	1	28-03-2023		**TLM1/TLM2**	
54.	Tutorial 10	1	29-03-2023		**TLM3**	
55.	FMS Planning and implementation	1	31-03-2023		**TLM1/TLM2**	
56.	FMS Planning and implementation	1	01-04-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: COMPUTER AIDED QUALITY CONTROL, COMPUTER INTEGRATED MANUFACTURING SYSTEMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
57.	CAQC: Introduction, The computers in QC	1	03-04-2023		**TLM1/TLM2**	
58.	Contact inspection methods	1	04-04-2023		**TLM1/TLM2**	
59.	Non-Contact inspection methods: Optical	1	10-04-2023		**TLM1/TLM2**	
60.	Non-Contact inspection methods: non optical	1	11-04-2023		**TLM1/TLM2**	
61.	Tutorial 11	1	12-04-2023		**TLM3**	
62.	Computer aided testing,	1	15-04-2023		**TLM1/TLM2**	
63.	CAQC with CAD/CAM	1	17-04-2023		**TLM1/TLM2**	
64.	CIM Introduction	1	18-04-2023		**TLM1/TLM2**	
65.	CIM integration, Implementation	1	19-04-2023		**TLM1/TLM2**	
66.	Benefits of CIM, Lean manufacturing	1	21-04-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

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

	of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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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: 2022-23

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:

T1 Bhandari V.B., Design of Machine Elements, 3rd edition, TMG 2010

T2 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	27/12/2022		TLM1	
2	Introduction to Unit-1, **Bearings** –Introduction, theory of lubrication, Types, materials	1	28/12/2022		TLM1	
3	**Journal Bearings** – Types, Important dimensionless parameters,	1	29/12/2022		TLM1	
4	Design procedure of journal bearing	1	30/12/2022		TLM1	
5	Journal bearings - problems	1	31/12/2022		TLM1	
6	Heat generated and heat dissipated in the bearing design – problems	1	03/01/2023		TLM1	
7	**Tutorial-I**	1	04/01/2023		TLM3	
8	**Rolling contact bearings**-types, bearing life, Materials and designation	1	05/01/2023		TLM1	
9	Static load and dynamic load capacity, equivalent bearing load	1	06/01/2023		TLM1	
10	Selection of ball bearing - problems	1	07/01/2023		TLM1	
11	Selection of roller bearing - problems	1	09/01/2023		TLM1	
12	**Tutorial-II**	1	10/01/2023		TLM3	
13	Cubic mean load derivation, Reliability of bearings - problems	1	11/01/2023		TLM1	
14	Problem on roller bearings	1	12/01/2023		TLM1	

15	**Assignment -I/ Quiz-I**	1	18/01/2023		TLM6	
No. of classes required to complete UNIT-I: 15			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	19/01/2023		TLM1	
2	Cylinder design - problems	1	20/01/2023		TLM1	
3	Problems on cylinder design	1	21/01/2023		TLM1	
4	**PISTON** : Piston design, - design	1	24/01/2023		TLM1	
5	Problems on piston design	1	25/01/2023		TLM1	
6	Problems on Piston	1	27/01/2023		TLM1	
7	**Tutorial-III**	1	28/01/2023		TLM3	
8	**CONNECTING ROD**: Thrust in C.R, buckling load	1	31/01/2023		TLM1	
9	Stresses due to whipping action on connecting rod ends-problems	1	01/02/2023		TLM1	
10	**CRANK SHAFT:** Design of crank and crank shaft	1	02/02/2023		TLM1	
11	Strength of center crank shaft - problem	1	02/02/2023		TLM1	
12	**Tutorial-IV**	1	04/02/2023		TLM3	
13	**Assignment-II/Quiz-2**	1	07/02/2023		TLM6	
No. of classes required to complete UNIT-II: 13			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	08/02/2023		TLM1	
2	Design Procedure of flat belts - Problems	1	09/02/2023		TLM1	
3	**PULLEYS:** Design of pulleys mild steel & cast iron	1	10/02/2023		TLM1	

4	Design of pulleys Problems	1	11/02/2023		TLM1	
5	**Tutorial-V**	1	14/02/2023		TLM1	
6	V-belts –designation, design and selection	1	15/02/2023		TLM1	
7	Design of V belts - problems	1	16/02/2023		TLM3	
8	Design of V belts - problem	1	17/02/2023		TLM1	
Mid-I Examination from 20-2-2023 to 25-02-2023						
9	Design of V- grooved pulley	1	28/02/2023		TLM1	
10	Design of V- grooved pulley	1	01/03/2023		TLM1	
11	V-belts –designation, design and selection		02/03/2023		TLM1	
12	**Tutorial-VI**	1	03/03/2023		TLM3	
13	**Assignment-III/Quiz-III**	1	04/03/2023		TLM6	
No. of classes required to complete UNIT-III: 13			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	07/03/2023		TLM1	
2	Stresses, deflection and stiffness in springs and their derivations	1	09/03/2023		TLM1	
3	Design of springs-problems	1	10/03/2023		TLM1	
4	Design of springs-problems	1	11/03/2023		TLM1	
5	Design of springs-problems	1	01/03/2023		TLM1	
6	Springs for fatigue loading	1	14/03/2023		TLM1	
7	**Tutorial-VII**	1	15/03/2023		TLM3	
8	Spring failures, design of helical springs	1	16/03/2023		TLM1	
9	Natural frequency of helical spring	1	17/03/2023		TLM1	
10	Energy storage capacity in springs	1	18/03/2023		TLM1	
11	Tension and torsion springs	1	21/03/2023		TLM1	
12	Co-axial springs design-Problems	1	23/03/2023		TLM1	
13	Co-axial springs design-Problems	1	24/03/2023		TLM1	

14	Design of leaf springs- Problems	1	25/03/2023		TLM1	
15	**Tutorial-VIII**	1	28/03/2023		TLM3	
16	**Assignment-IV/Quiz-IV**	1	29/03/2023		TLM6	
No. of classes required to complete UNIT-V: 16			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 terminology, Types of gears, design formulae	1	31/03/2023		TLM1	
2	Design Analysis of gears, Estimation of centre distance, module & face width	1	01/04/2023		TLM1	
3	Design procedure of spur gears, Check for dynamic and wear considerations	1	04/04/2023		TLM1	
4	Design of spur gears - Problems	1	06/04/2023		TLM1	
5	Design of spur gears - Problems	1	08/04/2023		TLM1	
6	Design of spur gears - Problems	1	11/04/2023		TLM1	
7	**Tutorial-IX**	1	12/04/2023		TLM3	
8	Design procedure of Helical gears, Check for dynamic and wear considerations	1	13/04/2023		TLM1	
9	Design of Helical gears - Problems	1	15/04/2023		TLM1	
10	Design of Helical gears - Problems	1	18/04/2023		TLM4	
11	**Tutorial-X**	1	19/04/2020		TLM3	
12	**Assignment-V/Quiz-V**	1	20/04/2023		TLM6	
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	HOD Sign Weekly
1	Design of flywheels	1	21/04/2023		TLM1 TLM2		

2	Design of epicycle gear train		21/04/2023		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**
Mr.B.Sudheer Kumar	Mr.B.Sudheer Kumar	Mr.B.Sudheer Kumar	Dr.S.Pichi Reddy

COURSE HANDOUT

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : **MODERN MACHING PROCESSES - 17ME26**

STRUCTURE : 3-0-0

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:

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	26.12.2022		TLM1/TLM2	CO1	T1/R1	
2.	Need for unconventional machining methods	1	27.12.2022		TLM1/TLM2	CO1	T1/R1	
3.	Classification of unconventional machining processes	1	28.12.2022		TLM1/TLM2	CO1	T1/R1	
4.	Considerations in process selection	1	29.12.2022		TLM1/TLM2	CO1	T1/R1	
5.	Tutorial -1	1	02.01.2023		TLM 3			
6.	Basic principle of ultrasonic machining, equipment setup and procedure,	2	05.01.2023		TLM1/TLM2	CO1	T1/R1	
7.	Process variables and applications	1	06.01.2023		TLM1/TLM2	CO1	T1/R1	
8.	Tutorial -2	1	09.01.2023					
9.	Basic principle of Abrasive jet machining, equipment setup and procedure.	2	11.01.2023		TLM3/TLM6	CO1	T1/R1	
10.	Water jet machining Basic principle, equipment setup and procedure	2	18.01.2023		TLM1/TLM2	CO1	T1/R1	
11.	Process variables and applications	1	19.01.2023		TLM1/TLM2	CO1	T1/R1	
No. of classes required to complete UNIT-I		12			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	20.01.2023		TLM1/TLM2	CO2	T1/R1	
13.	Tutorial -3	1	23.01.2023		TLM 3	CO2		
14.	ECM Process, and principles	2	25.01.2023		TLM1/TLM2	CO2	T1/R1	
15.	Equipment and material removal rate	1	27.01.2023		TLM1/TLM2	CO2	T1/R1	
16.	Tutorial -4	1	30.01.2023		TLM 3	CO2		

17.	Electrochemical machining	1	31.01.2023		TLM1/TLM2	CO2	T1/R1	
18.	Electrochemical grinding	1	01.02.2023		TLM1/TLM2	CO2	T1/R1	
19.	Electrochemical deburring, Electrochemical honing	2	03.02.2023		TLM1/TLM2	CO2	T1/R1	
20.	Tutorial -5	1	06.02.2023		TLM 3	CO2		
21.	Chemical machining-principle	1	07.02.2023		TLM1/TLM2	CO2	T1/R1	
22.	Maskants –Etchants, Advantages and Applications.	1	08.02.2023		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
23.	EDM Principle	1	09.02.2023		TLM1/TLM2	CO3	T1/R1	
24.	Process	1	10.02.2023		TLM1/TLM2	CO3	T1/R1	
25.	Tutorial -6	1	13.02.2023		TLM 3	CO3		
26.	Power circuits for EDM	2	15.02.2023		TLM1/TLM2	CO3	T1/R1	
27.	Mechanics of metal removal in EDM	1	16.02.2023		TLM1/TLM2	CO3	T1/R1	
28.	Tutorial -7	1	13.02.2023		TLM 3	CO3		
29.	Process parameters	2	28.02.2023		TLM1/TLM2	CO3	T1/R1	
30.	selection of tool electrode and dielectric fluid	1	01.03.2023		TLM1/TLM2	CO3	T1/R1	
31.	Electric discharge wire cutting principle	1	02.03.2023		TLM1/TLM2	CO3	T1/R1	
32.	Applications of EDM and Wire EDM	1	03.03.2023		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
33.	Electron Beam Machining, Principle, process	2	07.03.2023		TLM1/TLM2	CO4	T2/R3	
34.	EBM Applications and Advantages	1	08.03.2023		TLM1/TLM2	CO4	T2/R3	
35.	laser beam machining, Principle, process	2	10.03.2023		TLM1/TLM2	CO4	T2/R3	
36.	Tutorial -8	1	13.03.2023		TLM 3			

37.	LBM Applications and Advantages	1	14.03.2023		TLM1/TLM2	CO4	T2/R3	
38.	Plasma arc machining, Principle, process	2	16.03.2023		TLM1/TLM2	CO4	T2/R3	
39.	PAM Applications and Advantages	1	17.03.2023		TLM1/TLM2	CO4	T2/R3	
40.	Tutorial -9	1	20.03.2023		TLM3			
41.	Hot machining, Process, equipment, applications	2	23.03.2023		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
42.	Introduction to RP fundamentals	1	24.03.2023		TLM1/TLM2	CO5	T2/R3	
43.	Elements, Advantages of Rapid Prototyping	1	27.03.2023		TLM1/TLM2	CO5	T2/R3	
44.	historical development, fundamentals of Rapid Prototyping	1	28.03.2023		TLM1/TLM2	CO5	T2/R3	
45.	classification of Rapid prototyping	2	31.03.2023		TLM1/TLM2	CO5	T2/R3	
46.	Tutorial -10	1	03.04.2023		TLM3			
47.	Rapid Prototyping process chain	2	06.04.2023		TLM1/TLM2	CO5	T2/R3	
48.	Stereo Lithography Apparatus (SLA)	1	10.04.2023		TLM1/TLM2	CO5	T2/R3	
49.	solid Ground Curing (SGC)	1	11.04.2023		TLM1/TLM2	CO5	T2/R3	
50.	EOS's EOSINT Systems	2	13.04.2023		TLM3/TLM2	CO5	T2/R3	
51.	Applications of Rapid Prototyping	1	17.04.2023		TLM3/TLM6			
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
52.	Abrasive water jet aerospace applications	1	18.04.2023					
53.	EDM process parameters	1	19.04.2023					
54.	Rapid prototyping case study	1	20.04.2023					
55.	Medical case study	1	21.04.2023					

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	26-12-2022	18-02-2023	8W
I Mid Examinations	20-02-2023	25-02-2023	1W
II Phase of Instructions	27-02-2023	22-04-2023	8W
II Mid Examinations	24-04-2023	29-04-2023	1W
Preparation and Practicals	01-05-2023	06-05-2023	1W
Semester End Examinations	08-05-2023	20-05-2023	2W

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.

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 ELECTRICAL AND ELECTRONICS ENGINEERING

PART-A

Name of Course Instructor: Mr P.Rathnakar Kumar
Course Name & Code : Electric Vehicles-20EE84
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech., VI-Sem., MECH –B section **A.Y** : 2022-23

PREREQUISITE: Basic Electrical Engineering

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student to acquire Knowledge on basic concepts related to mechanics, kinetics and dynamics of electric vehicles, technical characteristics and properties of batteries. It also introduces the concepts of different configurations of drive trains.

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

CO1	Illustrate propulsion system for an electric vehicle. (**Understand-L2**)
CO2	Understand characteristics and properties of batteries. (**Understand-L2**)
CO3	Analyze ratings and requirements of electrical machines. (**Understand-L2**)
CO4	Analyze mechanism of electrical vehicle drive train. (**Understand-L2**)
CO5	Understand configuration of hybrid electric vehicles**. (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	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

Text book(s) and/or required materials

i. IqbalHussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011.
ii. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

Reference Books:

i. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
ii. SandeepDhameja, "Electric Vehicle Battery Systems", Newnes, 2000
http://nptel.ac.in/courses/108103009/

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: ELECTRIC VEHICLES

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 the subject and Course Outcomes	1	26-12-2022		TLM1	
2.	Components	1	27-12-2022		TLM1	
3.	Vehicle Mechanics	1	29-12-2022		TLM1	
4.	Roadway Fundamentals	1	30-12-2022		TLM1	
5.	Roadway Fundamentals	1	02-01-2023		TLM1	
6.	Vehicle Kinetics	1	03-01-2023		TLM1	
7.	Dynamics of vehicle motion	1	06-01-2023		TLM1	
8.	Dynamics of vehicle motion	1	09-01-2023		TLM1	
9.	Propulsion system design.	1	10-01-2023		TLM1	
10.	Propulsion system design.	1	19-01-2023		TLM1	
No. of classes required to complete UNIT-I		10				

UNIT-II : BATTERY

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	Basics-Types	1	20-01-2023		TLM1	
12	Parameters	1	23-01-2023		TLM1	
13	Capacity	1	24-01-2023		TLM1	
14	Discharge Rate	1	27-01-2023		TLM1	
15	Sate of charge	1	30-01-2023		TLM1	
16	State of Discharge	1	31-01-2023		TLM1	
17	Depth od Discharge		31-01-2023		TLM1	
18	Technical Characteristics	1	02-02-2023		TLM1	
19	Battery pack Design	1	03-02-2023		TLM2	
20	Battery pack Design	1	06-02-2023		TLM2	
21	Properties of Batteries	1	07-02-2023		TLM2	
No. of classes required to complete UNIT-II		10				

UNIT-III : DC & AC ELECTRICAL MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22	Motor & Engine rating, requirements	1	09-02-2023		TLM1	

23	Motor & Engine rating, requirements	1	10-02-2023		TLM1	
25	DC machines	1	13-02-2023		TLM1	
26.	DC machines	1	14-02-2023		TLM1	
27.	Three phase A.C. Machines	1	16-02-2023		TLM1	
29.	Three phase A.C. Machines	1	17-02-2023		TLM1	
30.	Induction Machines	1	27-02-2023		TLM1	
31	Permanent magnet machines	1	28-02-2023		TLM1	
32	Permanent magnet machines	1	02-03-2023		TLM1	
33.	Switched reluctance machines	1	03-03-2023		TLM1	
No. of classes required to complete UNIT-III		11				

UNIT-IV : ELECTRIC VEHICLE DRIVE TRAIN

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	Transmission Configuration	1	06-03-2023		TLM1	
35	Transmission Configuration	1	07-03-2023		TLM1	
36	Components	1	09-03-2023		TLM1	
37	gears	1	10-03-2023		TLM1	
38	differential	1	13-03-2023		TLM1	
39	clutch	1	14-03-2023		TLM1	
40	brakes	1	16-03-2023		TLM2	
41	Regenerative braking	1	17-03-2023		TLM1	
42	Regenerative braking	1	20-03-2023		TLM1	
43	Motor sizing	1	21-03-2023		TLM1	
44	Motor sizing	1	23-03-2023		TLM2	
No. of classes required to complete UNIT-IV		11				

UNIT-V: HYBRID ELECTRIC VEHICLES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45	Types	1	24-03-2023		TLM1	
46	Series	1	27-03-2023		TLM1	
47	Parallel and series	1	28-03-2023		TLM1	
48	Parallel configuration	1	31-03-2023		TLM1	
49	Design	1	03-04-2023		TLM1	

50	Drive train	1	04-04-2023		TLM2	
51	Sizing of components	1	06-04-2023		TLM2	
52	Revision	1	10-04-2023		TLM2	
53	Revision unit-I	1	11-04-2023		TLM2	
54	Revision unit-II	1	13-04-2023		TLM2	
55	Revision unit-III	1	17-04-2023		TLM2	
56	Revision unit-IV	1	18-04-2023		TLM2	
57	Revision unit-V	1	21-04-2023		TLM2	
No. of classes required to complete UNIT-V		13				

CONTENT BEYOND SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods
1		1	20-4-23		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 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 modeling 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 ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO4	Design controllers for electrical and electronic systems to improve their performance.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr P.Rathnakar Kumar**	**Mr P.Rathnakar Kumar**	**Dr.G.Nageswara Rao**	**Dr.J.S.Vara Prasad**
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 : 2022-23
COURSE NAME & CODE : Heat Transfer Lab &20ME62
L-T-P STRUCTURE : 0-0-3
COURSE CREDITS : 2
LABORATORY INSTRUCTORS : Dr. K.Dilip Kumar/A.Pratyush
LABORATORY INCHARGE : K.Lakshmi Prasad
PREREQUISITE SUBJECT: Thermodynamics, Thermal Engineering

COURSE EDUCATIONAL OBJECTIVES:

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:

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

CO1: Estimate the thermal conductivity of different materials and powders
CO2: Experiment both free and forced convection to predict heat transfer coefficient.
CO3: Validate the Stefan Boltzmann Constant and estimate emissivity of grey body.
CO4: Compare parallel and counter flow heat exchanger performance characteristics.

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	3	2	-	1	-	2	3	2	1	3	-	1
CO2	1	2	2	3	2	-	1	-	2	-	2	1	3	-	1
CO3	2	1	2	3	2	-	1	-	2	-	1	1	3	-	1
CO4	1	2	2	3	1	-	1	-	3	1	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: 2 A.Y:2022-23

S. No	Batch	EXP. No	0	1	2	3	4	5	6	7	8	9	10	11	12
		Date	26-12-2022	2-1-2023	9-1-2023	23-1-2023	30-1-2023	6-2-2023	13-2-2023	27-2-2023	6-3-2023	13-3-2023	20-3-2023	27-3-2023	10-4-2023
		Regd. No	CYCLE-I						CYCLE-2						
1	BATCH-I	20761A0383	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION	INTERNAL LAB TEST
2		20761A0384													
3		20761A0385													
4		20761A0386													
5		20761A0387													
6		20761A0388													
7	BATCH-2	20761A0389	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1		
8		20761A0390													
9		20761A0391													
10		20761A0392													
11		20761A0393													
12		20761A0394													
13	BATCH-3	20761A0395	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2		
14		20761A0396													
15		20761A0397													
16		20761A0398													
17		20761A0399													
18		20761A03A0													
19		21765A0320													

20	BATCH-4	21765A0321	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	REPETITION	INTERNAL LAB TEST
21		21765A0322													
22		21765A0323													
23		21765A0324													
24		21765A0325													
25		21765A0326													
26		21765A0327													
27	BATCH-5	21765A0328	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4		
28		21765A0329													
29		21765A0330													
30		21765A0331													
31		21765A0332													
32		21765A0333													
33		21765A0334													

LAB INCHARGE

COURSE: B.Tech **BRANCH: MECHANICAL** **SECTION: B-Sec (Wednesday)** **BATCH: 1** **A.Y:2022-23**

S.No	Batch	EXP. No	0	1	2	3	4	5	6	7	8	9	10	11	12
		Date	28-12-2022	4-1-2023	11-1-2023	18-1-2023	25-1-2023	1-2-2023	8-2-2023	15-2-2023	1-3-2023	15-3-2023	29-3-2023	12-4-2023	19-4-2023
		Regd. No	CYCLE-I						CYCLE-2						
1	BATCH-I	20761A0348	DEMO	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	REPETITION	INTERNAL LAB TEST
2		20761A0349													
3		20761A0350													
4		20761A0351													
5		20761A0352													
6		20761A0353													
7		20761A0354													
8	BATCH-2	20761A0355	DEMO	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1		
9		20761A0356													
10		20761A0357													
11		20761A0358													
12		20761A0359													
13		20761A0360													
14		20761A0361													
15	BATCH-3	20761A0362	DEMO	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2		
16		20761A0363													
17		20761A0364													
18		20761A0365													
19		20761A0366													
20		20761A0367													
21		20761A0368													

22	BATCH-4	20761A0369	DEMO	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	REPETITION	INTERNAL LAB TEST
23		20761A0370													
24		20761A0371													
25		20761A0372													
26		20761A0373													
27		20761A0374													
28		20761A0375													
29	BATCH-5	20761A0377	DEMO	HT-5	HT-1	HT-2	HT-3	HT-4	HT-5	HT-1	HT-2	HT-3	HT-4		
30		20761A0378													
31		20761A0379													
32		20761A0380													
33		20761A0381													
34		20761A0382													

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: B Sec Batch: 2020 A.Y: 2022-23

S.No	Cycle	Exp. Code	Name of the Experiment
1	CYCLE-I	DEMO	DEMONSTRATION
2		HT-1	Determination of Thermal Conductivity of Lagged Pipe (Glass wool).
3		HT-2	Determination of Thermal Conductivity of Insulating Powder(Asbestos)
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	Determination of Thermal Conductivity of given Liquid
7	CYCLE-II	HT-1	Heat Pipe Demonstration.
8		HT-2	Test on Pin-Fin Apparatus.
9		HT-3	Determination of Convective Heat Transfer Co-efficient of air in Natural Convection.
10		HT-4	Test on Emissivity Measurement Apparatus.
11		HT-5	(A) Test on Tube in Tube Parallel Flow Heat Exchanger. (B) Test on Tube in Tube Counter Flow Heat Exchanger.
12		REP	REPETITION
13		INT	INTERNAL LAB TEST

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)
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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.M.B.Satya Sreekara Reddy, Mr.A.Nageswara Rao, Ms P.Mounika 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/AB **A.Y.:** 2022-23

PREREQUISITE: Computer Aided Machine Drawing, CAD/CAM

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

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

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

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

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

SOFTWARE PACKAGES: CATIA /ANSYS / Iron CAD etc.

REFERENCES:

- Lab Manuals

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments (Section – A)

S.No	Batches	Regd. Nos	Total No. of Students
1	Batch B1	20761A0348-20761A03A0, 21765A0320-21765A0334	67

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	26-12-2022		TLM4	
Cycle-I						
2.	Design and Assembly Modeling of Knuckle joint using CAD software	3	02-01-2023		TLM4	
3.	Design and Assembly Modeling of Universal Coupling using CAD software	3	09-01-2023		TLM4	
4.	Design and Assembly Modeling of Piston, Connecting Rod parts using CAD software	3	23-01-2023		TLM4	
5.	Analysis of trusses using ANSYS	3	30-01-2023		TLM4	
6.	Analysis of Beams using ANSYS	3	06-02-2023		TLM4	
Cycle-II						
7.	Analysis of 3D solids using ANSYS	3	13-02-2023		TLM4	
8.	Steady state heat transfer analysis using ANSYS	3	27-02-2023		TLM4	
9.	Estimation of natural frequencies and mode shapes for simple problems using ANSYS	3	06-03-2023		TLM4	
10.	Development of NC code using CAM packages	3	13-03-2023		TLM4	
11.	Machining of simple components on CNC Turning by	3	20-03-2023		TLM4	

	transferring NC Code from CAM package					
12.	Machining of Simple components on CNC-Mill by transferring NC Code from CAM Package	3	27-03-2023		TLM4	
13.	Robot programming, simulation, and execution	3	03-04-2023		TLM4	
14.	Revision	3	10-04-2023		TLM4	
15.	Internal Exam	3	17-04-2023		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.
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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 (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

Laboratory Code : 20ME64 (R 20 Reg) **Lab: Robotics and Simulation Lab**
A.Y. : 2022-2023 **Class: B. Tech – VI Semester (Section – B)**
Lab/Practicals : 3 hrs/ Week **Continuous Internal Assessment** : 15
Credits : 02 **Semester End Examination** : 35
Name of the Faculty :Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)

COURSE EDUCATIONAL OBJECTIVES *(CEOs) and* COURSE OUTCOMES *(COs)*:

PRE-REQUISITES: Engineering Mechanics, Theory of Machines, Robotics.

COURSE EDUCATIONAL OBJECTIVES:
The main objective of this course is to demonstrate and analysis of various types of robots.

COURSE OUTCOMES: After completion of the laboratory, students will be able to

CO 1: Simulate forward and inverse kinematic movements of a robot using Robo Analyzer and MATLAB. (Understanding - L2)

CO 2: Perform the demo operations on SCARA and PUMA using Robo analyzer software.(Applying - L3)

CO 3: Experiment the robot operations like palletizing, gluing, spray painting, polishing, loading and Unloading. (Applying - L3)

CO 4: Develop Robot Programmes to use to control commands. (Analyzing - L4)

Mapping of COs with POs and PSOs:

LABORATORY COURSE ARTICULATION MATRIX (Correlation between COs and POs and PSOs):

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) & PSOs – Robotics and SimulationLab (20ME64)															
		POs											PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
COs	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: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)																

Lab instructor (s) **Head of the Department**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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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

Laboratory Code	**: 20ME64 (R 20 Reg)**	**Lab: Robotics and Simulation Lab**	
A.Y.	**: 2022-2023**	**Class: B. Tech – VI Semester (Section – B)**	
Lab/Practicals	**: 3 hrs/ Week**	**Continuous Internal Assessment**	**: 15**
Credits	**: 02**	**Semester End Examination**	**: 35**
Name of the Faculty	**: Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)**		

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 analyze 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):

PSO1: To apply the principles of thermal sciences to design and develop various thermal systems.

PSO2: 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.

PSO3: 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.

Lab instructor (s) **Head of the Department**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code : **20ME64 (R 20 Reg)Lab: Robotics and Simulation Lab**
A.Y. : **2022-2023** **Class: B. Tech – VI Semester (Section – B)**
Lab/Practicals : **3 hrs/ Week** **Continuous Internal Assessment : 15**
Credits : **02** **Semester End Examination : 35**
Name of the Faculty : **Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)**

LIST OF EXPERIMENTS

At least 10 Experiments from 16 overall should be conducted

LIST OF EXPERIMENTS:

1. Study the anatomy of robots.
2. Analysis of robot configuration and Simulation of Robot with 2 Dof, to6 Dof using Robo Analyzer.
3. Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer.
4. D-H parametric representation of various robotic arms using Robo Analyzer.
5. Dynamic analysis of robot using Robo Analyzer.
6. Simulation of SCARA, PUMA using Robo Aanlyzer.
7. Program for commands like a line command, circle command.
8. Program for commands SPLINE command (continues path).
9. Program for Point to Point (PTP) command.
10. Palletizing.
11. Loading/Unloading.
12. Gluing.
13. Spray painting.
14. Polishing.
15. Simulate forward and inverse kinematics RR Manipulator using MATLAB.
16. Simulate forward and inverse kinematics RP Manipulator using MATLAB. SOFTWARE PACKAGES: ARISTO ROBOT, C Prog, Robo Analyzer, MAT Lab

SOFTWARE PACKAGES

ARISTO ROBOT, ROBOANALYZER, MATLAB, C Prog

REFERENCE: Robotics and Simulation Lab Manual

Lab instructor (s) **Head of the Department**

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A.Y.	**: 2022-2023**	**Class: B. Tech – VI Semester (Section – B)**	
Lab/Practicals	**: 3 hrs/ Week**	**Continuous Internal Assessment**	**: 15**
Credits	**: 02**	**Semester End Examination**	**: 35**
Name of the Faculty	**: Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)**		

Notification of Cycles (Section –A)

At least TEN experiments may be conducted.

Cycle – I

1. Study the anatomy of robots.
2. Analysis of robot configuration and Simulation of Robot with 2 Dof, to6 Dof using Robo Analyzer.
3. Forward and Inverse Kinematics Analysis of Robot using Robo Analyzer.
4. D-H parametric representation of various robotic arms using Robo Analyzer.
5. Dynamic analysis of robot using Robo Analyzer.
6. Simulation of SCARA, PUMA using Robo Aanlyzer.
7. Program for commands like a line command, circle command.
8. Program for commands SPLINE command (continues path).

Cycle – II

9. Program for Point to Point (PTP) command.
10. Palletizing.
11. Loading/Unloading.
12. Gluing.
13. Spray painting.
14. Polishing.
15. Simulate forward and inverse kinematics RR Manipulator using MATLAB.
16. Simulate forward and inverse kinematics RP Manipulator using MATLAB. SOFTWARE

SOFTWARE PACKAGES

ARISTO ROBOT, ROBOANALYZER, MATLAB

Lab instructor (s) **Head of the Department**

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DEPARTMENT OF MECHANICAL ENGINEERING

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A.Y. : 2022-2023 — **Class: B. Tech – VI Semester (Section – B)**

Lab/Practicals : 3 hrs/ Week — **Continuous Internal Assessment** : 15

Credits : 02 — **Semester End Examination** : 35

Name of the Faculty : Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)

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

↓Day/Date →	*9.00 – 9.50*	*9.50-10.40*	*10.50-11.40*	*11.40-12.30-*	*12.30-1.30*	*1.30-2.20*	*2.20-3.10*	*3.10-4.00*
Monday	*R/S LAB VI-B SEC*				*LUNCH BREAK*			
Tuesday								
Wednesday						*R/S LAB VI-B SEC*		
Thursday								
Friday								
saturday								

Faculty – In Charges:

S.No	Class	Section	Lab Assistant	Faculty – In Charge
1	B.Tech – VI Semester	*B / S*	Mr. P. Guna Sundar Reddy	Dr.Ch.Siva Sankara Babu Mr.K.Karthik

Lab instructor (s) **Head of the Department**

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DEPARTMENT OF MECHANICAL ENGINEERING

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A.Y. : 2022-2023 **Class: B. Tech – VI Semester (Section – B)**
Lab/Practicals : 3 hrs/ Week **Continuous Internal Assessment** : 15
Credits : 02 **Semester End Examination** : 35
Name of the Faculty : Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)

Batches (Section – B)

S.No	Batches	Regd.Nos	Total No. of Students
1	B. Tech –VI Sem - B/S	20761A0348 to 21765A0334	67
2	Batch B1	20761A0348-364,20761A0365-382	34
3	Batch B2	20761A0383-398,20761A0399-21765A0334	33

Sub Batch of B11:
20761A0348-364 (17)

S. No	Batch	Registered Nos	Total
1	B111	20761A0348-350	03
2	B112	20761A0351-353	03
3	B113	20761A0354-356	03
4	B114	20761A0357-359	03
5	B115	20761A0360-362	03
6	B116	20761A0363-364	02
Total (B11)			17

Sub Batch of B12:
20761A0365-381 (17)

S. No	Batch	Registered Nos	Total
1	B121	20761A0365-367	03
2	B122	20761A0368-370	03
3	B123	20761A0371-373	03
4	B124	20761A0374-376	03
5	B125	20761A0377-379	03
6	B126	20761A0380-381	02
Total (B12)			17

Sub Batches of B21:
20761A0383-398 (16)

S. No	Batch	Registered Nos	Total
1	B211	20761A0382-384	03
2	B212	20761A0385-387	03
3	B213	20761A0388-390	03
4	B214	20761A0391-393	03
5	B215	20761A0394-396	02
6	B216	20761A0397-398	02
Total (B21)			16

Sub Batches of B22:
20761A0399-21765A0334 (17)

S. No	Batch	Registered Nos	Total
1	B221	20761A0399-21-320	03
2	B222	21765A0321-323	03
3	B223	21765A0324-326	03
4	B224	21765A0327-329	03
5	B225	21765A0330-332	03
6	B226	21765A0333-334	02
Total (B22)			17

Lab instructor (s) **Head of the Department**

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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code : **20ME64 (R 20 Reg)** **Lab: Robotics and Simulation Lab**
A.Y. : **2022-2023** **Class: B. Tech – VI Semester (Section – B)**
Lab/Practicals : **3 hrs/ Week** **Continuous Internal Assessment : 15**
Credits : **02** **Semester End Examination : 35**
Name of the Faculty : **Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)**

Schedule of Experiments (Section – B: B1 Batch)

S.No	Batches	Regd. Nos	Total No. of Students
1	**Batch B1**	**20761A0348-364,20761A0365-382**	**34**

S.No.	Name of the experiment	No. of Classes Required	Tentative Date of Completion	Teaching Learning Methods
1	**Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory**	3	26-12-2022	TLM4
Cycle I				
2	Program for commands like joint command, circle command	3	2-01-2023	TLM4
3	Program for commands SPLINE command (continues path)	3	9-01-2023	TLM4
4	Program for PTP command	3	11-01-2023	TLM4
5	Palletizing	3	30-01-2023	TLM4
6	Loading / Unloading	3	6-02-2023	TLM4
Cycle II				
7	Gluing	3	13-02-2023	TLM4
8	Spray painting, Polishing	3	27-02-2023	TLM4
	I Mid Exams	20-02-2023 to 25-02-2023		
9	Simulation of Robot with 2 Dof, 3 Dof, 4 Dof using ROBOANALYZER	3	6-03-2023	TLM4
10	Simulation of SCARA, PUMA using ROBOANALYZER	3	13-03-2023	TLM4
11	Simulate forward and inverse kinematics RR Manipulator using MATLAB	3	20-03-2023	TLM4
12	Simulate forward and inverse kinematics RP Manipulator using MATLAB	3	27-03-2023	TLM4
13	Design of Robotic System	3	3-04-2023	TLM4
14	Revision	3	10-04-2023	TLM4
15	Internal Exam	3	17-04-2023	TLM4
	II Mid Exams	24-04-2023 to 29-04-2023		
	Preparation and Practicals	01-05-2023 to 06-05-2023		
	Semester End Exams	08-05-2023 to 20-05-2023		

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Laboratory Code : 20ME64 (R 20 Reg) **Lab: Robotics and Simulation Lab**
A.Y. : 2022-2023 **Class: B. Tech – VI Semester (Section – B)**
Lab/Practicals : 3 hrs/ Week **Continuous Internal Assessment** : 15
Credits : 02 **Semester End Examination** : 35
Name of the Faculty : Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)

Schedule of Experiments (Section – B: B2 Batch)

S.No	Batches	Regd.Nos	Total No. of Students
1	Batch B2	20761A0383-398,20761A0399-21765A0334	33

S.No.	Name of the experiment	No. of Classes Required	Tentative Date of Completion	Teaching Learning Methods
1	**Introduction to Robotics and Simulation Lab, Demonstration of all experiments, CEOs, and COs of the Laboratory**	3	29-12-2022	TLM4
Cycle I				
2	Program for commands like joint command, circle command	3	4-01-2023	TLM4
3	Program for commands SPLINE command (continues path)	3	11-01-2023	TLM4
4	Program for PTP command	3	18-01-2023	TLM4
5	Palletizing	3	25-01-2023	TLM4
6	Loading / Unloading		1-02-2023	TLM4
7	Gluing	3	8-02-2023	TLM4
8	Circular Motion	3	15-02-2023	TLM4
Cycle II				
9	Spray painting, Polishing	3	1-03-2023	TLM4
10	Simulation of Robot with 2 Dof, 3 Dof, 4 Dof using ROBOANALYZER	3	8-03-2023	TLM4
	I Mid Exams	20-02-2023 to 25-02-2023		
11	Simulation of SCARA, PUMA using ROBOANALYZER	3	15-03-2023	TLM4
12	Simulate forward and inverse kinematics RR Manipulator using MATLAB	3	22-03-2023	TLM4
13	Simulate forward and inverse kinematics RP Manipulator using MATLAB	3	29-03-2023	TLM4
14	Welding Applications	3	5-04-2023	TLM4
15	Collaboration of Robots	3	12-04-2023	TLM4
16	Revision	3	12-04-2023	TLM4
17	Internal Exam	3	19-04-2023	TLM4
	II Mid Exams	24-04-2023 to 29-04-2023		
	Preparation and Practicals	01-05-2023 to 06-05-2023		
	Semester End Exams	08-05-2023 to 20-05-2023		

Lab instructor (s) **Head of the Department**

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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code : **20ME64 (R 20 Reg)** **Lab: Robotics and Simulation Lab**
A.Y. : **2022-2023** **Class: B. Tech – VI Semester (Section – B)**
Lab/Practicals : **3 hrs/ Week** **Continuous Internal Assessment : 15**
Credits : **02** **Semester End Examination : 35**
Name of the Faculty : **Dr.Ch.Siva Sankara Babu(Sr.Assistant Professor)/Mr.K.Karthik(Assistant Professor)**

Evaluation Criterion for Laboratory

EVALUATION PROCESS:

Evaluation Task	COs	Max. Marks
Day – to – Day Evaluation	**1,2,3,4**	**A=5**
Mid Examination	**1,2,3,4**	**B=5**
Viva-Voce	**1,2,3,4**	**C=5**
Attendance: D (≥95% =**5M**; 90%≤A<95%=**4M;** 85%≤A<90%=**3M;** 80%≤A<85%=**2M;** 75%≤A<80%=**1M; <75%=0M)**	-	-
Cumulative Internal Examination (CIE): A+B+C	**1,2,3,4**	**A+B+C=15**
Semester End Examinations (SEE): D	**1,2,3,4**	**D=35**
Total Marks: CIE + SEE = A+B+C+D	**1,2,3,4**	**50**

Lab instructor (s) **Head of the Department**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

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

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

Name of Course Instructor : Dr. Sujith Kumar Rath& Mr. B Sagar
Course Name & Code : Soft skills & soft skills Laboratory (20HSS1)
L-T-P Structure : 0-0-1+2 Credit : 2
Program/Sem/Sec : B.Tech.,MECH-A&B , VI-Sem., A.Y: 2022-23

Course Description & Objectives:

The Soft Skills Laboratory course equips students with required behavioural, 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	**Infer** the self awareness and personality **(Understand – L2)**
CO2	Work effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.**(Apply – L3)**
CO3	Communicate through verbal/oral communication and improve the listening skills**(Apply – L3)**
CO4	**Relate** thecritical & lateral thinking while dealing with personal/social/professional issues. **(Apply – L3)**

Course Content:

Personality Development Skills

Role of language in Personality – How language reflects, impactsPersonality – Using gender-neutral language in MNCs – being culturally-sensitive-Personality Traits- Grooming & Dress code

Activities: Group Discussion/Role play/Presentations (authentic materials: News papers, pamphlets and news clippings)

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

ProfessionalSkills:

Career Planning- job vs. career- goal setting- SWOT analysis-Timemanagement – 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.

REFERENCEBOOKS:

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

MECH-A

S.No.	No. of Lecture Hours	Date	Planned Topics	Actual Date	HOD Sign Weekly
1	1	30-12-22	Role of language in personality		
2	2	30-12-22	Extempore		
3	1	06-01-23	How language reflects, impacts Personality		
4	2	06-01-23	Story Telling		
5	1	20-01-23	Using gender-neutral language in MNCs		
6	2	20-01-23	Case Studies		
7	1	27-01-23	Being culturally-sensitive-Personality Traits- Grooming & Dress code		
8	2	27-01-23	Using authentic materials: News papers, pamphlets and news clippings		
9	1	03-02-23	Career Planning		
10	2	03-02-23	Public Speaking		
11	1	10-02-23	Job vs. career- goal setting		
12	2	10-02-23	Critical Appreciation and Textual Analysis		
13	1	17-02-23	SWOT analysis		
14	2	17-02-23	Writing a review on a given short story/videos/book		
15	1	03-03-23	Time management		
16	2	03-03-23	Empathetic speaking		

17	1	10-03-23	Self-management		
18	2	10-03-23	Telephonic conversation		
19	1	17-03-23	Stress-management		
20	2	17-03-23	Situation based dialogues		
21	1	24-03-23	Effective Resume-Writing and presentation		
22	2	24-03-23	Listening to dialogues and analyzing		
23	1	31-03-23	Interview Skills		
24	2	31-03-23	Pronunciation Practice		
25	1	21-04-23	Body Language, Postures, Gestures, Eye contact		
26	2	21-04-23	Mock interviews		

MECH-B

S.No.	No. of Lecture Hours	Date	Planned Topics	Actual Date	HOD Sign Weekly
1	1	31-12-22	Role of language in personality		
2	2	27-12-22	Extempore		
3	1	07-01-23	How language reflects, impacts Personality		
4	2	03-01-23	Story Telling		
5	1	21-01-23	Using gender-neutral language in MNCs		
6	2	10-01-23	Case Studies		
7	1	28-01-23	Being culturally-sensitive-Personality Traits- Grooming & Dress code		
8	2	24-01-23	Using authentic materials: News papers, pamphlets and news clippings		
9	1	04-02-23	Career Planning		
10	2	31-01-23	Public Speaking		
11	1	11-02-23	Job vs. career- goal setting		
12	2	07-02-23	Critical Appreciation and Textual Analysis		

13	1	04-03-23	SWOT analysis		
14	2	28-02-23	Writing a review on a given short story/videos/book		
15	1	11-03-23	Time management		
16	2	07-03-23	Empathetic speaking		
17	1	18-03-23	Self-management		
18	2	14-03-23	Telephonic conversation		
19	1	25-03-23	Stress-management		
20	2	21-03-23	Situation based dialogues		
21	1	01-04-23	Effective Resume-Writing and presentation		
22	2	04-04-23	Listening to dialogues and analyzing		
23	1	08-04-23	Interview Skills		
24	2	11-04-23	Pronunciation Practice		
25	1	15-04-23	Body Language, Postures, Gestures, Eye contact		
26	2	18-04-23	Mock interviews		

Signature of Faculty

Signature of HOD