



DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech, VII Sem., Mechanical Engineering
ACADEMIC YEAR	: 2023-24
COURSE NAME & CODE	: Automobile Engineering-20ME29
L-T-P STRUCTURE	: 3 (L) – 0 (T) – 0 (P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Dr. P.Ravindra Kumar
COURSE COORDINATOR	: Dr. P.Ravindra Kumar
RE-REQUISITES	: Thermodynamics, Internal Combustion Engines

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to make students learn about automobile layout, Engine Emissions, working of Transmission system, Steering system, Suspension system, Braking system, Fuel system and different Electrical systems.

COURSE OUTCOMES (COs)

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

- CO1** List the basic components of Automobile (Remembering –L1).
- CO2** Differentiate the fuel supply systems in petrol and diesel engines. (Understanding – L2).
- CO3** Comprehend the functions of various electrical systems in automobiles. (Understanding –L2).
- CO4** Distinguish various transmission systems, wheels, and tyres. (Understanding –L2)
- CO5** Compare various types of Steering systems, Braking systems, and Suspension systems. (Understanding –L2)

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	-	1
CO3	1	2	2	-	-	-	-	-	-	-	-	2	2	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-	2
CO5	2	2	-	-	-	-	-	-	-	-	-	2	2	-	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).

BOS APPROVED TEXTBOOKS:

- T1 Dr. Kirpal Singh, Automobile Engineering-Vol I & II, 13th Edition, Standard Publishers Distributors, 2014.
- T2 R.B.Gupta, Automobile Engineering, 8th edition, Tech India publication series, 2013.

BOS APPROVED REFERENCE BOOKS:

- R1 V.A.W Hillier and David R. Rogers, Hillier’s Fundamentals of Motor Vehicle Technology, Book1, 5th Edition- 2007.
- R2 Heinz Heisler, Advanced Vehicle Technology, 2nd Edition, Butterworth-Heinemann Series, 2002.
- R3 David A Crolla, Automotive Engineering, 1st Edition, Butterworth-Heinemann series, 2009.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: INTRODUCTION, ENGINE CONSTRUCTION, ENGINE EMISSIONS AND CONTROL

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction to CO's and PO's	1	03.07.2023		TLM1/ TLM2	CO1	T1, T2	
2.	Introduction- Components of an Automobile and its classification	1	04.07.2023		TLM1/ TLM2	CO1	T1, T2	
3.	Chassis, Frame-Types, Specifications of Automobiles, Types of Automobiles	1	05.07.2023		TLM1/ TLM2/ TLM5	CO1	T1	
4.	Rear wheel drive, front wheel drive and four-wheel drive	1	05.07.2023		TLM1/ TLM2/ TLM4	CO1	T1	
5.	ENGINE CONSTRUCTION: Basic terminology and working of engines	1	06.07.2023		TLM1/ TLM2	CO1	T1	
6.	Engine construction Details- Cylinder Block and Crankcase- Cylinder Head- Oil Pan- Manifolds- Gaskets- Cylinder Liners- Piston- Connecting Rod- Engine Valves,	2	10.07.2023		TLM1/ TLM2/ TLM6	CO1	T1, T2	
7.	Firing Order, Turbo charging.	1	11.07.2023		TLM1/ TLM2	CO1	T2	
8.	ENGINE EMISSIONS AND CONTROL: Emissions from Automobiles, Nitrogen oxides, Soot, Carbon monoxide, Hydrocarbons,	1	12.07.2023		TLM2/ TLM5	CO1	T1, T2	
9.	Emission Regulations	1	12.07.2023		TLM2	CO1	T1, T2	
10.	Types of pollutants in SI engines.	1	13.07.2023		TLM2	CO1	T1, T2	
11.	Types of pollutants in CI Engines.	1	17.07.2023		TLM2	CO1	T1, T2	
12.	Thermal converters	1	18.07.2023		TLM4/ TLM5	CO1	T1, T2	
13.	Three-way catalytic converters, EGR.	1	19.07.2023		TLM4/ TLM5	CO1	T1, T2	
14.	Class seminar	1	19.07.2023		TLM1/ TLM2/ TLM5	CO1		
No. of classes required to complete UNIT-I: 14					No. of classes taken:			

UNIT-II: ENGINE SERVICING, FUEL SUPPLY SYSTEM IN PETROL& DIESEL ENGINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	ENGINE SERVICING: Engine Removal, Cylinder Head, Gaskets, Valves, Piston-connecting Rod Assembly.	2	20.07.2023 24.07.2023		TLM1/ TLM2/ TLM6	CO2	T1, T2	
2.	Fuel Supply system in petrol engines- Fuel pump, fuel gauge, simple carburetor-defects	1	25.07.2023		TLM1/ TLM2	CO2	T1, T2	
3.	Zenith carburetor, SU carburetor	1	26.07.2023		TLM1/ TLM2	CO2	T1, T2	
4.	FUEL SUPPLY SYSTEMS IN PETROL & DIESEL ENGINES. Petrol Injection-Types, Mechanical injection system	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
5.	Electronic injection systems.	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
6.	Types of Injection systems in Diesel Engines	1	28.07.2023		TLM1/ TLM2	CO2	T1, T2	
7.	Fuel filters, Air filters,	1	31.07.2023		TLM1/ TLM2	CO2	T1	
8.	Fuel injection pumps	1	01.08.2023		TLM1/ TLM2	CO2	T1	
9.	Air cleaners	1	02.08.2023		TLM1/ TLM2	CO2	T1	
10.	Jerk type pump	1	02.08.2023		TLM1/ TLM2	CO2	T1	
11.	Governors-Types	1	03.08.2023		TLM1/ TLM2	CO2	T2	
12.	Class seminar	1	07.08.2023		TLM1/ TLM2/ TLM5	CO2		
No. of classes required to complete UNIT-II: 12					No. of classes taken:			

UNIT-III: IGNITION SYSTEM, CHARGING SYSTEM & STARTING SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	IGNITION SYSTEM: Types of Ignition systems	1	08.08.2023		TLM1/ TLM2	CO3	T1	
2.	Battery Ignition system- Components of Battery Ignition system, Ignition timing, Spark plug,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	

3.	Magneto Ignition system,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
4.	Electronic Ignition system-	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
5.	Capacitive discharge Ignition system	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
6.	CHARGING SYSTEM & STARTING SYTEMS: Batteries- Types- Lead acid battery	1	14.08.2023		TLM1/ TLM2	CO3	T1, T2	
7.	Charging system- Introduction- Principle of Generator	1	15.08.2023		TLM1/ TLM2	CO3	T1, T2	
8.	Constructional details, Generator output control	1	16.08.2023		TLM1	CO3	T1, T2	
9.	Starting Motor, Starting drives,	1	16.08.2023		TLM2	CO3	T1, T2	
10.	Bendix drive Mechanism,	1	17.08.2023		TLM1/ TLM2	CO3	T1, T2	
11.	Solenoid switch operation.	1	22.08.2023		TLM2	CO3	T1, T2	
12.	Class seminar	1	23.08.2023		TLM1/ TLM2/ TLM5	CO3	T1, T2	
13.	Revision		24.08.2023		TLM5	CO3	T1, T2	
No. of classes required to complete UNIT-I: 13					No. of classes taken:			

UNIT-IV: TRANSMISSION SYSTEM, WHEELS, AND TYRES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	TRANSMISSION SYSTEM: Clutches- Introduction, Types, Single plate clutch,	1	04.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
2.	Multi plate Clutch, Centrifugal clutch, Fluid Fly wheel,	1	05.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
3.	Necessity of Transmission, Types of Transmission,	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
4.	Sliding Mesh Gear Box.	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
5.	Constant Mesh gear box, Propeller shaft	1	07.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
6.	Torque convertor	1	11.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
7.	Final drive, Differential	1	12.09.2023		TLM1/ TLM2	CO4	T1, T2	

8.	Rear axle drives.	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
9.	WHEELS AND TYRES: Types of Wheels, Wheel dimensions	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
10.	Tyre- Types of Tyres, Carcass types, Tyre Materials, Tyre designations.	1	14.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
11.	Advances in Transmission system.	1	14.09.2023		TLM5	CO4	T1, T2	
12.	Seminar	1	18.09.2023		TLM5	CO4	T1, T2	
No. of classes required to complete UNIT-I:-12					No. of classes taken:			

UNIT-V: FRONT AXLE AND STEERING, SUSPENSION SYSTEM, BRAKING SYSTEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Front Axle and Steering- Front Axle, Types of stub axle,	1	18.09.2023		TLM1/ TLM2	CO5	T1, T2	
2.	Wheel alignment, Steering geometry- Camber- Kingpin inclination	1	19.09.2023		TLM1/ TLM2	CO5	T1	
3.	Combined angle and scrub radius- Castor- Toe in and Toe out,	1	20.09.2023		TLM1/ TLM2	CO5	T1	
4.	Understeer and Oversteer, Power steering,	1	20.09.2023		TLM1/ TLM2/ TLM5	CO5	T2	
5.	Steering Linkages, Steering gears.	1	21.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
6.	SUSPENSION SYSTEM: Introduction, Types of Suspension springs, Leaf springs, Coil springs, Torsion bars,	1	25.09.2023		TLM1/ TLM2	CO5	T1, T2	
7.	Shock Absorbers, Independent suspension- Types,	1	26.09.2023		TLM1/ TLM2	CO5	T1, T2	
8.	Air-suspension system	1	27.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
9.	BRAKING SYSTEM: Braking Requirements	1	27.09.2023		TLM1/ TLM2	CO5	T1, T2	
10.	Sensors	1	28.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	

11.	Types of Brakes, Drum brakes and Disc Brakes,	1	03.10.2023		TLM1/ TLM2	CO5	T1, T2		
12.	Hydraulic Brakes,	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2		
13.	Air brakes, Anti-lock braking systems.	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2		
14.	Class seminar	1	05.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2		
No. of classes required to complete UNIT-I: 14					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	Textbook followed	HOD Sign
1.	Sensors in Electric Vehicle Latest trends in wheels and tires, Plug in Hybrid Electric Vehicles	2	25.10.2023 25.10.2023 26.10.2023		TLM2/ TLM5	CO1 -CO5	T1, T2, R1 to R5	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 21.02.2022			
I Phase of Instructions	03.07.2023	26.08.2023	8
I Mid Examinations	28.08.2023	02.09.2023	1
II Phase of Instructions	04.09.2023	28.10.2023	8
II Mid Examinations	30.10.2023	04.11.2023	1
Preparation and Practical	06.11.2023	11.11.2023	1
Semester End Examinations	13.11.2023	25.11.2023	2

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment – Cycle -I	1,2,3	A1=05
Quiz – 1	1,2,3	Q1=10
Assignment – Cycle -II	3,4,5	A2=05
Quiz – 2	3,4,5	Q2=10
I-Mid Examination	1,2,3	B1=15
II-Mid Examination	3,4,5	B2=15
Evaluation of Assignment/Quiz Marks: $A = (\text{Cycle -I} + \text{Cycle - II})/2$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B = 80\% \text{ of Max (B1, B2) + } 20\% \text{ of Min(B1, B2)}$	1,2,3,4,5	B=20
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	A+B+Q=30
Semester End Examinations: E	1,2,3,4,5	E=70
Total Marks: A+B+Q+E	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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.

PROGRAMME 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 contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.

7. Environment and sustainability: Understand the impact of 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 engineering practice.

9. Individual and teamwork: 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.

Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name	Dr. P.Ravindra Kumar	Dr. P.Ravindra Kumar	Dr. P.Vijay Kumar	Dr. S. PACHI REDDY
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B RAMA KRISHNA

Course Name & Code : Disaster Management & 20CE82

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

Credits: 3

Program/Sem/Sec : B.Tech, VII SEM, Mechanical - A

A.Y.: 2023-24

PREREQUISITE: NIL

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

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

CO1	Identify the basic terms, types of disasters and their impact (Understand - L2)
CO2	Illustrate the role of technology in handling disaster management situations(Understand-L2)
CO3	Identify the stake-holders concerned and design the different action plans for responding in case of disaster occurrence (Understand - L2)
CO4	Evaluate the importance of education and community approach for the responsive actions to be taken in case of disaster occurrence (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	1	1	-	1	2	1	-	-	-	-	-	1	2	1	2	
CO2	1	1	1	2	2	1	-	-	-	-	-	1	2	1	2	
CO3	1	-	-	1	2	1	1	1	-	-	-	1	1	1	2	
CO4	1	-	-	1	1	1	1	1	1	1	1	1	1	1	2	
	1 - Low			2 -Medium					3 - High							

TEXTBOOKS:

- T1** Tushar Bhattacharya, "Disaster Science and Management", Tata McGraw Hill Publications, New Delhi, 2012.
- T2** R.Subramanian, "Disaster Management", Vikas Publishing house Pvt. Ltd, 2022.

REFERENCE BOOKS:

- R1** G.K. Ghosh, "Disaster Management", APH Publishing Corporation, 2006.
- R2** U.K. Chakrabarty, "Industrial Disaster Management and Emergency Response", Asian Books Pvt. Ltd., New Delhi 2007.
- R3** H K Gupta (Ed.), "Disaster Management", Universities Press, 2003
- R4** W.N. Carter, "Disaster Management: A Disaster Management Handbook", Asian Development Bank, Bangkok, 1991.
- R5** Government of India website on Disaster Management: www.ndmindia.nic.in

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: DEFINITIONS & TYPES OF DISASTER

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction CO's & PO's, Subject	1	03-07-2023		TLM2	
2.	Definitions – types of Disasters	3	04-07-2023 05-07-2023 07-07-2023		TLM2	
3.	Concept of disaster management - Disaster Management Cycle	1	10-07-2023		TLM2	
4.	Vulnerability -	1	11-07-2023		TLM2	
5.	Mitigation	1	12-07-2023		TLM2	
6.	Various types of disasters: Natural: Drought, cyclone	1	14-07-2023		TLM2	
7.	Earthquake and landslides.	1	15-07-2023		TLM2	
8.	Manmade and Industrial: Engineering and Technical failure	1	17-07-2023		TLM2	
9.	Nuclear and Chemical disasters	1	18-07-2023		TLM2	
10.	Accident-Related Disasters	1	19-07-2023		TLM2	
11.	High Power Committee on Disaster Management in India	1	21-07-2023		TLM2	
12.	Disaster Management Act 2005	1	22-07-2023		TLM2	
13.	Tutorial- 1/ Quick revision	1	24-07-2023		TLM3	
14.	Revision	1	25-07-2023		TLM3	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: IMPACT OF DISASTERS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Impact due to – Earthquake	1	26-07-2023		TLM2	
16.	Impact due to – Cyclone	1	28-07-2023		TLM2	
17.	Landslides, Fire hazards	1	31-07-2023		TLM2	
18.	Life & livestock, Habitation	1	01-08-2023		TLM2	
19.	Agriculture & livelihood loss- Health hazards	2	02-08-2023 04-08-2023		TLM2	
20.	Malnutrition problems- Contamination of water	1	05-08-2023		TLM2	
21.	Impact on children	1	07-08-2023		TLM2	
22.	Environmental loss	1	08-08-2023		TLM2	
23.	Tutorial- 2/ Quick revision	1	09-08-2023		TLM3	
24.	Revision	1	11-08-2023		TLM3	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III: ROLE OF TECHNOLOGY IN DISASTER MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Role of remote sensing	1	14-08-2023		TLM2	
26.	information systems and decision	1	16-08-2023		TLM2	

	making tools				
27.	mitigation programme for earthquakes	1	18-08-2023		TLM2
28.	Geospatial information in agriculture	2	19-08-2023 21-08-2023		TLM2
29.	drought assessment	1	22-08-2023		TLM2
30.	Disaster management for infra structures - electrical substations	1	23-08-2023		TLM2
31.	Roads and bridges	1	25-08-2023		TLM2
32.	Multimedia technology in disaster risk management and training	1	26-08-2023		TLM2
33.	Transformable indigenous knowledge in disaster reduction.	3	04-09-2023 05-09-2023 08-09-2023		TLM2
34.	Tutorial- 3/ Quick revision	1	11-09-2023		TLM3
No. of classes required to complete UNIT-III: 13				No. of classes taken:	

UNIT-IV: PLANNING & RISK PREVENTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
MID - I Examination		28.08.2023 - 02.09.2023				
35.	Planning, early warning system	1	12-09-2023		TLM2	
36.	crisis intervention and management	1	13-09-2023		TLM2	
37.	Response and Rehabilitation after Disasters	1	15-09-2023		TLM2	
38.	temporary shelter – food and nutrition- safe drinking water	2	16-09-2023 19-09-2023		TLM2	
39.	response to drought	2	20-09-2023 22-09-2023		TLM2	
40.	rehabilitation after cyclones	1	23-09-2023		TLM2	
41.	response to river erosion	1	25-09-2023		TLM2	
42.	response after earthquake	1	26-09-2023		TLM3	
43.	response after Tsunami- Hunger and Disaster	1	27-09-2023		TLM2	
44.	Tutorial- 4/ Quick revision	1	30-09-2023		TLM3	
45.	Revision	1	03-10-2023		TLM3	
No. of classes required to complete UNIT-IV: 12				No. of classes taken:		

UNIT-V: EDUCATION AND COMMUNITY PREPAREDNESS & CASE STUDIES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Essentials of disaster education –	1	04-10-2023		TLM2	
47.	school awareness and safety programs	1	06-10-2023		TLM2	
48.	Community based disaster recovery – voluntary agencies	1	07-10-2023		TLM2	
49.	Community participation at various stages of disaster management	1	09-10-2023		TLM1	
50.	Building community capacity for action	1	10-10-2023		TLM1	
51.	Corporate sector and disaster risk reduction	1	11-10-2023		TLM1	
52.	A community focused approach	1	13-10-2023		TLM2	
53.	Case studies on different disasters in the world	3	16-10-2023 17-10-2023 18-10-2023		TLM2	

54.	Impacts, Technology usage	1	20-10-2023		TLM3
55.	Risk prevention, Education and community preparedness	1	21-10-2023		TLM2
56.	Tutorial- 5/ Quick revision	1	24-10-2023		TLM3
57.	Revision		25-10-2023 27-10-2023 28-10-2023		TLM3
MID - II Examination		30.10.2023 - 04.11.2023			
No. of classes required to complete UNIT-V: 13				No. of classes taken:	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

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

Title	Course Instructor	Module Coordinator	Head of the Department
Name of the Faculty	B. Rama krishna	Dr. J.V.Rao	Dr. Ramakrishna
Signature			



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B.Sudheer Kumar

Course Name & Code : FINITE ELEMENT ANALYSIS & 20ME26

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

Credits: 3

Program/Sem/Sec : B.Tech/VI/A&B

A.Y.: 2023-24

PREREQUISITE: Mechanics of Solids, Heat Transfer

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to understand the principles of finite elements and to develop finite models for engineering applications.

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

CO1	Formulate the equilibrium equations for solving static engineering problems.(Applying-L3)
CO2	Compute the characteristics of flexural elements under different loading conditions. (Applying-L3)
CO3	Analyze 2-D structures with iso-parametric elements along with Axi-symmetric problems.(Analyzing-L4)
CO4	Apply the finite element techniques for solving thermal problems of different geometries.(Applying-L3)
CO5	Compute the Eigen values and vectors for bar and beam elements for dynamic analysis. (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	3	2	3	-	3	-	-	-	-	3	2	-	-	3
CO2	2	2	2	3	3	3	-	-	-	-	3	2	-	-	3
CO3	2	3	2	2	3	3	-	-	-	-	3	2	-	-	3
CO4	3	2	2	3	-	3	-	-	-	-	3	2	-	3	
CO5	2	2	2	3	3	3	-	-	-	-	3	2	-	-	3
	1 - Low			2 -Medium				3 - High							

BOS APPROVED TEXT BOOKS:

- T1.** 1. Chandraputla, Ashok and Belegundu, Introduction to Finite Elements in Engineering, 6th edition, Prentice-Hall,2014.
- T2.** S.S Rao, The Finite Element Methods in Engineering 6th edition, B.H.Pergamon.2013

BOS APPROVED REFERENCE BOOKS:

- R1** SS Bhavikatti, Finite Element Analysis, New Age International Publishers 3rd edition 2005.
- R2** JN. Reddy, An introduction to Finite Element Method, 3rd edition, Mc Graw Hill, 2011.
- R3.** George R. Buchanan and R. Rudra Moorthy, Finite Element Analysis, Tata Mc Graw Hill,2006.

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: ONE DIMENSIONAL PROBLEM**

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 Finite Element Method	1	03-07-2023		TLM1	
2.	Equilibrium equations in elasticity, Stresses in typical element, Stresses& equilibrium	1	04-07-2023		TLM1	
3.	Strain displacement relations, Stress strainrelations	1	04-07-2023		TLM1	
4.	Plane stress and plane strain problems. Potential energy and equilibrium method	1	06-07-2023		TLM1	
5.	FE Formulation from governing differential equations. One dimensional Problem,FE Modeling	1	10-07-2023		TLM1	
6.	Shape functions &coordinates of shape functions	1	11-07-2023		TLM1	
7.	Assembly of GSM & Load vector, Finite element equations and treatment of boundaryconditions	1	11-07-2023		TLM1	
8.	Problems- 1D Bar	1	13-07-2023		TLM1	
9.	Problems- 1D Bar	1	15-07-2023		TLM1	
10.	Tutorial-I	1	17-07-2023		TLM3	
11.	Thermal induced stresses and strains	1	18-07-2023		TLM1	
12.	Problems- 1D Bar	1	18-07-2023		TLM1	
13.	Problems- 1D Bar	1	20-07-2023		TLM1	
14.	Tutorial-II	1	22-07-2023		TLM3	
15.	Assignment/Quiz-1	1	24-07-2023		TLM1	
No. of classes required to complete UNIT-I:				No. of classes taken:		

UNIT-II: ANALYSIS OF BEAMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Analysis of Beams: Beam elements	1	25-07-2023		TLM1	
17.	Types loading, DOF, Boundary conditions	1	25-07-2023		TLM1	
18.	Hermite shape functions	1	27-07-2023		TLM1	
19.	Stiffness matrix for two node DOF per node	1	31-07-2023		TLM1	
20.	Problems- on Simply Supported Beam with point Load	1	01-08-2023		TLM1	
21.	Problems- on Simply Supported Beam with UDL	1	01-08-2023		TLM1	
22.	Problems- on Simply Supported Beam with UVL	1	03-08-2023		TLM1	
23.	Tutorial-III	1	05-08-2023		TLM3	
24.	Problems- on Cantilever Beam with UDL.	1	07-08-2023		TLM1	
25.	Problems- on Cantilever Beam with UVL.	1	08-08-2023		TLM1	
26.	Tutorial-IV	1	08-08-2023		TLM3	
27.	Assignment/Quiz-2	1	10-08-2023		TLM3	
No. of classes required to complete UNIT-II:				No. of classes taken:		

UNIT-III: CONSTANT STRAIN TRIANGLE & AXISYMMETRIC LOADING

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.	Introduction to constant strain triangle	1	12-08-2023		TLM1	
29.	2-D elements (CST), Boundary Conditions	1	14-08-2023		TLM1	
30.	Jacobian, Shape functions, Area of triangles	1	17-08-2023		TLM1	
31.	Problems- CST Element	1	19-08-2023		TLM1	
32.	Problems- CST Element	1	21-08-2023		TLM1	
33.	Tutorial-V	1	22-08-2023		TLM3	
34.	Axisymmetric solids ,Axisymmetric loading	1	22-08-2023		TLM1	
35.	Axisymmetric loading with triangular elements	1	24-08-2023		TLM1	
36.	Problems	1	26-08-2023		TLM1	
37.	I-Mid Exams :28.08.2023 to 02.09.2023					
38.	2-D four noded isoparametric elements, Jacobian, shape functions,	1	04-09-2023		TLM1	
39.	Problems	1	05-09-2023		TLM1	

40.	Isoparametric formulation of 4-noded quadrilateral element	1	05-09-2023		TLM1	
41.	Tutorial-VI	1	07-09-2023		TLM3	
42.	Problems- On Axisymmetric Loading on quadratic Elements	1	09-09-2023		TLM1	
43.	Problems- On Axisymmetric Loading on quadratic Elements	1	11-09-2023		TLM1	
44.	Assignment& Quiz-III	1	12-09-2023		TLM3	
No. of classes required to complete UNIT-III:				No. of classes taken:		

UNIT-IV: HEAT TRANSFER ANALYSIS

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.	One dimensional analysis of HT problems	1	12-09-2023		TLM1	
46.	Conductivity matrix, boundary conditions	1	14-09-2023		TLM1	
47.	Problems-On Composite wall	1	16-09-2023		TLM1	
48.	Problems-On Composite wall	1	19-09-2023		TLM1	
49.	Tutorial-VII	1	19-09-2023		TLM3	
50.	1-D analysis of a fin, Conductivity matrix boundary conditions.	1	21-09-2023		TLM1	
51.	Problems-On Fin with Circular Cross section	1	23-09-2023		TLM1	
52.	Problems-On Fin with rectangular and Tapered Cross section	1	25-09-2023		TLM1	
53.	Two-dimensional analysis of thin plate with triangular elements	1	26-09-2023		TLM1	
54.	Element conductivity matrix Convection Matrix-Heat rate vector. & Tutorial-VIII	1	26-09-2023		TLM1 TLM3	
55.	Assignment/Quiz-IV	1	30-09-2023		TLM3	
No. of classes required to complete UNIT-IV:				No. of classes taken:		

UNIT-V: DYNAMIC ANALYSIS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
56.	Introduction-Dynamic analysis	1	03-10-2023		TLM1	
57.	Formulation of finite element model	1	03-10-2023		TLM1	
58.	Hamilton Principle for Eigen value and Eigen Vector	1	12-10-2023		TLM1	
59.	Lumped Mass Matrix and Consistent Mass Matrix	1	14-10-2023		TLM1	

60.	Lumped Mass Matrix Equation for Bar and Beam Element	1	16-10-2023		TLM1	
61.	Consistent Mass Matrix Equation for Bar and Beam Element	1	17-10-2023		TLM1	
62.	Evaluation of Eigen values and Eigen vectors for a stepped bar.	1	17-10-2023		TLM1	
63.	Problems - Eigen values and Eigen vectors for a stepped bar	1	19-10-2023		TLM1	
64.	Problems - Eigen values and Eigen vectors for a stepped bar	1	21-10-2023		TLM1	
65.	Tutorial-IX	1	24-10-2023		TLM3	
66.	Problems - Eigen values and Eigen vectors for a Beams	1	24-10-2023		TLM1	
67.	Problems - Eigen values and Eigen vectors for a Beams	1	26-10-2023		TLM1	
68.	Tutorial-X, Assignment/ Quiz-V	1	28-10-2023		TLM3	
69.	Beyond Syllabus - Evaluation of Eigen values and Eigen vectors for a beam with different loads.	1	26-10-2023		TLM1	
No. of classes required to complete UNIT-V:				No. of classes taken:		
II-Mid Exams :30.10.2023 to 04.11.2023						

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 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.B.Sudheer Kumar	Dr.B.Sudheer Kumar	Dr.B.Sudheer Kumar	Dr. S.Pichi Reddy
Signature				



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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. S. Pichi Reddy

Course Name & Code : INDUSTRIAL ECONOMICS AND MANAGEMENT & 20HS03

L-T-P Structure : 5-0-0

Credits: 03

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

A.Y.: 2023-24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Comprehend the principles of Management. (Understanding-L2)
CO2	Estimate the budget requirements considering break even analysis for industrial applications.(Applying-L3)
CO3	Implement work study techniques to identify the effective method of production. (Applying-L3)
CO4	Apply the principles of quality control to check the process capability and quality of the product. (Applying-L3)
CO5	Describe the functions of human resource management. (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						3		1	2	1	3	2		3	
CO2						3		1	2	1	3	2		3	
CO3						3		1	2	1	3	2		3	
CO4						3		1	2	1	3	2		3	
CO5						3		1	2	1	3	2		3	
	1 - Low				2 -Medium				3 - High						

TEXTBOOKS:

T1 Dr A.R.Aryasri, Management Science; TMH, 4th Edition 2009

REFERENCE BOOKS:

R1 Neville Stanton et al., Handbook of Human Factors and Ergonomics Methods; CRC press, 2009

R2 Khan MI; Industrial Ergonomics; PHI Learning

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION, ORGANIZATIONAL STRUCTURE

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.	INDUSTRIAL ECONOMICS AND MANAGEMENT Introduction	01	03-07-2023			
2.	Management - Definition	01	04-07-2023			
3.	Nature, Importance of management	01	05-07-2023			
4.	Functions of Management	01	06-07-2023			
5.	Taylor's scientific management theory	01	10-07-2023			
6.	Fayal's principles of management	01	11-07-2023			
7.	Contribution of Elton mayo	01	12-07-2023			
8.	Maslow, Herzberg	01	13-07-2023			
9.	Douglas Mc Gregor Theories	01	15-07-2023			
10.	basic concepts of Organization	01	17-07-2023			
11.	Departmentation and Decentralization	01	18-07-2023			
12.	Organization structures, Line organization	01	19-07-2023			
13.	Functional organization, Committee organization	01	20-07-2023			
14.	Matrix organization	01	22-07-2023			
No. of classes required to complete UNIT-I:				No. of classes taken:		

UNIT-II: COST ANALYSIS, CAPITAL BUDGETING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	COST ANALYSIS		24-07-2023			
16.	Cost concepts		25-07-2023			
17.	Break-even Analysis (BEA)		26-07-2023			
18.	Determination of Break-Even Point (simple problems)		27-07-2023			
19.	Simple problems		01-08-2023			
20.	Managerial Significance		02-08-2023			
21.	CAPITAL BUDGETING		03-08-2023			
22.	Capital and its significance		05-08-2023			
23.	Types of Capital		07-08-2023			
24.	Estimation of Fixed and Working capital requirements		08-08-2023			
25.	Methods and sources of raising capital		09-08-2023			
26.	Trading Forecast		10-08-2023			
27.	Capital Budget		12-08-2023			
28.	Cash Budget		14-08-2023			
No. of classes required to complete UNIT-II:				No. of classes taken:		

UNIT-III: OPERATIONS MANAGEMENT, WORK STUDY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	OPERATIONS MANAGEMENT		16-08-2023			
30.	Plant location		17-08-2023			
31.	Factors influencing location		19-08-2023			
32.	Principles and types of plant layouts		21-08-2023			
33.	Methods of production:		22-08-2023			
34.	Job batch		23-08-2023			
35.	Mass production		24-08-2023			
36.	Applications		26-08-2023			
37.	WORK STUDY		04-09-2023			
38.	Basic procedure		05-09-2023			
39.	Method study		07-09-2023			
40.	Work measurement		09-09-2023			
41.	Advantages, limitations		11-09-2023			
42.	Applications.		12-09-2023			
No. of classes required to complete UNIT-III:				No. of classes taken:		

UNIT-IV: QUALITY AND MATERIALS MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	QUALITY AND MATERIALS MANAGEMENT		13-09-2023			
44.	Statistical quality control		14-09-2023			
45.	Meaning Variables		16-09-2023			
46.	Attributes		19-09-2023			
47.	X chart,		20-09-2023			
48.	R Chart		21-09-2023			
49.	C Chart		23-09-2023			
50.	P Chart		25-09-2023			
51.	Simple Problems		26-09-2023			
52.	Simple Problems		27-09-2023			
53.	Simple Problems		30-09-2023			
54.	Acceptance sampling		03-10-2023			
55.	Sampling plans		04-10-2023			
56.	Deming's contribution to quality		05-10-2023			
No. of classes required to complete UNIT-IV:				No. of classes taken:		

UNIT-V: HUMAN RESOURCE MANAGEMENT (HRM), FUNCTIONS OF HR MANAGER

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.	HUMAN RESOURCE MANAGEMENT (HRM)		07-10-2023			
58.	Concepts of HRM		09-10-2023			
59.	Personal management		10-10-2023			
60.	Industrial relations		11-10-2023			
61.	FUNCTIONS OF HR MANAGER		12-10-2023			
62.	Manpower planning		16-10-2023			
63.	Recruitment		17-10-2023			
64.	Selection		18-10-2023			

65.	Training and development		19-10-2023			
66.	Placement		21-10-2023			
67.	Wage and salary administration		24-10-2023			
68.	Promotion, Transfers Separation		25-10-2023			
69.	Performance appraisal		26-10-2023			
70.	Job evaluation and merit rating		28-10-2023			
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 (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	A NAGESWARA RAO			Dr. S. Pichi Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.K.DILIP KUMAR
Course Name & Code : POWER PLANT ENGINEERING
L-T-P Structure : 4-0-0 Credits : 3
Program/Sem/Sec : B.Tech., MECH., VII-Sem., A & B-Section A.Y : 2023-24

PRE-REQUISITE:Thermodynamics, Thermal Engineering.

COURSE EDUCATIONAL OBJECTIVES (CEOs):To study the various power plant potentials and its working principles.

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

CO 1	Understand the basics of various energy sources and various circuits in steam power plant.
CO 2	Comprehend Diesel and Gas Turbine power generating plants.
CO 3	Analyze salient features of Hydroelectric and Nuclear power plants.
CO 4	Differentiates different direct energy conversion systems.
CO 5	Evaluate economics of power generation and pollution issues related to power plants.

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	1	1	1	1	1	-	1	2	1	1	1	-	1
CO2	3	3	2	2	2	1	2	-	1	2	2	1	3	-	1
CO3	2	3	2	1	2	1	3	-	1	2	2	1	3	-	1
CO4	3	2	1	2	1	1	2	-	1	2	2	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).

TEXT BOOKS:

- T1 Arora & Domkundwar, A course in Power Plant Engineering- Dhanpat Rai & Company 5th Revised Reprint Edition, 2004.
T2 P.K.Nag, Power Plant Engineering, 3rd Edition, 2008 TMH, New Delhi,

REFERENCE BOOKS:

- R1 R.K.Rajput, A Text book of Power Plant Engineering, Laxmi Publications, 2nd Edition 2001
R2 M.M.EIWakil, Power plant technology, 3rd Edition 2010 TMH.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: STEAM POWER PLANT

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.	Course Outcomes	1	03-07-2023		TLM2	
2.	Introduction to Subject	1	04-07-2023		TLM2	
3.	Energy sources, Resources and Development of Power in India.	1	05-07-2023		TLM2	
4.	Steam power plant:Plant Layout, Working of Different circuits, factors to be considered for the selection of the plant	1	06-07-2023		TLM2	
5.	Types of Coal-Fuel handling systems-	1	10-07-2023		TLM2	
6.	Coal handling, choice of coal handling equipment, Coal Storage	1	11-07-2023		TLM2	
7.	Ash handling systems	1	12-07-2023		TLM2	
8.	Overfeed and underfeed stokers	1	13-07-2023		TLM2	
9.	Traveling grate stokers, Spreader stokers, Retort stokers	1	15-07-2023		TLM2	
10.	Pulverized fuel burning system and, its components	1	17-07-2023		TLM2	
11.	Draught system, Cyclone furnace	1	18-07-2023		TLM2	
12.	Design and construction, Dust collectors,	1	19-07-2023		TLM2	
13.	Dust collectors, Electrostatic precipitator	1	20-07-2023		TLM2	
14.	Cooling towers and heat rejection	1	22-07-2023		TLM2	
No. of classes required to complete UNIT-I:14				No. of classes taken:		

UNIT-II: DIESEL POWER PLANT AND GAS TURBINE PLANT

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.	Plant layout with auxiliaries-Fuel storage	1	24-07-2023		TLM2	
2.	Fuel supply system-	1	25-07-2023		TLM2	
3.	Air supply system-Exhaust system	1	26-07-2023		TLM2	
4.	Water cooling system-	1	27-07-2023		TLM2	
5.	Lubrication system	1	31-07-2023		TLM2	
6.	Starting system-Supercharging	1	01-08-2023		TLM2	
7.	Advantages and Disadvantages of Diesel plants over Thermal plants	1	02-08-2023		TLM2	
8.	Advantages and Disadvantages of Diesel plants over Thermal plants 1	1	03-08-2023		TLM2	

9.	Introduction-Classification-Layout with auxiliaries	1	05-08-2023		TLM2	
10.	Introduction-Classification-Layout with auxiliaries	1	07-08-2023		TLM2	
11.	Principles of working of Closed cycle gas turbines	1	08-08-2023		TLM2	
12.	Principles of working of Open cycle gas turbines	1	09-08-2023		TLM2	
13.	Combined cycle power plants and comparison	1	10-08-2023		TLM2	
14.	Combined cycle power plants and comparison	1	14-08-2023		TLM2	
No. of classes required to complete UNIT-II:14				No. of classes taken:		

UNIT-III: HYDRO ELECTRIC POWER PLANT AND NUCLEAR POWER PLANT

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.	Hydrology-Hydrological cycle Rainfall- Run off Hydrograph	1	16-08-2023		TLM2	
2.	Flow duration curve- Mass curve	1	17-08-2023		TLM2	
3.	Site selection of hydro plant- Typical layout	1	19-08-2023		TLM2	
4.	Different types of hydro plants	1	21-08-2023		TLM2	
5.	Nuclear Fission and Fusion - Nuclear Fuels- Breeding	1	22-08-2023		TLM2	
6.	Components of Reactor	1	23-08-2023		TLM2	
7.	Types of Nuclear Reactors- Pressurized water reactor(PWR)	1	24-08-2023		TLM2	
8.	Boiling water reactor (BWR)	1	26-08-2023		TLM2	
9.	CANDU reactor-	1	04-09-2023		TLM2	
10.	Gas cooled reactor	1	05-09-2023		TLM2	
11.	Liquid metal cooled reactor-	1	07-09-2023		TLM2	
12.	Fast Breeder Reactor	1	09-09-2023		TLM2	
13.	Nuclear waste and its Disposal	1	11-09-2023		TLM2	
14.	Nuclear waste and its Disposal	1	12-09-2023		TLM2	
No. of classes required to complete UNIT-III: 14				No. of classes taken:		

UNIT-IV: POWER FROM NON-CONVENTIONAL SOURCES AND DIRECT ENERGY CONVERSION SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Solar power plants-Utilization of Solar collectors.	1	12-09-2023		TLM2	
2.	Different types of solar collectors.	1	13-09-2023		TLM2	
3.	Principle of working of Wind energy-Types	1	14-09-2023		TLM2	
4.	Principle of working of Wind energy-Types	1	16-09-2023		TLM2	

5.	Tidal Energy	1	19-09-2023		TLM2	
6.	Tidal Energy	1	20-09-2023		TLM2	
7.	Tidal Energy	1	21-09-2023		TLM2	
8.	Solar cell- Fuel cell	1	23-09-2023		TLM2	
9.	Solar cell- Fuel cell	1	25-09-2023		TLM2	
10.	Thermo Electric and Thermo ionic conversion system	1	26-09-2023		TLM2	
11.	Thermo Electric and Thermo ionic conversion system	1	27-09-2023		TLM2	
12.	MHD power generation	1	29-09-2023		TLM2	
13.	MHD power generation	1	30-09-2023		TLM2	
No. of classes required to complete UNIT-IV:13				No. of classes taken:		

UNIT-V:POWER PLANT ECONOMICS AND POLLUTION & CONTROL

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Fixed cost-Operating cost.- Fluctuating loads	1	03-10-2023		TLM2	
2.	Fixed cost-Operating cost.- Fluctuating loads	1	04-10-2023		TLM2	
3.	General arrangement of Power Distribution-Load curves	1	05-10-2023		TLM2	
4.	General arrangement of Power Distribution-Load curves	1	07-10-2023		TLM2	
5.	Load duration curve and its problems	1	09-10-2023		TLM2	
6.	Load duration curve and its problems	1	10-10-2023		TLM2	
7.	Various load factors in power plants	1	11-10-2023		TLM2	
8.	Various load factors in power plants	1	12-10-2023		TLM2	
9.	Particulate and gaseous pollutants	1	14-10-2023		TLM2	
10.	Particulate and gaseous pollutants	1	16-10-2023		TLM2	
11.	Air and Water pollution by Thermal plants	1	17-10-2023		TLM2	
12.	Air and Water pollution by Thermal plants	1	18-10-2023		TLM2	
13.	Acid rains -Methods to control pollution	1	19-10-2023		TLM2	
14.	Acid rains -Methods to control pollution	1	21-10-2023		TLM2	
15.	Numerical Problems on economics of power generation	1	24-10-2023		TLM2	
No. of classes required to complete UNIT-V:15				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
1.	Gas-Turbine Engines	01	25-10-2023		TLM1	-	T1/R2	
2.	Emissions from Diesel Engines	01	26-10-2023		TLM1	-	T1/R2	
3.	Steam power plants	01	28-10-2023		TLM1	-	T1/R2	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 10-07-2023			
I Phase of Instructions	03/07/2023	26/08/2023	9
I Mid Examinations	28/08/2023	02/09/2023	
II Phase of Instructions	04/09/2023	28/10/2023	9
II Mid Examinations	30/10/2023	04/11/2023	
Preparation and Practical's	06/11/2023	11/11/2023	1
Semester End Examinations	13/11/2023	25/11/2023	2

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2	B1=20
Quiz – 1	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
Quiz – 2	3,4,5	Q2=10

Evaluation of Assignment: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\%$ of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Evaluation of Quiz Marks: $Q=75\%$ of Max(Q1,Q2)+25% of Min(Q1,Q2)	1,2,3,4,5	Q=10
Attendance		Att=5
Cumulative Internal Examination : A+B+Q+Att	1,2,3,4,5	CIE=40
Semester End Examinations	1,2,3,4,5	SEE=60
Total Marks: CIE+SEE	1,2,3,4,5	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	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.

Course Instructor
Dr.K.Dilip Kumar

Course Coordinator
Dr.K.Dilip Kumar

Module Coordinator
Dr. P.Vijay Kumar

HOD
Dr. S. Pichi Reddy

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech., VII-Sem. ME
ACADEMIC YEAR : 2023-2024
COURSE NAME & CODE : Refrigeration and Air-Conditioning - 20ME024
L-T-P STRUCTURE : 3-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Dr. V. DHANA RAJU
COURSE COORDINATOR : Dr. V. DHANA RAJU
PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVE: In a broader way, this course provides the simple understanding of refrigeration and air conditioning fundamentals. First, it covers the different refrigeration cycles and its analysis. Then the concepts of psychrometry and psychrometry processes used for air conditioning are imparted. Finally, the concepts of comfort air conditioning, cooling load design and its estimation are addressed.

COURSE OUTCOMES (CO)

- CO1: Describe the basic concepts of refrigeration and its applications.
- CO2: Evaluate the performance parameters of refrigeration systems.
- CO3: Identify the desirable refrigerants and its use in various refrigeration systems.
- CO4: Analyze the psychrometric properties and processes used in Air Conditioning systems.
- CO5: Design of Air Conditioning systems for thermal comfort conditions.

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	1		2	2					1	3		
CO2	3	3	3	1		2	2					1	3		
CO3	2	2	2	2		3	3					2	2		
CO4	3	3	2	2		2	2					2	2		
CO5	3	3	3	2		2	2					2	3		

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

BOS APPROVED TEXT BOOKS:

- T1** C. P. Arora. , Refrigeration and air conditioning - TMH, 2nd Edition, 2000.
- T2** R. Dossat, Principles of Refrigeration - - Pearson 4th Edition 2001.

BOS APPROVED REFERENCE BOOKS:

- R1** S. C. Arora, Domkundwar, A course in refrigeration and air conditioning-Dhanapat Rai& sons 5th Edition 1997.
- R2** Wilbert F.Stoecker, Jerold W. J.Jones, MGH, 1986.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I FUNDAMENTALS OF REFRIGERATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Textbook followed	HOD Sign Weekly
1	CRT Classes	1	03-07-2023					
2	CRT Classes	1	04-07-2023					
3	CRT Classes	1	04-07-2023					
4	CRT Classes	1	06-07-2023					
6	Introduction: Refrigeration, CEOs, Course Outcomes, POs and PSOs	1	10-07-2023		TLM2	CO1	T1	
7	Applications of refrigeration	1	11-07-2023		TLM2	CO2	T1	
81	Unit of refrigeration and COP	1	11-07-2023		TLM2	CO1	T1	
9	Heat Engine, Refrigerator and Heat pump	1	13-07-2023		TLM2	CO1	T1	
10	Types of Refrigeration systems	1	15-07-2023		TLM2, TLM 4	CO2	T1	
11	Problems on refrigeration basics	1	17-07-2023		TLM2, TLM 4	CO2	T1	
12	Refrigerant: Desirable characteristics of ideal refrigerant	1	18-07-2023		TLM2	CO3	T1	
13	Classification of refrigerants- Desirable Properties-Nomenclature, Refrigerant Designation	1	18-07-2023		TLM 1	CO3	T1	
14	Commonly used refrigerants, Alternate refrigerants, Green House effect& Global	1	20-07-2023		TLM 1	CO3	T1	
15	Air refrigeration system: working on Reversed Carnot cycle	1	22-07-2023		TLM 1	CO2	T1	
16	Air refrigeration system working on Bell Coleman cycle	1	24-07-2023		TLM 1	CO2	T1	
17	Air refrigeration Problems	1	25-07-2023		TLM 1	CO2	T1	
18	COP- Open and Dense air systems Problems	1	25-07-2023		TLM 1	CO2	T1	
19	Tutorial	1	27-07-2023		TLM 1	CO2	T1	
No. of classes required to complete UNIT-I = 19			No. of classes taken:					

UNIT-II VAPOUR COMPRESSION REFRIGERATION SYSTEM & COMPONENTS

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
20	Introduction to VCR system: Essential	1	31-07-2023		TLM 1	CO1	T1	

	components of the VCR plant							
21	Simple vapour compression refrigeration cycle, COP	1	01-08-2023		TLM 1	CO1	T2	
22	Representation of cycle on T-S and p-h Charts	1	03-08-2023		TLM 1	CO1	T2	
23	VCR numerical problems	1	05-08-2023		TLM 1	CO1	T2	
24	Tutorial	1	07-08-2023		TLM 1	CO1	T2	
25	Effect of sub cooling and superheating,	1	08-08-2023		TLM 1	CO1	T2	
26	Effect of condenser and evaporator pressure	1	08-08-2023		TLM 1	CO1	T2	
27	Actual VCR and theoretical VCR, Tutorial	1	10-08-2023		TLM 1	CO1	T2	
28	VCR-System Components: Compressors -Classification-Working Principles	1	14-08-2023		TLM 1	CO1	R1	
29	Work expression for the reciprocating compressor	1	17-08-2023		TLM 1	CO1	R1	
30	Rotary compressors, Problems	1	19-08-2023		TLM 1	CO1	R1	
31	Condensers – Classification-working principle,	1	21-08-2023		TLM 1	CO1	R1	
32	Evaporators-Classification-working principle	1	22-08-2023		TLM 1	CO1	R1	
33	Expansion valve – Classification-working principle-	1	22-08-2023		TLM 1	CO1	R1	
No. of classes required to complete UNIT-II = 14			No. of classes taken:					

UNIT-III VAPOUR ABSORPTION, STEAM JET & NON-CONVENTIONAL REFRIGERATION SYSTEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
34	Introduction to VAR system and its working principle,	1	24-08-2023		TLM 1	CO1	T2	
35	Max. COP derivation for the VAR system and VAR problems	1	26-08-2023		TLM 1	CO1	T2	
I Mid Examinations		5	19-09-2022 to 24-09-2022					
36	Description and working of NH ₃ -Water system, Refrigerant-Absorbent solution requirements	1	04-09-2023		TLM 1	CO1	T2	
37	LiBr-Water (Two shell & Four shell) System, Tutorial	1	05-09-2023		TLM 1	CO1	T2	
38	Principle of operation of Three fluid absorption systems, Salient features	1	05-09-2023		TLM 1	CO1	T2	

39	Steam Jet Refrigeration System: Working Principle, Basic Analysis- Applications	1	07-09-2023		TLM 1	CO1	T2	
40	. Non-Conventional Refrigeration Systems: Thermo electric refrigeration,	1	11-09-2023		TLM 1	CO1	T2	
41	Vortex tube refrigeration,	1	12-09-2023		TLM 1	CO1	T2	
No. of classes required to complete UNIT-III = 08			No. of classes taken:					

UNIT-IV PSYCHROMETRY & HUMAN COMFORT

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	Psychrometry: Introduction,	1	12-09-2023		TLM 1	CO4	T1	
43	Psychrometric properties and relations	1	14-09-2023		TLM 1	CO4	T1	
44	Psychrometric problems	1	16-09-2023		TLM 1	CO4	T1	
45	Psychrometric problems	1	19-09-2023		TLM 1	CO4	T1	
46	Psychrometric chart and its analysis,	1	19-09-2023		TLM 1	CO4	T1	
47	Psychrometric processes and its analysis	1	21-09-2023		TLM 1	CO4	T1	
48	Tutorial	1	23-09-2023		TLM 1	CO4	T1	
49	Psychrometric processes and its analysis	1	25-09-2023		TLM 1	CO4	T1	
50	Sensible, Latent and Total heat,	1	26-09-2023		TLM 1	CO4	T1	
51	Sensible Heat Factor and Bypass Factor,	1	26-09-2023		TLM 1	CO4	T1	
52	Solving Problems	1	30-09-2023		TLM 1	CO4	T1	
53	Human Comfort: Thermodynamics of human body	1	03-10-2023		TLM 1	CO4	T1	
54	Factors affecting the human comfort and its analysis.	1	03-10-2023		TLM 1	CO4	T1	
55	Effective temperature –	1	05-10-2023		TLM 1	CO4	T1	
56	Comfort chart	1	07-10-2023		TLM 1	CO4	T1	
No. of classes required to complete UNIT-IV = 15			No. of classes taken:					

UNIT-V AIR CONDITIONING SYSTEMS AND DESIGN

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
57	Introduction: Air Conditioning Systems,	1	09-10-2023		TLM 1	CO5	T1	
58	Components of Air conditioning	1	10-10-2023		TLM 1	CO5	T1	
59	Classification of air conditioning system	1	10-10-2023		TLM 1	CO5	T1	

60	Central and Unitary systems, Winter and Year-round systems	1	12-10-2023		TLM 1	CO5	T1	
61	Cooling load estimation and its procedure	1	16-10-2023		TLM 1	CO5	T1	
62	Cooling load components	1	17-10-2023		TLM 1	CO5	R1	
63	Infiltration load, Design of Air Condition Systems,	1	17-10-2023		TLM 1	CO5	R1	
64	Bypass factor-circulated air with ADP, System with Ventilated and re-circulation,	1	19-10-2023		TLM 1	CO5	T1	
65	RSHF, GSHP and ESHF, Solving cooling load Problems	1	21-10-2023		TLM 1	CO5	R1	
66	Solving cooling load Problems	1	24-10-2023		TLM 1	CO5	R1	
67	Solving cooling load Problems	1	24-10-2023		TLM 1	CO5	R1	
No. of classes required to complete UNIT-V = 11			No. of classes taken:					

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
68	Air craft Refrigeration System and Cryogenics	1	26-10-2023		TLM2	CO1,CO4	R3	
69	Eco friendly refrigerants	1	28-10-2023		TLM2	CO4	R3	

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 CALENDER:

Commencement of Class work		11-07-2022	
I Phase of Instructions	03-07-2023	26-08-2023	8 Weeks
I Mid Examinations	28-08-2023	02-09-2023	1 Week
II Phase of Instructions	04-09-2023	28-10-2023	8 Weeks
II Mid Examinations	30-10-2023	04-11-2023	1 Week
Preparation and Practical's	06-11-2023	11-11-2023	1 Week
Semester End Examinations	13-11-2023	25-11-2023	2 Weeks

PART-C

EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Quiz Examination (Units-III, IV & V)	Q2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=15
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	Q=10
Cumulative Internal Examination (CIE) : A+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	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	Communication: Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2	VLSI and Embedded Systems: Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
PSO 3	Signal Processing: Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor
Dr.V.Dhana Raju

Course Coordinator
Dr.V.Dhana Raju

Module Coordinator
Dr. P.Vijay Kumar

HOD
Dr. S. Pichi Reddy



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

PROGRAM	: B.Tech. - VII-Sem.- Mechanical Engineering – A & B Section
ACADEMIC YEAR	: 2023-24
COURSE NAME & CODE	: Total Quality management & 20ME35
L-T-P STRUCTURE	: 3-0-0
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Seelam Srinivasa Reddy, Assoc., Professor
COURSE COORDINATOR	: Seelam Srinivasa Reddy, Associate Professor
PER-REQUISITE	: Industrial Management

COURSE EDUCATIONAL OBJECTIVES:The main objective of this course is to familiarize the concepts of quality management techniques in industries

COURSE OUTCOMES:

After completion of the course student will be able to:

CO1:Comprehend the principles and strategies of quality control. **(Understanding – L2)**

CO2:Apply the principles of total quality management to improve the quality of the product.**(Applying -L3)**

CO3: Choose the appropriate statistical quality control tool to check the process capability.
(Applying- L3)

CO4: Examine various TQM techniques for industrial applications. **(Applying – L3)**

CO5: Interpret ISO quality standards in an organization.**(Understanding – L2)**

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

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

T :Dale H. Bester filed., Total Quality Management, Pearson Education, 3rd Edition 2010

BOS APPROVED REFERENCE BOOKS:

R1. James R. Evans & William M. Lid say, The Management and Control of Quality, South-Western (Thomson Learning), 2002.

R2. Feigenbaum. A.V, Total Quality Management, McGraw-Hill, 2005.

R3. Narayana V. and Sreenivasan, N.S, Quality Management- Concepts and Tasks, New Age International, 2006.

R4.Zeiri, Total Quality Management for Engineers, Wood Head Publishers, 2009.

COURSE DELIVERY PLAN (LESSON PLAN): ROBOTICS (17ME29)

PART - B

UNIT-I:INTRODUCTION TO TQM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction to TQM	1	3-7-23		TLM1	CO'1	T&R1	
2.	CEOs, Course Outcomes, POs and PSOs	1	4-7-23		TLM1	CO'1	T&R1	
3.	INTRODUCTION: Evolution of total quality management	1	5-7-23		TLM1	CO'1	T&R1	
4.	Definition of Quality	1	6-7-23		TLM1	CO'1	T&R1	
5.	Quality costs,	1	10-7-23		TLM2	CO'1	T&R1	
6.	Quality Council	1	11-7-23		TLM2	CO'1	T&R1	
7.	Strategic Planning	1	12-7-23		TLM2	CO'1	T&R1	
8.	Deming Philosophy	1	13-7-23		TLM2	CO'1	T&R1	
9.	Barriers to TQM Implementation	1	15-7-23		TLM2	CO'1	T&R1	
10.	Barriers to TQM Implementation	1	17-7-23		TLM2	CO'1	T&R1	
11.	Revision	1	18-7-23		TLM2	CO'1	T&R1	
12.	Quiz-1	1	19-7-23		TLM6	CO'1	T&R1	
No. of classes required to complete UNIT-I:		12			No. of classes taken:			

UNIT-II:TQM PRINCIPLES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
13.	TQM Principles: Customer satisfaction.	1	20-7-23		TLM1	CO2	T&R1	
14.	Types of Customers, customer supply chain	1	22-7-23		TLM1	CO2	T&R1	
15.	Customer perception of quality, customer feedback.	1	24-7-23		TLM2	CO2	T&R1	
16.	customer retention, Service quality.	1	25-7-23		TLM2	CO2	T&R1	
17.	Employee Involvement, Motivation.	1	26-7-23		TLM2	CO2	T&R1	
18.	Maslow 's hierarchy of needs, Herzberg theory,	1	27-7-23		TLM2	CO2	T&R1	
19.	Empowerment and Teamwork, Performance appraisal, Benefits,	1	29-7-23		TLM2	CO2	T&R1	
20.	Continuous process improvement: Continuous process improvement, Juran Trilogy:	1	31-7-23		TLM2	CO2	T&R1	
21.	PDSA cycle,	1	1-8-23		TLM2	CO2	T&R1	
22.	5S, Kaizen, Supplier	1	2-8-23		TLM2	CO2	T&R1	
23.	Partnership- Partnering, sourcing,	1	3-8-23		TLM2	CO2	T&R1	
24.	supplier selection,	1	5-8-23		TLM2	CO2	T&R1	
25.	Performance Measures-Basic Concepts,	1	7-8-23		TLM2	CO2	T&R1	
26.	Strategy, Performance Measure	1	9-8-23		TLM2	CO2	T&R1	
27.	Revision	1	10-8-23		TLM2	CO2	T&R1	

28.	Quiz	1	12-8-23		TLM6	CO2	T&R1	
No. of classes required to complete UNIT-II		16		No. of classes taken:				

UNIT-III: STATISTICAL PROCESS CONTROL

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
29.	STATISTICAL PROCESS CONTROL: The seven tools of quality,	1	14-8-23		TLM1	CO3	T&R1	
30.	Statistical Fundamentals,	1	16-8-23		TLM2	CO3	T&R1	
31.	Population and Sample,	1	17-8-23		TLM2	CO3	T&R1	
32.	Normal curve,	1	19-8-23		TLM2	CO3	T&R1	
33.	Control charts for variables and attributes,	1	21-8-23		TLM2	CO3	T&R1	
34.	Process capability,	1	22-8-23		TLM2	CO3	T&R1	
35.	Concepts of six sigma,	1	23-8-23		TLM2	CO3	T&R1	
36.	Indicators of six sigma, Principle,	1	24-8-23		TLM2	CO3	T&R1	
37.	elements, process,	1	26-8-23		TLM2	CO3	T&R1	
38.	advantages, limitations.	1	4-9-23		TLM2	CO3	T&R1	
39.	applications	1	5-9-23		TLM2	CO3	T&R1	
40.	Problems	1	7-9-23		TLM3	CO3	T&R1	
41.	Revision & Quiz	1	11-9-23		TLM2&6	CO3	T&R1	
No. of classes required to complete UNIT-III		12		No. of classes taken:				

UNIT-IV:TQM TOOLS

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.	TQM TOOLS: Benchmarking,	1	12-9-23		TLM1	CO4	T&R1	
43.	Benchmarking Process,	1	13-9-23		TLM2	CO4	T&R1	
44.	Quality Function Deployment (QFD),	1	14-9-23		TLM2	CO4	T&R1	
45.	House of Quality, QFD Process	1	16-9-23		TLM2	CO4	T&R1	
46.	Taguchi Quality Loss Function,	1	19-9-23		TLM2	CO4	T&R1	
47.	Total Productive Maintenance Concept,	1	20-9-23		TLM2	CO4	T&R1	
48.	Improvement needs,.	1	21-9-23		TLM2	CO4	T&R1	
49.	FMEA- Stages of FMEA	1	23-9-23		TLM2	CO4	T&R1	
50.	Revision	1	25-9-23		TLM2	CO4	T&R1	
51.	Quiz	1	26-9-23		TLM6	CO4	T&R1	
No. of classes required to complete UNIT-IV		10				No. of classes taken:		

UNIT-V:QUALITY SYSTEMS

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.	QUALITY SYSTEMS: Need for ISO 9000	1	27-9-23		TLM1	CO5	T&R1	
53.	other Quality systems,	1	30-9-23		TLM1	CO5	T&R1	
54.	ISO 9000:2000 Quality System,	1	3-10-23		TLM2	CO5	T&R1	
55.	Implementation of Quality system,	1	4-10-23		TLM2	CO5	T&R1	
56.	Implementation of Quality system,	1	5-10-23		TLM2	CO5	T&R1	
57.	Documentation,	1	7-10-23		TLM2	CO5	T&R1	
58.	Documentation,	1	9-10-23		TLM2	CO5	T&R1	
59.	Quality Auditing,	1	10-10-23		TLM2	CO5	T&R1	
60.	TS 16949,	1	11-10-23		TLM2	CO5	T&R1	
61.	TS 16949,	1	12-10-23		TLM2	CO5	T&R1	
62.	ISO 14000- concepts.	1	14-10-23		TLM2	CO5	T&R1	
63.	ISO 14000- concepts.	1	16-10-23		TLM2	CO5	T&R1	
64.	Revision	1	17-10-23		TLM2	CO5	T&R1	
65.	Quiz	1	18-10-23		TLM2&6	CO5	T&R1	
66.	Beyond syllabus	1	19-10-23		TLM2	CO5	T&R1	
67.	Unit-I and Unit-II revision	1	25-10-23		TLM2	CO1&CO2	T&R1	
68.	Unit- II and unit-IV revision	1	26-10-23		TLM2	CO2&CO4	T&R1	
69.	Extra syllabus	1	27-10-23		TLM2	CO5	T&R1	
70.	Extra syllabus	1	28-10-23		TLM2	CO5		
No. of classes required to complete UNIT-V		15+ 03 (Beyond Syllabus)						
II Mid Examinations – 30-10-23 to 4-11-23								

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/Assignment/Quiz

ACADEMIC CALENDER:

Commencement of Class work		03-07-2023	
I Phase of Instructions	03-07-2023	26-08-2023	8 Weeks
I Mid Examinations	28-08-2023	02-09-2023	1 Week
II Phase of Instructions	04-09-2023	28-10-2023	8 Weeks
II Mid Examinations	30-10-2023	04-11-2023	1 Week
Preparation and Practicals	06-11-2023	11-11-2023	1 Week
Semester End Examinations	13-11-2023	25-11-2023	2 Weeks

PART – C**EVALUATION PROCESS:**

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=05
Assignment/Quiz – 2	2	A2=05
I-Mid Examination	1,2	B1=20
I-Online Mid Examination	1,2	C1=10
Assignment/Quiz – 3	3	A3=05
Assignment/Quiz – 4	4	A4=05
Assignment/Quiz – 5	5	A5=05
II-Mid Examination	3,4,5	B2=20
II-Online Mid Examination	3,4,5	C2=10
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Evaluation of Online Mid Marks: $C=75\% \text{ of Max}(C1,C2)+25\% \text{ of Min}(C1,C2)$	1,2,3,4,5	C=10
Attendance: $D (\geq 95\% =5M; 90\% \leq A < 95\% =4M; 85\% \leq A < 90\% =3M; 80\% \leq A < 85\% =2M; 75\% \leq A < 80\% =1M; < 75\% =0M)$	-	D=05
Cumulative Internal Examination: A+B+C+D	1,2,3,4,5	A+B+C+D=40
Semester End Examinations: E	1,2,3,4,5	E=60
Total Marks: A+B+C+D+E	1,2,3,4,5	100

PART – D**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

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.

PROGRAMME 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 modeling 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.

Faculty Name	S.Srinivasa Reddy	S. Srinivasa Reddy	Dr. MBS Srikar Reddy	Dr. S. Pichi Reddy
Designation	Course Instructor	Course Coordinator	Module Coordinator	HOD
Signature				



DEPARTMENT OF Electrical & Electronics Engineering

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech, VII Sem., Mechanical Engineering
ACADEMIC YEAR	: 2023-24
COURSE NAME & CODE	: UTILIZATION OF ELECTRICAL ENERGY - 20ME83
L-T-P STRUCTURE	: 3 (L) – 0 (T) –0(P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Dr. A.V.G.A.Marthanda
COURSE COORDINATOR	: Dr. A.V.G.A.Marthanda
RE-REQUISITES	: Basic Electrical Engineering

Course Educational Objective: This course enables the student to acquire knowledge on methods of Electric Heating and welding, different lighting schemes. It also introduces the concepts of Electric Drives for Industrial and traction system, and also different tariff methods

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

CO1: Understand mechanism of electric heating and electric welding. **(Understand-L2)**

CO2: Analyze performance of various lighting schemes. **(Understand-L2)**

CO3: Analyze the performance of electric drive systems. **(Understand-L2)**

CO4: Illustrate the different schemes of traction and its main components **(Understand-L2)**

CO5: Understand various tariff methods and power factor improvement techniques. **(Understand-L2)**

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	-	1
CO3	1	2	2	-	-	-	-	-	-	-	-	2	2	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-	2
CO5	2	2	-	-	-	-	-	-	-	-	-	2	2	-	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:

1. C.L.Wadhwa “Generation, Distribution and Utilization of Electrical energy, New Age International Publishers, 3rd Edition, 2015.
2. N.V.Suryanarayana “Utilization of electric power including electric drives and electric traction, New age international publishers New Delhi, 2nd edition 2014.

RREFERENCE:

1. V K Mehta & Rohit Mehta, “Principles of Power System”, Revised Edition, S.Chand Publications, 2022.
2. A.Chakrabarthy, M.L.Soni, P.V.Gupta and U.S.Bhatnagar, “A Textbook on Power system Engineering”, DhanpatRai Publishing Company (P) Ltd., 2008.

Part-B
COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction to CO's and PO's	1	03.07.2023		TLM1/ TLM2	CO1	T1, T2	
2.	Electric Heating :Advantages and methods of electric heating–	1	04.07.2023		TLM1/ TLM2	CO1	T1, T2	
3.	Resistance heating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
4.	Resistance heating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
5.	induction heating and dielectric heating Arc furnaces – Direct and indirect arc furnaces.	1	06.07.2023		TLM1/ TLM2	CO1	T1	
6.	induction heating and dielectric heating Arc furnaces – Direct and indirect arc furnaces.	2	10.07.2023		TLM1/ TLM2/	CO1	T1, T2	
7.	Electric Welding: Electric welding– Resistance	1	11.07.2023		TLM1/ TLM2	CO1	T2	
8.	arc welding– Electric welding equipment–	1	12.07.2023		TLM2/ TLM5	CO1	T1, T2	
9.	– arc welding– Electric welding equipment	1	12.07.2023		TLM2	CO1	T1, T2	
10.	arc welding– Electric welding equipment	1	13.07.2023		TLM2	CO1	T1, T2	
11.	equipment– Comparison between AC and DC Welding	1	17.07.2023		TLM2	CO1	T1, T2	
12.	equipment– Comparison between AC and DC Welding	1	18.07.2023		TLM4/ TLM5	CO1	T1, T2	
13.	equipment– Comparison between AC and DC Welding	1	19.07.2023		TLM4/ TLM5	CO1	T1, T2	
14.	Revision/seminar	1	19.07.2023		TLM1/ TLM2/	CO1	T1, T2	

					TLM5			
No. of classes required to complete UNIT-I: 14					No. of classes taken:			

UNIT-II ILLUMINATION ENGINEERING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction, Nature of light & Laws of illumination,	2	20.07.2023 24.07.2023		TLM1/ TLM2/ TLM6	CO2	T1, T2	
2.	Nature of light & Laws of illumination	1	25.07.2023		TLM1/ TLM2	CO2	T1, T2	
3.	Nature of light & Laws of illumination	1	26.07.2023		TLM1/ TLM2	CO2	T1, T2	
4.	Lighting schemes	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
5.	, sources of light, Fluorescent Lamp, CFL and LED, Sodium	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
6.	Vapour Lamp, Neon lamps,	1	28.07.2023		TLM1/ TLM2	CO2	T1, T2	
7.	mercury vapour lamps,	1	31.07.2023		TLM1/ TLM2	CO2	T1	
8.	Comparison between tungsten & fluorescent tubes,	1	01.08.2023		TLM1/ TLM2	CO2	T1	
9.	Comparison between tungsten & fluorescent tubes,	1	02.08.2023		TLM1/ TLM2	CO2	T1	
10.	Requirements of good lighting & Street lighting	1	02.08.2023		TLM1/ TLM2	CO2	T1	
11.	Requirements of good lighting & Street lighting	1	03.08.2023		TLM1/ TLM2	CO2	T2	
12.	Class seminar/revision	1	07.08.2023		TLM1/ TLM2/ TLM5	CO2		
No. of classes required to complete UNIT-II: 12					No. of classes taken:			

UNIT-III: ELECTRIC DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
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1.	Introduction, Factors affecting selection of motor,	1	08.08.2023		TLM1/ TLM2	CO3	T1	
2.	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
3.	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
4.	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
5.	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
6.	Transient characteristics,	1	14.08.2023		TLM1/ TLM2	CO3	T1, T2	
7.	Transient characteristics	1	15.08.2023		TLM1/ TLM2	CO3	T1, T2	
8.	Transient characteristics	1	16.08.2023		TLM1	CO3	T1, T2	
9.	Size of motor, load equalization, Industrial applications	1	16.08.2023		TLM2	CO3	T1, T2	
10.	Size of motor	1	17.08.2023		TLM1/ TLM2	CO3	T1, T2	
11.	equalization, Industrial applications	1	22.08.2023		TLM2	CO3	T1, T2	
12.	equalization, Industrial applications	1	23.08.2023		TLM1/ TLM2/ TLM5	CO3	T1, T2	
13.	Revision		24.08.2023		TLM5	CO3	T1, T2	
No. of classes required to complete UNIT-I: 13					No. of classes taken:			

UNIT-IV: UNIT-IV: ELECTRIC TRACTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction, requirements of an ideal traction	1	04.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	

	system, System of electric traction and track electrification– the traction motor–							
2.	traction and track electrification– the traction motor	1	05.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
3.	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
4.	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
5.	train movement, Mechanics of trainmovement–	1	07.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
6.	train movement, Mechanics of trainmovement–	1	11.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
7.	Speed–time curves for different services	1	12.09.2023		TLM1/ TLM2	CO4	T1, T2	
8.	train movement, Mechanics of trainmovement–	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
9.	– Trapezoidal and quadrilateral speed time curves	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
10.	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
11.	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM5	CO4	T1, T2	
12.	Seminar	1	18.09.2023		TLM5	CO4	T1, T2	
No. of classes required to complete UNIT-I:12					No. of classes taken:			

UNIT-V: TARIFF AND POWER FACTOR IMPROVEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Tariff: Desirable characteristics, types - Flat rate,	1	18.09.2023		TLM1/ TLM2	CO5	T1, T2	

	block-rate, KVA maximum demand and Time of Day tariff.							
2.	KVA maximum demand and Time of Day tariff.	1	19.09.2023		TLM1/ TLM2	CO5	T1	
3.	Power factor: Disadvantages of low power factor,	1	20.09.2023		TLM1/ TLM2	CO5	T1	
4.	, advantages of improved p.f.,without using p.f. improvement devices	1	20.09.2023		TLM1/ TLM2/ TLM5	CO5	T2	
5.	, advantages of improved p.f.,	1	21.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
6.	without using p.f. improvement devices	1	25.09.2023		TLM1/ TLM2	CO5	T1, T2	
7.	power factor	1	26.09.2023		TLM1/ TLM2	CO5	T1, T2	
8.	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
9.	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2	CO5	T1, T2	
10.	economical power factor, location of	1	28.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
11.	power factor improvement devices from consumer	1	03.10.2023		TLM1/ TLM2	CO5	T1, T2	
12.	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
13.	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
14.	Class seminar	1	05.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
No. of classes required to complete UNIT-I: 14					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	Textbook followed	HOD Sign
1.	Recent trends Electrical energy utilization in industrial applications	2	25.10.2023 25.10.2023 26.10.2023		TLM2/ TLM5	CO1 -CO5	T1, T2, R1 to R5	

Lesson plan Section-B

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction to CO's and PO's	1	03.07.2023		TLM1/ TLM2	CO1	T1, T2	
2	Electric Heating : Advantages and methods of electric heating–	1	04.07.2023		TLM1/ TLM2	CO1	T1, T2	
3	Resistance heating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
4	Resistance heating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
5	induction heating and dielectric heating Arc furnaces – Direct and indirect arc furnaces.	1	06.07.2023		TLM1/ TLM2	CO1	T1	
6	induction heating and dielectric heating Arc furnaces – Direct and indirect arc furnaces.	2	10.07.2023		TLM1/ TLM2/	CO1	T1, T2	
7	Electric Welding : Electric welding– Resistance	1	11.07.2023		TLM1/ TLM2	CO1	T2	
8	arc welding– Electric welding equipment–	1	12.07.2023		TLM2/ TLM5	CO1	T1, T2	
9	– arc welding– Electric welding equipment	1	12.07.2023		TLM2	CO1	T1, T2	

10	arc welding– Electric welding equipment	1	13.07.2023		TLM2	CO1	T1, T2
11	equipment– Comparison between AC and DC Welding	1	17.07.2023		TLM2	CO1	T1, T2
12	equipment– Comparison between AC and DC Welding	1	18.07.2023		TLM4/ TLM5	CO1	T1, T2
13	equipment– Comparison between AC and DC Welding	1	19.07.2023		TLM4/ TLM5	CO1	T1, T2
14	Revision/seminar	1	19.07.2023		TLM1/ TLM2/ TLM5	CO1	T1, T2
No. of classes required to complete UNIT-I: 14					No. of classes taken:		

UNIT-II ILLUMINATION ENGINEERING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction, Nature of light &Laws of illumination,	2	20.07.2023 24.07.2023		TLM1/ TLM2/ TLM6	CO2	T1, T2	
2	Nature of light &Laws of illumination	1	25.07.2023		TLM1/ TLM2	CO2	T1, T2	
3	Nature of light &Laws of illumination	1	26.07.2023		TLM1/ TLM2	CO2	T1, T2	
4	Lighting schemes	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
5	, sources of light, Fluorescent Lamp, CFL and LED, Sodium	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
6	Vapour Lamp, Neon lamps,	1	28.07.2023		TLM1/ TLM2	CO2	T1, T2	
7	mercury vapour lamps,	1	31.07.2023		TLM1/ TLM2	CO2	T1	
8	Comparison between tungsten & fluorescent tubes,	1	01.08.2023		TLM1/ TLM2	CO2	T1	
9	Comparison between tungsten & fluorescent tubes,	1	02.08.2023		TLM1/ TLM2	CO2	T1	

10	Requirements of good lighting & Street lighting	1	02.08.2023		TLM1/ TLM2	CO2	T1		
11	Requirements of good lighting & Street lighting	1	03.08.2023		TLM1/ TLM2	CO2	T2		
12	Class seminar/revision	1	07.08.2023		TLM1/ TLM2/ TLM5	CO2			
No. of classes required to complete UNIT-II: 12					No. of classes taken:				

UNIT-III: ELECTRIC DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction, Factors affecting selection of motor,	1	08.08.2023		TLM1/ TLM2	CO3	T1	
2	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
3	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
4	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
5	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
6	Transient characteristics,	1	14.08.2023		TLM1/ TLM2	CO3	T1, T2	
7	Transient characteristics	1	15.08.2023		TLM1/ TLM2	CO3	T1, T2	
8	Transient characteristics	1	16.08.2023		TLM1	CO3	T1, T2	
9	Size of motor, load equalization, Industrial applications	1	16.08.2023		TLM2	CO3	T1, T2	
10	Size of motor	1	17.08.2023		TLM1/ TLM2	CO3	T1, T2	
11	equalization, Industrial applications	1	22.08.2023		TLM2	CO3	T1, T2	

12	equalization, Industrial applications	1	23.08.2023		TLM1/ TLM2/ TLM5	CO3	T1, T2	
13	Revision		24.08.2023		TLM5	CO3	T1, T2	
No. of classes required to complete UNIT-I: 13					No. of classes taken:			

UNIT-IV: UNIT-IV: ELECTRIC TRACTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction, requirements of an ideal traction system, System of electric traction and track electrification– the traction motor–	1	04.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
2	traction and track electrification– the traction motor	1	05.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
3	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
4	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
5	train movement, Mechanics of trainmovement–	1	07.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
6	train movement, Mechanics of trainmovement–	1	11.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
7	Speed–time curves for different services	1	12.09.2023		TLM1/ TLM2	CO4	T1, T2	
8	train movement, Mechanics of trainmovement–	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
9	– Trapezoidal and quadrilateral speed time curves	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
10	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	

11	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM5	CO4	T1, T2	
12	Seminar	1	18.09.2023		TLM5	CO4	T1, T2	
No. of classes required to complete UNIT-I:12					No. of classes taken:			

UNIT-V: TARIFF AND POWER FACTOR IMPROVEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Tariff: Desirable characteristics, types - Flat rate, block-rate, KVA maximum demand and Time of Day tariff.	1	18.09.2023		TLM1/ TLM2	CO5	T1, T2	
2	KVA maximum demand and Time of Day tariff.	1	19.09.2023		TLM1/ TLM2	CO5	T1	
3	Power factor: Disadvantages of low power factor,	1	20.09.2023		TLM1/ TLM2	CO5	T1	
4	, advantages of improved p.f.,without using p.f. improvement devices	1	20.09.2023		TLM1/ TLM2/ TLM5	CO5	T2	
5	, advantages of improved p.f.,	1	21.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
6	without using p.f. improvement devices	1	25.09.2023		TLM1/ TLM2	CO5	T1, T2	
6	power factor	1	26.09.2023		TLM1/ TLM2	CO5	T1, T2	
7	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
8	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2	CO5	T1, T2	
9	economical power factor, location of	1	28.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
10	power factor improvement	1	03.10.2023		TLM1/ TLM2	CO5	T1, T2	

	devices from consumer							
11	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
12	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
13	Class seminar	1	05.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
No. of classes required to complete UNIT-I: 14					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	Textbook followed	HOD Sign
1	Recent trends Electrical energy utilization in industrial applications	2	25.10.2023 25.10.2023 26.10.2023		TLM2/ TLM5	CO1 -CO5	T1, T2, R1 to R5	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 21.02.2022			
I Phase of Instructions	03.07.2023	26.08.2023	8
I Mid Examinations	28.08.2023	02.09.2023	1
II Phase of Instructions	04.09.2023	28.10.2023	8
II Mid Examinations	30.10.2023	04.11.2023	1
Preparation and Practical	06.11.2023	11.11.2023	1
Semester End Examinations	13.11.2023	25.11.2023	2

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment – Cycle -I	1,2,3	A1=05
Quiz – 1	1,2,3	Q1=10
Assignment – Cycle -II	3,4,5	A2=05
Quiz – 2	3,4,5	Q2=10
I-Mid Examination	1,2,3	B1=15

II-Mid Examination	3,4,5	B2=15
Evaluation of Assignment/Quiz Marks: A=(Cycle -I + Cycle - II)/2	1,2,3,4,5	A=05
Evaluation of Mid Marks: B=80% of Max (B1, B2) + 20% of Min(B1, B2)	1,2,3,4,5	B=20
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	A+B+Q=30
Semester End Examinations: E	1,2,3,4,5	E=70
Total Marks: A+B+Q+E	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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.

PROGRAMME 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

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 contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.

7.Environment and sustainability: Understand the impact of 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 engineering practice.

9.Individual and teamwork: 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 c

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.

.Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name	Dr.A.VGA.Marthanda	Dr.A.VGA.Marthanda	Dr.G.Nageswar rao	Dr.JSV Prasad
Signature				

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

COURSE HANDOUT

PROGRAM : B.Tech., VII-Sem. ME
ACADEMIC YEAR : 2023-2024
COURSE NAME & CODE : Refrigeration and Air-Conditioning - 20ME024
L-T-P STRUCTURE : 3-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Dr. V. DHANA RAJU
COURSE COORDINATOR : Dr. V. DHANA RAJU
PRE-REQUISITE: Thermodynamics

COURSE OBJECTIVE: In a broader way, this course provides the simple understanding of refrigeration and air conditioning fundamentals. First, it covers the different refrigeration cycles and its analysis. Then the concepts of psychrometry and psychrometry processes used for air conditioning are imparted. Finally, the concepts of comfort air conditioning, cooling load design and its estimation are addressed.

COURSE OUTCOMES (CO)

- CO1: Describe the basic concepts of refrigeration and its applications.
- CO2: Evaluate the performance parameters of refrigeration systems.
- CO3: Identify the desirable refrigerants and its use in various refrigeration systems.
- CO4: Analyze the psychrometric properties and processes used in Air Conditioning systems.
- CO5: Design of Air Conditioning systems for thermal comfort conditions.

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	1		2	2					1	3		
CO2	3	3	3	1		2	2					1	3		
CO3	2	2	2	2		3	3					2	2		
CO4	3	3	2	2		2	2					2	2		
CO5	3	3	3	2		2	2					2	3		

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

BOS APPROVED TEXT BOOKS:

- T1** C. P. Arora. , Refrigeration and air conditioning - TMH, 2nd Edition, 2000.
- T2** R. Dossat, Principles of Refrigeration - - Pearson 4th Edition 2001.

BOS APPROVED REFERENCE BOOKS:

- R1** S. C. Arora, Domkundwar, A course in refrigeration and air conditioning-Dhanapat Rai& sons 5th Edition 1997.
- R2** Wilbert F.Stoecker, Jerold W. J.Jones, MGH, 1986.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I FUNDAMENTALS OF REFRIGERATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Textbook followed	HOD Sign Weekly
1	CRT Classes	1	03-07-2023					
2	CRT Classes	1	04-07-2023					
3	CRT Classes	1	04-07-2023					
4	CRT Classes	1	06-07-2023					
6	Introduction: Refrigeration, CEOs, Course Outcomes, POs and PSOs	1	10-07-2023		TLM2	CO1	T1	
7	Applications of refrigeration	1	11-07-2023		TLM2	CO2	T1	
81	Unit of refrigeration and COP	1	11-07-2023		TLM2	CO1	T1	
9	Heat Engine, Refrigerator and Heat pump	1	13-07-2023		TLM2	CO1	T1	
10	Types of Refrigeration systems	1	15-07-2023		TLM2, TLM 4	CO2	T1	
11	Problems on refrigeration basics	1	17-07-2023		TLM2, TLM 4	CO2	T1	
12	Refrigerant: Desirable characteristics of ideal refrigerant	1	18-07-2023		TLM2	CO3	T1	
13	Classification of refrigerants- Desirable Properties-Nomenclature, Refrigerant Designation	1	18-07-2023		TLM 1	CO3	T1	
14	Commonly used refrigerants, Alternate refrigerants, Green House effect& Global	1	20-07-2023		TLM 1	CO3	T1	
15	Air refrigeration system: working on Reversed Carnot cycle	1	22-07-2023		TLM 1	CO2	T1	
16	Air refrigeration system working on Bell Coleman cycle	1	24-07-2023		TLM 1	CO2	T1	
17	Air refrigeration Problems	1	25-07-2023		TLM 1	CO2	T1	
18	COP- Open and Dense air systems Problems	1	25-07-2023		TLM 1	CO2	T1	
19	Tutorial	1	27-07-2023		TLM 1	CO2	T1	
No. of classes required to complete UNIT-I = 19			No. of classes taken:					

UNIT-II VAPOUR COMPRESSION REFRIGERATION SYSTEM & COMPONENTS

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
20	Introduction to VCR system: Essential	1	31-07-2023		TLM 1	CO1	T1	

	components of the VCR plant							
21	Simple vapour compression refrigeration cycle, COP	1	01-08-2023		TLM 1	CO1	T2	
22	Representation of cycle on T-S and p-h Charts	1	03-08-2023		TLM 1	CO1	T2	
23	VCR numerical problems	1	05-08-2023		TLM 1	CO1	T2	
24	Tutorial	1	07-08-2023		TLM 1	CO1	T2	
25	Effect of sub cooling and superheating,	1	08-08-2023		TLM 1	CO1	T2	
26	Effect of condenser and evaporator pressure	1	08-08-2023		TLM 1	CO1	T2	
27	Actual VCR and theoretical VCR, Tutorial	1	10-08-2023		TLM 1	CO1	T2	
28	VCR-System Components: Compressors -Classification-Working Principles	1	14-08-2023		TLM 1	CO1	R1	
29	Work expression for the reciprocating compressor	1	17-08-2023		TLM 1	CO1	R1	
30	Rotary compressors, Problems	1	19-08-2023		TLM 1	CO1	R1	
31	Condensers – Classification-working principle,	1	21-08-2023		TLM 1	CO1	R1	
32	Evaporators-Classification-working principle	1	22-08-2023		TLM 1	CO1	R1	
33	Expansion valve – Classification-working principle-	1	22-08-2023		TLM 1	CO1	R1	
No. of classes required to complete UNIT-II = 14			No. of classes taken:					

UNIT-III VAPOUR ABSORPTION, STEAM JET & NON-CONVENTIONAL REFRIGERATION SYSTEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
34	Introduction to VAR system and its working principle,	1	24-08-2023		TLM 1	CO1	T2	
35	Max. COP derivation for the VAR system and VAR problems	1	26-08-2023		TLM 1	CO1	T2	
I Mid Examinations		5	19-09-2022 to 24-09-2022					
36	Description and working of NH ₃ -Water system, Refrigerant-Absorbent solution requirements	1	04-09-2023		TLM 1	CO1	T2	
37	LiBr-Water (Two shell & Four shell) System, Tutorial	1	05-09-2023		TLM 1	CO1	T2	
38	Principle of operation of Three fluid absorption systems, Salient features	1	05-09-2023		TLM 1	CO1	T2	

39	Steam Jet Refrigeration System: Working Principle, Basic Analysis- Applications	1	07-09-2023		TLM 1	CO1	T2	
40	. Non-Conventional Refrigeration Systems: Thermo electric refrigeration,	1	11-09-2023		TLM 1	CO1	T2	
41	Vortex tube refrigeration,	1	12-09-2023		TLM 1	CO1	T2	
No. of classes required to complete UNIT-III = 08			No. of classes taken:					

UNIT-IV PSYCHROMETRY & HUMAN COMFORT

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	Psychrometry: Introduction,	1	12-09-2023		TLM 1	CO4	T1	
43	Psychrometric properties and relations	1	14-09-2023		TLM 1	CO4	T1	
44	Psychrometric problems	1	16-09-2023		TLM 1	CO4	T1	
45	Psychrometric problems	1	19-09-2023		TLM 1	CO4	T1	
46	Psychrometric chart and its analysis,	1	19-09-2023		TLM 1	CO4	T1	
47	Psychrometric processes and its analysis	1	21-09-2023		TLM 1	CO4	T1	
48	Tutorial	1	23-09-2023		TLM 1	CO4	T1	
49	Psychrometric processes and its analysis	1	25-09-2023		TLM 1	CO4	T1	
50	Sensible, Latent and Total heat,	1	26-09-2023		TLM 1	CO4	T1	
51	Sensible Heat Factor and Bypass Factor,	1	26-09-2023		TLM 1	CO4	T1	
52	Solving Problems	1	30-09-2023		TLM 1	CO4	T1	
53	Human Comfort: Thermodynamics of human body	1	03-10-2023		TLM 1	CO4	T1	
54	Factors affecting the human comfort and its analysis.	1	03-10-2023		TLM 1	CO4	T1	
55	Effective temperature –	1	05-10-2023		TLM 1	CO4	T1	
56	Comfort chart	1	07-10-2023		TLM 1	CO4	T1	
No. of classes required to complete UNIT-IV = 15			No. of classes taken:					

UNIT-V AIR CONDITIONING SYSTEMS AND DESIGN

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
57	Introduction: Air Conditioning Systems,	1	09-10-2023		TLM 1	CO5	T1	
58	Components of Air conditioning	1	10-10-2023		TLM 1	CO5	T1	
59	Classification of air conditioning system	1	10-10-2023		TLM 1	CO5	T1	

60	Central and Unitary systems, Winter and Year-round systems	1	12-10-2023		TLM 1	CO5	T1	
61	Cooling load estimation and its procedure	1	16-10-2023		TLM 1	CO5	T1	
62	Cooling load components	1	17-10-2023		TLM 1	CO5	R1	
63	Infiltration load, Design of Air Condition Systems,	1	17-10-2023		TLM 1	CO5	R1	
64	Bypass factor-circulated air with ADP, System with Ventilated and re-circulation,	1	19-10-2023		TLM 1	CO5	T1	
65	RSHF, GSHP and ESHF, Solving cooling load Problems	1	21-10-2023		TLM 1	CO5	R1	
66	Solving cooling load Problems	1	24-10-2023		TLM 1	CO5	R1	
67	Solving cooling load Problems	1	24-10-2023		TLM 1	CO5	R1	
No. of classes required to complete UNIT-V = 11			No. of classes taken:					

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
68	Air craft Refrigeration System and Cryogenics	1	26-10-2023		TLM2	CO1,CO4	R3	
69	Eco friendly refrigerants	1	28-10-2023		TLM2	CO4	R3	

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 CALENDER:

Commencement of Class work		11-07-2022	
I Phase of Instructions	03-07-2023	26-08-2023	8 Weeks
I Mid Examinations	28-08-2023	02-09-2023	1 Week
II Phase of Instructions	04-09-2023	28-10-2023	8 Weeks
II Mid Examinations	30-10-2023	04-11-2023	1 Week
Preparation and Practical's	06-11-2023	11-11-2023	1 Week
Semester End Examinations	13-11-2023	25-11-2023	2 Weeks

PART-C

EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=15
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=15
II-Quiz Examination (Units-III, IV & V)	Q2=10
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=15
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	Q=10
Cumulative Internal Examination (CIE) : A+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	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	Communication: Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2	VLSI and Embedded Systems: Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
PSO 3	Signal Processing: Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor
Dr.V.Dhana Raju

Course Coordinator
Dr.V.Dhana Raju

Module Coordinator
Dr. P.Vijay Kumar

HOD
Dr. S. Pichi Reddy



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B.Sudheer Kumar

Course Name & Code : FINITE ELEMENT ANALYSIS & 20ME26

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

Credits: 3

Program/Sem/Sec : B.Tech/VI/A&B

A.Y.: 2023-24

PREREQUISITE: Mechanics of Solids, Heat Transfer

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to understand the principles of finite elements and to develop finite models for engineering applications.

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

CO1	Formulate the equilibrium equations for solving static engineering problems.(Applying-L3)
CO2	Compute the characteristics of flexural elements under different loading conditions. (Applying-L3)
CO3	Analyze 2-D structures with iso-parametric elements along with Axi-symmetric problems.(Analyzing-L4)
CO4	Apply the finite element techniques for solving thermal problems of different geometries.(Applying-L3)
CO5	Compute the Eigen values and vectors for bar and beam elements for dynamic analysis. (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	3	2	3	-	3	-	-	-	-	3	2	-	-	3
CO2	2	2	2	3	3	3	-	-	-	-	3	2	-	-	3
CO3	2	3	2	2	3	3	-	-	-	-	3	2	-	-	3
CO4	3	2	2	3	-	3	-	-	-	-	3	2	-	3	
CO5	2	2	2	3	3	3	-	-	-	-	3	2	-	-	3
	1 - Low			2 -Medium				3 - High							

BOS APPROVED TEXT BOOKS:

- T1.** 1. Chandraputla, Ashok and Belegundu, Introduction to Finite Elements in Engineering, 6th edition, Prentice-Hall,2014.
- T2.** S.S Rao, The Finite Element Methods in Engineering 6th edition, B.H.Pergamon.2013

BOS APPROVED REFERENCE BOOKS:

- R1** SS Bhavikatti, Finite Element Analysis, New Age International Publishers 3rd edition 2005.
- R2** JN. Reddy, An introduction to Finite Element Method, 3rd edition, Mc Graw Hill, 2011.
- R3.** George R. Buchanan and R. Rudra Moorthy, Finite Element Analysis, Tata Mc Graw Hill,2006.

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: ONE DIMENSIONAL PROBLEM**

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 Finite Element Method	1	03-07-2023		TLM1	
2.	Equilibrium equations in elasticity, Stresses in typical element, Stresses& equilibrium	1	04-07-2023		TLM1	
3.	Strain displacement relations, Stress strainrelations	1	04-07-2023		TLM1	
4.	Plane stress and plane strain problems. Potential energy and equilibrium method	1	06-07-2023		TLM1	
5.	FE Formulation from governing differential equations. One dimensional Problem,FE Modeling	1	10-07-2023		TLM1	
6.	Shape functions &coordinates of shape functions	1	11-07-2023		TLM1	
7.	Assembly of GSM & Load vector, Finite element equations and treatment of boundaryconditions	1	11-07-2023		TLM1	
8.	Problems- 1D Bar	1	13-07-2023		TLM1	
9.	Problems- 1D Bar	1	15-07-2023		TLM1	
10.	Tutorial-I	1	17-07-2023		TLM3	
11.	Thermal induced stresses and strains	1	18-07-2023		TLM1	
12.	Problems- 1D Bar	1	18-07-2023		TLM1	
13.	Problems- 1D Bar	1	20-07-2023		TLM1	
14.	Tutorial-II	1	22-07-2023		TLM3	
15.	Assignment/Quiz-1	1	24-07-2023		TLM1	
No. of classes required to complete UNIT-I:				No. of classes taken:		

UNIT-II: ANALYSIS OF BEAMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Analysis of Beams: Beam elements	1	25-07-2023		TLM1	
17.	Types loading, DOF, Boundary conditions	1	25-07-2023		TLM1	
18.	Hermite shape functions	1	27-07-2023		TLM1	
19.	Stiffness matrix for two node DOF per node	1	31-07-2023		TLM1	
20.	Problems- on Simply Supported Beam with point Load	1	01-08-2023		TLM1	
21.	Problems- on Simply Supported Beam with UDL	1	01-08-2023		TLM1	
22.	Problems- on Simply Supported Beam with UVL	1	03-08-2023		TLM1	
23.	Tutorial-III	1	05-08-2023		TLM3	
24.	Problems- on Cantilever Beam with UDL.	1	07-08-2023		TLM1	
25.	Problems- on Cantilever Beam with UVL.	1	08-08-2023		TLM1	
26.	Tutorial-IV	1	08-08-2023		TLM3	
27.	Assignment/Quiz-2	1	10-08-2023		TLM3	
No. of classes required to complete UNIT-II:				No. of classes taken:		

UNIT-III: CONSTANT STRAIN TRIANGLE & AXISYMMETRIC LOADING

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.	Introduction to constant strain triangle	1	12-08-2023		TLM1	
29.	2-D elements (CST), Boundary Conditions	1	14-08-2023		TLM1	
30.	Jacobian, Shape functions, Area of triangles	1	17-08-2023		TLM1	
31.	Problems- CST Element	1	19-08-2023		TLM1	
32.	Problems- CST Element	1	21-08-2023		TLM1	
33.	Tutorial-V	1	22-08-2023		TLM3	
34.	Axisymmetric solids ,Axisymmetric loading	1	22-08-2023		TLM1	
35.	Axisymmetric loading with triangular elements	1	24-08-2023		TLM1	
36.	Problems	1	26-08-2023		TLM1	
37.	I-Mid Exams :28.08.2023 to 02.09.2023					
38.	2-D four noded isoparametric elements, Jacobian, shape functions,	1	04-09-2023		TLM1	
39.	Problems	1	05-09-2023		TLM1	

40.	Isoparametric formulation of 4-noded quadrilateral element	1	05-09-2023		TLM1	
41.	Tutorial-VI	1	07-09-2023		TLM3	
42.	Problems- On Axisymmetric Loading on quadratic Elements	1	09-09-2023		TLM1	
43.	Problems- On Axisymmetric Loading on quadratic Elements	1	11-09-2023		TLM1	
44.	Assignment& Quiz-III	1	12-09-2023		TLM3	
No. of classes required to complete UNIT-III:				No. of classes taken:		

UNIT-IV: HEAT TRANSFER ANALYSIS

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.	One dimensional analysis of HT problems	1	12-09-2023		TLM1	
46.	Conductivity matrix, boundary conditions	1	14-09-2023		TLM1	
47.	Problems-On Composite wall	1	16-09-2023		TLM1	
48.	Problems-On Composite wall	1	19-09-2023		TLM1	
49.	Tutorial-VII	1	19-09-2023		TLM3	
50.	1-D analysis of a fin, Conductivity matrix boundary conditions.	1	21-09-2023		TLM1	
51.	Problems-On Fin with Circular Cross section	1	23-09-2023		TLM1	
52.	Problems-On Fin with rectangular and Tapered Cross section	1	25-09-2023		TLM1	
53.	Two-dimensional analysis of thin plate with triangular elements	1	26-09-2023		TLM1	
54.	Element conductivity matrix Convection Matrix-Heat rate vector. & Tutorial-VIII	1	26-09-2023		TLM1 TLM3	
55.	Assignment/Quiz-IV	1	30-09-2023		TLM3	
No. of classes required to complete UNIT-IV:				No. of classes taken:		

UNIT-V: DYNAMIC ANALYSIS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
56.	Introduction-Dynamic analysis	1	03-10-2023		TLM1	
57.	Formulation of finite element model	1	03-10-2023		TLM1	
58.	Hamilton Principle for Eigen value and Eigen Vector	1	12-10-2023		TLM1	
59.	Lumped Mass Matrix and Consistent Mass Matrix	1	14-10-2023		TLM1	

60.	Lumped Mass Matrix Equation for Bar and Beam Element	1	16-10-2023		TLM1	
61.	Consistent Mass Matrix Equation for Bar and Beam Element	1	17-10-2023		TLM1	
62.	Evaluation of Eigen values and Eigen vectors for a stepped bar.	1	17-10-2023		TLM1	
63.	Problems - Eigen values and Eigen vectors for a stepped bar	1	19-10-2023		TLM1	
64.	Problems - Eigen values and Eigen vectors for a stepped bar	1	21-10-2023		TLM1	
65.	Tutorial-IX	1	24-10-2023		TLM3	
66.	Problems - Eigen values and Eigen vectors for a Beams	1	24-10-2023		TLM1	
67.	Problems - Eigen values and Eigen vectors for a Beams	1	26-10-2023		TLM1	
68.	Tutorial-X, Assignment/ Quiz-V	1	28-10-2023		TLM3	
69.	Beyond Syllabus - Evaluation of Eigen values and Eigen vectors for a beam with different loads.	1	26-10-2023		TLM1	
No. of classes required to complete UNIT-V:				No. of classes taken:		
II-Mid Exams :30.10.2023 to 04.11.2023						

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 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.B.Sudheer Kumar	Dr.B.Sudheer Kumar	Dr.B.Sudheer Kumar	Dr. S.Pichi Reddy
Signature				



DEPARTMENT OF MECHANICAL ENGINEERING COURSE HANDOUT

Part-A

PROGRAM	: B.Tech, VII Sem., B section Mechanical Engineering
ACADEMIC YEAR	: 2023-24
COURSE NAME & CODE	: Automobile Engineering-20ME29
L-T-P STRUCTURE	: 3 (L) – 0 (T) – 0(P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Dr. P.Vijaya Kumar
COURSE COORDINATOR	: Dr. P.Ravindra Kumar
RE-REQUISITES	: Thermodynamics, Internal Combustion Engines

COURSE EDUCATIONAL OBJECTIVES (CEOs):The objective of this course is to make students learn about automobile layout, Engine Emissions, working of Transmission system, Steering system, Suspension system, Braking system, Fuel system and different Electrical systems.

COURSE OUTCOMES (COs)

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

- CO1** List and Illustrate the basic components of Automobile (Remembering –L1).
- CO2** Differentiate the fuel supply systems in petrol and diesel engines. (Understanding –L2).
- CO3** Comprehend the functions of various electrical systems in automobiles. (Understanding –L2).
- CO4** Distinguish various transmission systems, wheels and tyres. (Understanding –L2)
- CO5** Compare various types of Steering systems, Braking systems and Suspension systems. (Understanding –L2)

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

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

BOS APPROVED TEXT BOOKS:

- T1 Dr. Kirpal Singh, Automobile Engineering-Vol I& II, 13th Edition, Standard Publishers Distributors, 2014.
- T2 R.B.Gupta, Automobile Engineering, 8th edition, Tech India publication series, 2013.

BOS APPROVED REFERENCE BOOKS:

- R1 V.A.W Hillier and David R.Rogers, Hillier’s Fundamentals of Motor Vehicle Technology, Book1, 5th edition- 2007.
- R2 Heinz Heisler, Advanced Vehicle Technology, 2ndedition, Butterworth-Heinemann Series, 2002.
- R3 David A Crolla, Automotive Engineering, 1st edition, Butterworth-Heinemann series,

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: INTRODUCTION, ENGINE CONSTRUCTION, ENGINE EMISSIONS AND CONTROL

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 to CO's and PO's	1	03.07.2023		TLM1/ TLM2	CO1	T1,T2	
2.	Introduction- Components of an Automobile, classification of automobiles	1	03.07.2023		TLM1/ TLM2	CO1	T1,T2	
3.	Chassis, Frame-Types, Specifications of Automobiles, Types of Automobiles	1	04.07.2023		TLM1/ TLM2	CO1	T1,T2	
4.	Rear wheel drive, front wheel drive and four wheel drive	1	06.07.2023		TLM1/ TLM2	CO1	T1,T2	
5.	ENGINE CONSTRUCTION Basic terminology and working of engines	1	07.07.2023		TLM1/ TLM2	CO1	T1,T2	
6.	Engine construction Details- Cylinder Block and Crankcase- Cylinder Head	1	10.07.2023		TLM1/ TLM2	CO1	T1,T2	
7.	Oil Pan- Manifolds- Gaskets- Cylinder Liners- Piston- Connecting Rod	1	10.07.2023		TLM1/ TLM2	CO1	T1,T2	
8.	Crank shaft, Engine Valves,Firing Order	1	11.07.2023		TLM1/ TLM2	CO1	T1,T2	
9.	ENGINE EMISSIONS AND CONTROL: Emissions from Automobiles, Nitrogen oxides, Soot,	1	13.07.2023		TLM1/ TLM2	CO1	T1,T2	
10.	Carbon monoxide, Hydrocarbons, Particulates,	1	14.07.2023		TLM1/ TLM2	CO1	T1,T2	
11.	Emission Regulations and exhaust gas recirculation	1	17.07.2023		TLM1/ TLM2	CO1	T1,T2	

12.	Types of pollutants in SI engines.	1	17.07.2023		TLM1/ TLM2	CO1	T1,T2	
13.	Types of pollutants in CI Engines.	1	18.07.2023		TLM1/ TLM2	CO1	T1,T2	
14.	Thermal converters	1	20.07.2023		TLM1/ TLM2	CO1	T1,T2	
15.	Three way catalytic converters, EGR.	1	21.07.2023		TLM1/ TLM2	CO1	T1,T2	
16.	Class seminar	1	24.07.2023		TLM1/ TLM2	CO1	T1,T2	
No. of classes required to complete UNIT-I: 16					No. of classes taken:			

UNIT-II: ENGINE SERVICING, FUEL SUPPLY SYSTEM IN PETROL& DIESEL ENGINES

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.	ENGINE SERVICING: Engine Removal, Cylinder Head, Gaskets, Valves, Piston-connecting Rod Assembly.	1	24.07.2023		TLM1/ TLM2	CO2	T1,T2	
2.	Fuel Supply system in petrol engines-Fuel pump, fuel gauge, simple carburetor-defects	1	25.07.2023		TLM1/ TLM2	CO2	T1,T2	
3.	Zenith carburetor, SU carburetor	1	27.07.2023		TLM1/ TLM2	CO2	T1,T2	
4.	FUEL SUPPLY SYSTEMS IN PETROL & DIESEL ENGINES. Petrol Injection-Types, Mechanical injection system	1	28.07.2023		TLM1/ TLM2	CO2	T1,T2	
5.	Electronic injection systems.	1	28.07.2023		TLM1/ TLM2	CO2	T1,T2	
6.	Types of Injection systems in Diesel Engines	1	31.07.2023		TLM1/ TLM2	CO2	T1,T2	
7.	Fuel filters, Air filters,	1	31.07.2023		TLM1/ TLM2	CO2	T1,T2	
8.	Fuel injection pumps-	1	01.08.2023		TLM1/ TLM2	CO2	T1,T2	
9.	Air cleaners	1	03.08.2023		TLM1/ TLM2	CO2	T1,T2	
10.	Jerk type pump	1	04.08.2023		TLM1/ TLM2	CO2	T1,T2	

11.	Governors-Types	1	07.08.2023		TLM1/ TLM2	CO2	T1,T2	
12	Class seminar	1	07.08.2023		TLM1/ TLM2	CO2	T1,T2	
13	Tutorial-2	1	08.08.2023					
No. of classes required to complete UNIT-II: 13					No. of classes taken:			

UNIT-III: IGNITION SYSTEM, CHARGING SYSTEM & STARTING SYSTEMS

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.	IGNITION SYSTEM: Types of Ignition systems	1	10.08.2023		TLM1/ TLM2	CO3	T1,T2	
2.	Battery Ignition system- Components of	1	11.08.2023		TLM1/ TLM2	CO3	T1,T2	
3.	Battery Ignition system, Ignition timing, Spark plug,	1	14.08.2023		TLM1/ TLM2	CO3	T1,T2	
4.	Magneto Ignition system,	1	17.08.2023		TLM1/ TLM2	CO3	T1,T2	
5.	Electronic Ignition system- Capacitive discharge Ignition system.	1	18.08.2023		TLM1/ TLM2	CO3	T1,T2	
6.	CHARGING SYSTEM & STARTING SYSTEMS: Batteries- Types- Lead acid battery	1	21.08.2023		TLM1/ TLM2	CO3	T1,T2	
7.	Charging system- Introduction- Principle of Generator	1	21.08.2023		TLM1/ TLM2	CO3	T1,T2	
8.	Generator constructional details	1	22.08.2023		TLM1/ TLM2	CO3	T1,T2	
9.	Generator output control	1	24.08.2023		TLM1/ TLM2	CO3	T1,T2	
10.	Starting Motor	1	25.08.2023		TLM1/ TLM2	CO3	T1,T2	
11.	Starting drives	1	26.08.2023		TLM1/ TLM2	CO3	T1,T2	
12.	Bendix drives	1	04.09.2023		TLM1/ TLM2	CO3	T1,T2	
13.	Solenoid switch	1	04.09.2023		TLM1/ TLM2	CO3	T1,T2	
14.	Tutorial-3	1	05.09.2023		TLM1/ TLM2	CO3	T1,T2	
No. of classes required to complete UNIT-I: 14					No. of classes taken:			

UNIT-IV: TRANSMISSION SYSTEM, WHEELS AND TYRES

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.	TRANSMISSION SYSTEM: Clutches- Introduction, Types, Single plate clutch,	1	07.09.2023		TLM1/ TLM2	CO4	T1,T2	
2.	Multi plate Clutch, Centrifugal clutch, Fluid Fly wheel,	1	08.09.2023		TLM1/ TLM2	CO4	T1,T2	
3.	Necessity of Transmission , Types of Transmission,	1	11.09.2023		TLM1/ TLM2	CO4	T1,T2	
4.	Sliding Mesh Gear Box.	1	11.09.2023		TLM1/ TLM2	CO4	T1,T2	
5.	Constant Mesh gear box, Propeller shaft,	1	12.09.2023		TLM1/ TLM2	CO4	T1,T2	
6.	Torque convertor,	1	14.09.2023		TLM1/ TLM2	CO4	T1,T2	
7.	Final drive, Differential,	1	15.09.2023		TLM1/ TLM2	CO4	T1,T2	
8.	Rear axle drives.	1	18.09.2023		TLM1/ TLM2	CO4	T1,T2	
9.	WHEELS AND TYRES: Types of Wheels, Wheel dimensions	1	18.09.2023		TLM1/ TLM2	CO4	T1,T2	
10.	Tyre- Types of Tyres,	1	19.09.2023		TLM1/ TLM2	CO4	T1,T2	
11.	Carcass types,	1	21.09.2023		TLM1/ TLM2	CO4	T1,T2	
12.	Tyre Materials, Tyre designations.	1	22.09.2023		TLM1/ TLM2	CO4	T1,T2	
13.	Tutorial-4	1	25.09.2023		TLM1/ TLM2	CO4	T1,T2	
14.	Seminar	1	25.09.2023		TLM1/ TLM2	CO4	T1,T2	
15.	Advances in Transmission system.	1	26.09.2023		TLM1/ TLM2	CO4	T1,T2	
No. of classes required to complete UNIT-I:15					No. of classes taken:			

UNIT-V: FRONT AXLE AND STEERING, SUSPENSION SYSTEM, BRAKING SYSTEM

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.	Front Axle and Steering- Front Axle, Types of stub axle,	1	29.09.2023		TLM1/ TLM2	CO5	T1,T2	
2.	Wheel alignment, Steering geometry- Camber- Kingpin inclination	1	29.09.2023		TLM1/ TLM2	CO5	T1,T2	
3.	Combined angle and scrub radius-	1	30.09.2023		TLM1/ TLM2	CO5	T1,T2	
4.	Castor- Toe in and Toe out,	1	03.10.2023		TLM1/ TLM2	CO5	T1,T2	
5.	Understeer and Oversteer cases	1	05.10.2023		TLM1/ TLM2	CO5	T1,T2	
6.	Power steering, Steering Linkages, Steering gears.	1	06.10.2023		TLM1/ TLM2	CO5	T1,T2	
7.	SUSPENSION SYSTEM: Introduction, Types of Suspension springs, Leaf springs, Coil springs, Torsion bars,	1	09.10.2023		TLM1/ TLM2	CO5	T1,T2	
8.	Shock Absorbers, Independent suspension- Types,	1	09.10.2023		TLM1/ TLM2	CO5	T1,T2	
9.	Air-suspension,	1	10.10.2023		TLM1/ TLM2	CO5	T1,T2	
10.	BRAKING SYSTEM: Braking Requirements	1	12.10.2023		TLM1/ TLM2	CO5	T1,T2	
11.	Sensors	1	13.10.2023		TLM1/ TLM2	CO5	T1,T2	
12.	Types of Brakes, Drum brakes and Disc Brakes,	1	16.10.2023		TLM1/ TLM2	CO5	T1,T2	
13.	Hydraulic Brakes,	1	16.10.2023		TLM1/ TLM2	CO5	T1,T2	
14.	Air brakes, Anti-lock braking systems.	1	17.10.2023		TLM1/ TLM2	CO5	T1,T2	
15.	Class seminar	1	19.10.2023		TLM1/ TLM2	CO5	T1,T2	

16.	Revision	1	20.10.2023		TLM1/ TLM2	CO5	T1,T2	
No. of classes required to complete UNIT-I: 16					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
1.	Modern Electric Vehicle	1	23.10.2023		TLM1/ TLM2	CO1 - CO5	T1, T2, R1 to R5	
2.	Thermal battery management systems	1	23.10.2023					
3.	Hydrogen based vehicles	1	23.10.2023					

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 21.02.2022			
I Phase of Instructions	03.07.2023	26.08.2023	8
I Mid Examinations	28.08.2023	02.09.2023	1
II Phase of Instructions	04.09.2023	28.10.2023	8
II Mid Examinations	30.10.2023	04.11.2023	1
Preparation and Practical	06.11.2023	11.11.2023	1
Semester End Examinations	13.11.2023	25.11.2023	2

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment – Cycle -I	1,2,3	A1=05
Quiz – 1	1,2,3	Q1=10
Assignment – Cycle -II	3,4,5	A2=05
Quiz – 2	3,4,5	Q2=10
I-Mid Examination	1,2,3	B1=15
II-Mid Examination	3,4,5	B2=15
Evaluation of Assignment/Quiz Marks: $A=(\text{Cycle -I} + \text{Cycle - II})/2$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B=80\% \text{ of Max}(B1,B2)+20\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	A+B+Q=30
Semester End Examinations: E	1,2,3,4,5	E=70
Total Marks: A+B+Q+E	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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.

PROGRAMME 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.

Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name	Dr. P.Ravindra Kumar	Dr. P.Ravindra Kumar	Dr. P.Vijay Kumar	Dr. S. PICHU REDDY
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.K.DILIP KUMAR
Course Name & Code : POWER PLANT ENGINEERING
L-T-P Structure : 4-0-0 Credits : 3
Program/Sem/Sec : B.Tech., MECH., VII-Sem., A & B-Section A.Y : 2023-24

PRE-REQUISITE:Thermodynamics, Thermal Engineering.

COURSE EDUCATIONAL OBJECTIVES (CEOs):To study the various power plant potentials and its working principles.

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

CO 1	Understand the basics of various energy sources and various circuits in steam power plant.
CO 2	Comprehend Diesel and Gas Turbine power generating plants.
CO 3	Analyze salient features of Hydroelectric and Nuclear power plants.
CO 4	Differentiates different direct energy conversion systems.
CO 5	Evaluate economics of power generation and pollution issues related to power plants.

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	1	1	1	1	1	-	1	2	1	1	1	-	1
CO2	3	3	2	2	2	1	2	-	1	2	2	1	3	-	1
CO3	2	3	2	1	2	1	3	-	1	2	2	1	3	-	1
CO4	3	2	1	2	1	1	2	-	1	2	2	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).

TEXT BOOKS:

- T1 Arora & Domkundwar, A course in Power Plant Engineering- Dhanpat Rai & Company 5th Revised Reprint Edition, 2004.
T2 P.K.Nag, Power Plant Engineering, 3rd Edition, 2008 TMH, New Delhi,

REFERENCE BOOKS:

- R1 R.K.Rajput, A Text book of Power Plant Engineering, Laxmi Publications, 2nd Edition 2001
R2 M.M.EIWakil, Power plant technology, 3rd Edition 2010 TMH.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: STEAM POWER PLANT

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.	Course Outcomes	1	03-07-2023		TLM2	
2.	Introduction to Subject	1	04-07-2023		TLM2	
3.	Energy sources, Resources and Development of Power in India.	1	05-07-2023		TLM2	
4.	Steam power plant:Plant Layout, Working of Different circuits, factors to be considered for the selection of the plant	1	06-07-2023		TLM2	
5.	Types of Coal-Fuel handling systems-	1	10-07-2023		TLM2	
6.	Coal handling, choice of coal handling equipment, Coal Storage	1	11-07-2023		TLM2	
7.	Ash handling systems	1	12-07-2023		TLM2	
8.	Overfeed and underfeed stokers	1	13-07-2023		TLM2	
9.	Traveling grate stokers, Spreader stokers, Retort stokers	1	15-07-2023		TLM2	
10.	Pulverized fuel burning system and, its components	1	17-07-2023		TLM2	
11.	Draught system, Cyclone furnace	1	18-07-2023		TLM2	
12.	Design and construction, Dust collectors,	1	19-07-2023		TLM2	
13.	Dust collectors, Electrostatic precipitator	1	20-07-2023		TLM2	
14.	Cooling towers and heat rejection	1	22-07-2023		TLM2	
No. of classes required to complete UNIT-I:14				No. of classes taken:		

UNIT-II: DIESEL POWER PLANT AND GAS TURBINE PLANT

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.	Plant layout with auxiliaries-Fuel storage	1	24-07-2023		TLM2	
2.	Fuel supply system-	1	25-07-2023		TLM2	
3.	Air supply system-Exhaust system	1	26-07-2023		TLM2	
4.	Water cooling system-	1	27-07-2023		TLM2	
5.	Lubrication system	1	31-07-2023		TLM2	
6.	Starting system-Supercharging	1	01-08-2023		TLM2	
7.	Advantages and Disadvantages of Diesel plants over Thermal plants	1	02-08-2023		TLM2	
8.	Advantages and Disadvantages of Diesel plants over Thermal plants 1	1	03-08-2023		TLM2	

9.	Introduction-Classification-Layout with auxiliaries	1	05-08-2023		TLM2	
10.	Introduction-Classification-Layout with auxiliaries	1	07-08-2023		TLM2	
11.	Principles of working of Closed cycle gas turbines	1	08-08-2023		TLM2	
12.	Principles of working of Open cycle gas turbines	1	09-08-2023		TLM2	
13.	Combined cycle power plants and comparison	1	10-08-2023		TLM2	
14.	Combined cycle power plants and comparison	1	14-08-2023		TLM2	
No. of classes required to complete UNIT-II:14				No. of classes taken:		

UNIT-III: HYDRO ELECTRIC POWER PLANT AND NUCLEAR POWER PLANT

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.	Hydrology-Hydrological cycle Rainfall- Run off Hydrograph	1	16-08-2023		TLM2	
2.	Flow duration curve- Mass curve	1	17-08-2023		TLM2	
3.	Site selection of hydro plant- Typical layout	1	19-08-2023		TLM2	
4.	Different types of hydro plants	1	21-08-2023		TLM2	
5.	Nuclear Fission and Fusion - Nuclear Fuels- Breeding	1	22-08-2023		TLM2	
6.	Components of Reactor	1	23-08-2023		TLM2	
7.	Types of Nuclear Reactors- Pressurized water reactor(PWR)	1	24-08-2023		TLM2	
8.	Boiling water reactor (BWR)	1	26-08-2023		TLM2	
9.	CANDU reactor-	1	04-09-2023		TLM2	
10.	Gas cooled reactor	1	05-09-2023		TLM2	
11.	Liquid metal cooled reactor-	1	07-09-2023		TLM2	
12.	Fast Breeder Reactor	1	09-09-2023		TLM2	
13.	Nuclear waste and its Disposal	1	11-09-2023		TLM2	
14.	Nuclear waste and its Disposal	1	12-09-2023		TLM2	
No. of classes required to complete UNIT-III: 14				No. of classes taken:		

UNIT-IV: POWER FROM NON-CONVENTIONAL SOURCES AND DIRECT ENERGY CONVERSION SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Solar power plants-Utilization of Solar collectors.	1	12-09-2023		TLM2	
2.	Different types of solar collectors.	1	13-09-2023		TLM2	
3.	Principle of working of Wind energy-Types	1	14-09-2023		TLM2	
4.	Principle of working of Wind energy-Types	1	16-09-2023		TLM2	

5.	Tidal Energy	1	19-09-2023		TLM2	
6.	Tidal Energy	1	20-09-2023		TLM2	
7.	Tidal Energy	1	21-09-2023		TLM2	
8.	Solar cell- Fuel cell	1	23-09-2023		TLM2	
9.	Solar cell- Fuel cell	1	25-09-2023		TLM2	
10.	Thermo Electric and Thermo ionic conversion system	1	26-09-2023		TLM2	
11.	Thermo Electric and Thermo ionic conversion system	1	27-09-2023		TLM2	
12.	MHD power generation	1	29-09-2023		TLM2	
13.	MHD power generation	1	30-09-2023		TLM2	
No. of classes required to complete UNIT-IV:13				No. of classes taken:		

UNIT-V:POWER PLANT ECONOMICS AND POLLUTION & CONTROL

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Fixed cost-Operating cost.- Fluctuating loads	1	03-10-2023		TLM2	
2.	Fixed cost-Operating cost.- Fluctuating loads	1	04-10-2023		TLM2	
3.	General arrangement of Power Distribution-Load curves	1	05-10-2023		TLM2	
4.	General arrangement of Power Distribution-Load curves	1	07-10-2023		TLM2	
5.	Load duration curve and its problems	1	09-10-2023		TLM2	
6.	Load duration curve and its problems	1	10-10-2023		TLM2	
7.	Various load factors in power plants	1	11-10-2023		TLM2	
8.	Various load factors in power plants	1	12-10-2023		TLM2	
9.	Particulate and gaseous pollutants	1	14-10-2023		TLM2	
10.	Particulate and gaseous pollutants	1	16-10-2023		TLM2	
11.	Air and Water pollution by Thermal plants	1	17-10-2023		TLM2	
12.	Air and Water pollution by Thermal plants	1	18-10-2023		TLM2	
13.	Acid rains -Methods to control pollution	1	19-10-2023		TLM2	
14.	Acid rains -Methods to control pollution	1	21-10-2023		TLM2	
15.	Numerical Problems on economics of power generation	1	24-10-2023		TLM2	
No. of classes required to complete UNIT-V:15				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
1.	Gas-Turbine Engines	01	25-10-2023		TLM1	-	T1/R2	
2.	Emissions from Diesel Engines	01	26-10-2023		TLM1	-	T1/R2	
3.	Steam power plants	01	28-10-2023		TLM1	-	T1/R2	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 10-07-2023			
I Phase of Instructions	03/07/2023	26/08/2023	9
I Mid Examinations	28/08/2023	02/09/2023	
II Phase of Instructions	04/09/2023	28/10/2023	9
II Mid Examinations	30/10/2023	04/11/2023	
Preparation and Practical's	06/11/2023	11/11/2023	1
Semester End Examinations	13/11/2023	25/11/2023	2

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2	B1=20
Quiz – 1	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
Quiz – 2	3,4,5	Q2=10

Evaluation of Assignment: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\%$ of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Evaluation of Quiz Marks: $Q=75\%$ of Max(Q1,Q2)+25% of Min(Q1,Q2)	1,2,3,4,5	Q=10
Attendance		Att=5
Cumulative Internal Examination : A+B+Q+Att	1,2,3,4,5	CIE=40
Semester End Examinations	1,2,3,4,5	SEE=60
Total Marks: CIE+SEE	1,2,3,4,5	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	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.

Course Instructor
Dr.K.Dilip Kumar

Course Coordinator
Dr.K.Dilip Kumar

Module Coordinator
Dr. P.Vijay Kumar

HOD
Dr. S. Pichi Reddy



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

PROGRAM	: B.Tech. - VII-Sem.- Mechanical Engineering – A & B Section
ACADEMIC YEAR	: 2023-24
COURSE NAME & CODE	: Total Quality management & 20ME35
L-T-P STRUCTURE	: 3-0-0
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Seelam Srinivasa Reddy, Assoc., Professor
COURSE COORDINATOR	: Seelam Srinivasa Reddy, Associate Professor
PER-REQUISITE	: Industrial Management

COURSE EDUCATIONAL OBJECTIVES:The main objective of this course is to familiarize the concepts of quality management techniques in industries

COURSE OUTCOMES:

After completion of the course student will be able to:

CO1:Comprehend the principles and strategies of quality control. **(Understanding – L2)**

CO2:Apply the principles of total quality management to improve the quality of the product.**(Applying -L3)**

CO3: Choose the appropriate statistical quality control tool to check the process capability. **(Applying- L3)**

CO4: Examine various TQM techniques for industrial applications. **(Applying – L3)**

CO5: Interpret ISO quality standards in an organization.**(Understanding – L2)**

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

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

T :Dale H. Bester filed., Total Quality Management, Pearson Education, 3rd Edition 2010

BOS APPROVED REFERENCE BOOKS:

R1. James R. Evans & William M. Lid say, The Management and Control of Quality, South-Western (Thomson Learning), 2002.

R2. Feigenbaum. A.V, Total Quality Management, McGraw-Hill, 2005.

R3. Narayana V. and Sreenivasan, N.S, Quality Management- Concepts and Tasks, New Age International, 2006.

R4.Zeiri, Total Quality Management for Engineers, Wood Head Publishers, 2009.

COURSE DELIVERY PLAN (LESSON PLAN): ROBOTICS (17ME29)

PART - B

UNIT-I:INTRODUCTION TO TQM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction to TQM	1	3-7-23		TLM1	CO'1	T&R1	
2.	CEOs, Course Outcomes, POs and PSOs	1	4-7-23		TLM1	CO'1	T&R1	
3.	INTRODUCTION: Evolution of total quality management	1	5-7-23		TLM1	CO'1	T&R1	
4.	Definition of Quality	1	6-7-23		TLM1	CO'1	T&R1	
5.	Quality costs,	1	10-7-23		TLM2	CO'1	T&R1	
6.	Quality Council	1	11-7-23		TLM2	CO'1	T&R1	
7.	Strategic Planning	1	12-7-23		TLM2	CO'1	T&R1	
8.	Deming Philosophy	1	13-7-23		TLM2	CO'1	T&R1	
9.	Barriers to TQM Implementation	1	15-7-23		TLM2	CO'1	T&R1	
10.	Barriers to TQM Implementation	1	17-7-23		TLM2	CO'1	T&R1	
11.	Revision	1	18-7-23		TLM2	CO'1	T&R1	
12.	Quiz-1	1	19-7-23		TLM6	CO'1	T&R1	
No. of classes required to complete UNIT-I:		12			No. of classes taken:			

UNIT-II:TQM PRINCIPLES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
13.	TQM Principles: Customer satisfaction.	1	20-7-23		TLM1	CO2	T&R1	
14.	Types of Customers, customer supply chain	1	22-7-23		TLM1	CO2	T&R1	
15.	Customer perception of quality, customer feedback.	1	24-7-23		TLM2	CO2	T&R1	
16.	customer retention, Service quality.	1	25-7-23		TLM2	CO2	T&R1	
17.	Employee Involvement, Motivation.	1	26-7-23		TLM2	CO2	T&R1	
18.	Maslow 's hierarchy of needs, Herzberg theory,	1	27-7-23		TLM2	CO2	T&R1	
19.	Empowerment and Teamwork, Performance appraisal, Benefits,	1	29-7-23		TLM2	CO2	T&R1	
20.	Continuous process improvement: Continuous process improvement, Juran Trilogy:	1	31-7-23		TLM2	CO2	T&R1	
21.	PDSA cycle,	1	1-8-23		TLM2	CO2	T&R1	
22.	5S, Kaizen, Supplier	1	2-8-23		TLM2	CO2	T&R1	
23.	Partnership- Partnering, sourcing,	1	3-8-23		TLM2	CO2	T&R1	
24.	supplier selection,	1	5-8-23		TLM2	CO2	T&R1	
25.	Performance Measures-Basic Concepts,	1	7-8-23		TLM2	CO2	T&R1	
26.	Strategy, Performance Measure	1	9-8-23		TLM2	CO2	T&R1	
27.	Revision	1	10-8-23		TLM2	CO2	T&R1	

28.	Quiz	1	12-8-23		TLM6	CO2	T&R1	
No. of classes required to complete UNIT-II		16		No. of classes taken:				

UNIT-III: STATISTICAL PROCESS CONTROL

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
29.	STATISTICAL PROCESS CONTROL: The seven tools of quality,	1	14-8-23		TLM1	CO3	T&R1	
30.	Statistical Fundamentals,	1	16-8-23		TLM2	CO3	T&R1	
31.	Population and Sample,	1	17-8-23		TLM2	CO3	T&R1	
32.	Normal curve,	1	19-8-23		TLM2	CO3	T&R1	
33.	Control charts for variables and attributes,	1	21-8-23		TLM2	CO3	T&R1	
34.	Process capability,	1	22-8-23		TLM2	CO3	T&R1	
35.	Concepts of six sigma,	1	23-8-23		TLM2	CO3	T&R1	
36.	Indicators of six sigma, Principle,	1	24-8-23		TLM2	CO3	T&R1	
37.	elements, process,	1	26-8-23		TLM2	CO3	T&R1	
38.	advantages, limitations.	1	4-9-23		TLM2	CO3	T&R1	
39.	applications	1	5-9-23		TLM2	CO3	T&R1	
40.	Problems	1	7-9-23		TLM3	CO3	T&R1	
41.	Revision & Quiz	1	11-9-23		TLM2&6	CO3	T&R1	
No. of classes required to complete UNIT-III		12		No. of classes taken:				

UNIT-IV:TQM TOOLS

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.	TQM TOOLS: Benchmarking,	1	12-9-23		TLM1	CO4	T&R1	
43.	Benchmarking Process,	1	13-9-23		TLM2	CO4	T&R1	
44.	Quality Function Deployment (QFD),	1	14-9-23		TLM2	CO4	T&R1	
45.	House of Quality, QFD Process	1	16-9-23		TLM2	CO4	T&R1	
46.	Taguchi Quality Loss Function,	1	19-9-23		TLM2	CO4	T&R1	
47.	Total Productive Maintenance Concept,	1	20-9-23		TLM2	CO4	T&R1	
48.	Improvement needs,.	1	21-9-23		TLM2	CO4	T&R1	
49.	FMEA- Stages of FMEA	1	23-9-23		TLM2	CO4	T&R1	
50.	Revision	1	25-9-23		TLM2	CO4	T&R1	
51.	Quiz	1	26-9-23		TLM6	CO4	T&R1	
No. of classes required to complete UNIT-IV		10				No. of classes taken:		

UNIT-V:QUALITY SYSTEMS

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.	QUALITY SYSTEMS: Need for ISO 9000	1	27-9-23		TLM1	CO5	T&R1	
53.	other Quality systems,	1	30-9-23		TLM1	CO5	T&R1	
54.	ISO 9000:2000 Quality System,	1	3-10-23		TLM2	CO5	T&R1	
55.	Implementation of Quality system,	1	4-10-23		TLM2	CO5	T&R1	
56.	Implementation of Quality system,	1	5-10-23		TLM2	CO5	T&R1	
57.	Documentation,	1	7-10-23		TLM2	CO5	T&R1	
58.	Documentation,	1	9-10-23		TLM2	CO5	T&R1	
59.	Quality Auditing,	1	10-10-23		TLM2	CO5	T&R1	
60.	TS 16949,	1	11-10-23		TLM2	CO5	T&R1	
61.	TS 16949,	1	12-10-23		TLM2	CO5	T&R1	
62.	ISO 14000- concepts.	1	14-10-23		TLM2	CO5	T&R1	
63.	ISO 14000- concepts.	1	16-10-23		TLM2	CO5	T&R1	
64.	Revision	1	17-10-23		TLM2	CO5	T&R1	
65.	Quiz	1	18-10-23		TLM2&6	CO5	T&R1	
66.	Beyond syllabus	1	19-10-23		TLM2	CO5	T&R1	
67.	Unit-I and Unit-II revision	1	25-10-23		TLM2	CO1&CO2	T&R1	
68.	Unit- II and unit-IV revision	1	26-10-23		TLM2	CO2&CO4	T&R1	
69.	Extra syllabus	1	27-10-23		TLM2	CO5	T&R1	
70.	Extra syllabus	1	28-10-23		TLM2	CO5		
No. of classes required to complete UNIT-V		15+ 03 (Beyond Syllabus)						
II Mid Examinations – 30-10-23 to 4-11-23								

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/Assignment/Quiz

ACADEMIC CALENDER:

Commencement of Class work		03-07-2023	
I Phase of Instructions	03-07-2023	26-08-2023	8 Weeks
I Mid Examinations	28-08-2023	02-09-2023	1 Week
II Phase of Instructions	04-09-2023	28-10-2023	8 Weeks
II Mid Examinations	30-10-2023	04-11-2023	1 Week
Preparation and Practicals	06-11-2023	11-11-2023	1 Week
Semester End Examinations	13-11-2023	25-11-2023	2 Weeks

PART – C**EVALUATION PROCESS:**

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=05
Assignment/Quiz – 2	2	A2=05
I-Mid Examination	1,2	B1=20
I-Online Mid Examination	1,2	C1=10
Assignment/Quiz – 3	3	A3=05
Assignment/Quiz – 4	4	A4=05
Assignment/Quiz – 5	5	A5=05
II-Mid Examination	3,4,5	B2=20
II-Online Mid Examination	3,4,5	C2=10
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Evaluation of Online Mid Marks: $C=75\% \text{ of Max}(C1,C2)+25\% \text{ of Min}(C1,C2)$	1,2,3,4,5	C=10
Attendance: D ($\geq 95\% = 5M$; $90\% \leq A < 95\% = 4M$; $85\% \leq A < 90\% = 3M$; $80\% \leq A < 85\% = 2M$; $75\% \leq A < 80\% = 1M$; $< 75\% = 0M$)	-	D=05
Cumulative Internal Examination: A+B+C+D	1,2,3,4,5	A+B+C+D=40
Semester End Examinations: E	1,2,3,4,5	E=60
Total Marks: A+B+C+D+E	1,2,3,4,5	100

PART – D**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

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.

PROGRAMME 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 modeling 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.

Faculty Name	S.Srinivasa Reddy	S. Srinivasa Reddy	Dr. MBS Srikar Reddy	Dr. S. Pichi Reddy
Designation	Course Instructor	Course Coordinator	Module Coordinator	HOD
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF CIVIL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: K HARISH KUMAR

Course Name & Code : Disaster Management & 20CE82

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

Program/Sem/Sec : B.Tech, VII SEM, Mechanical - B

Credits: 3

A.Y.: 2023-24

PREREQUISITE: NIL

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

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

CO1	Identify the basic terms, types of disasters and their impact (Understand - L2)
CO2	Illustrate the role of technology in handling disaster management situations(Understand-L2)
CO3	Identify the stake-holders concerned and design the different action plans for responding in case of disaster occurrence (Understand - L2)
CO4	Evaluate the importance of education and community approach for the responsive actions to be taken in case of disaster occurrence (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	1	1	-	1	2	1	-	-	-	-	-	1	2	1	2
CO2	1	1	1	2	2	1	-	-	-	-	-	1	2	1	2
CO3	1	-	-	1	2	1	1	1	-	-	-	1	1	1	2
CO4	1	-	-	1	1	1	1	1	1	1	1	1	1	1	2
			1 - Low			2 -Medium			3 - High						

TEXTBOOKS:

- T1** Tushar Bhattacharya, "Disaster Science and Management", Tata McGraw Hill Publications, New Delhi, 2012.
- T2** R.Subramanian, "Disaster Management", Vikas Publishing house Pvt. Ltd, 2022.

REFERENCE BOOKS:

- R1** G.K. Ghosh, "Disaster Management", APH Publishing Corporation, 2006.
- R2** U.K. Chakrabarty, "Industrial Disaster Management and Emergency Response", Asian Books Pvt. Ltd., New Delhi 2007.
- R3** H K Gupta (Ed.), "Disaster Management", Universities Press, 2003
- R4** W.N. Carter, "Disaster Management: A Disaster Management Handbook", Asian Development Bank, Bangkok, 1991.
- R5** Government of India website on Disaster Management: www.ndmindia.nic.in

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: DEFINITIONS & TYPES OF DISASTER

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction CO's & PO's, Subject	1	03-07-2023		TLM2	
2.	Definitions – types of Disasters	3	04-07-2023 06-07-2023 07-07-2023		TLM2	
3.	Concept of disaster management - Disaster Management Cycle	1	10-07-2023		TLM2	
4.	Vulnerability -	1	11-07-2023		TLM2	
5.	Mitigation	1	13-07-2023		TLM2	
6.	Various types of disasters: Natural: Drought, cyclone	1	14-07-2023		TLM2	
7.	Earthquake and landslides.	1	15-07-2023		TLM2	
8.	Manmade and Industrial: Engineering and Technical failure	1	17-07-2023		TLM2	
9.	Nuclear and Chemical disasters	1	18-07-2023		TLM2	
10.	Accident-Related Disasters	1	20-07-2023		TLM2	
11.	High Power Committee on Disaster Management in India	1	21-07-2023		TLM2	
12.	Disaster Management Act 2005	1	22-07-2023		TLM2	
13.	Tutorial- 1/ Quick revision	1	24-07-2023		TLM3	
14.	Revision	1	25-07-2023		TLM3	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: IMPACT OF DISASTERS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Impact due to – Earthquake	1	27-07-2023		TLM2	
16.	Impact due to – Cyclone	1	28-07-2023		TLM2	
17.	Landslides, Fire hazards	1	31-07-2023		TLM2	
18.	Life & livestock, Habitation	1	01-08-2023		TLM2	
19.	Agriculture & livelihood loss- Health hazards	2	03-08-2023 04-08-2023		TLM2	
20.	Malnutrition problems- Contamination of water	1	05-08-2023		TLM2	
21.	Impact on children	1	07-08-2023		TLM2	
22.	Environmental loss	1	08-08-2023		TLM2	
23.	Tutorial- 2/ Quick revision	1	10-08-2023		TLM3	
24.	Revision	1	11-08-2023		TLM3	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III: ROLE OF TECHNOLOGY IN DISASTER MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Role of remote sensing	1	14-08-2023		TLM2	
26.	information systems and decision	1	17-08-2023		TLM2	

	making tools				
27.	mitigation programme for earthquakes	1	18-08-2023		TLM2
28.	Geospatial information in agriculture	2	19-08-2023 21-08-2023		TLM2
29.	drought assessment	1	22-08-2023		TLM2
30.	Disaster management for infra structures - electrical substations	1	24-08-2023		TLM2
31.	Roads and bridges	1	25-08-2023		TLM2
32.	Multimedia technology in disaster risk management and training	1	26-08-2023		TLM2
33.	Transformable indigenous knowledge in disaster reduction.	3	04-09-2023 05-09-2023 07-09-2023		TLM2
34.	Tutorial- 3/ Quick revision	1	08-09-2023		TLM3
35.	Revision	1	11-09-2023		TLM3
No. of classes required to complete UNIT-III: 13				No. of classes taken:	

UNIT-IV: PLANNING & RISK PREVENTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
MID - I Examination		28.08.2023 - 02.09.2023				
36.	Planning, early warning system	1	12-09-2023		TLM2	
37.	crisis intervention and management	1	14-09-2023		TLM2	
38.	Response and Rehabilitation after Disasters	1	15-09-2023		TLM2	
39.	temporary shelter – food and nutrition- safe drinking water	2	16-09-2023 19-09-2023		TLM2	
40.	response to drought	2	21-09-2023 22-09-2023		TLM2	
41.	rehabilitation after cyclones	1	23-09-2023		TLM2	
42.	response to river erosion	1	25-09-2023		TLM2	
43.	response after earthquake	1	26-09-2023		TLM3	
44.	response after Tsunami- Hunger and Disaster	1	29-09-2023		TLM2	
45.	Tutorial- 4/ Quick revision	1	30-09-2023		TLM3	
46.	Revision	1	03-10-2023		TLM3	
No. of classes required to complete UNIT-IV: 12				No. of classes taken:		

UNIT-V: EDUCATION AND COMMUNITY PREPAREDNESS & CASE STUDIES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Essentials of disaster education –	1	05-10-2023		TLM2	
48.	school awareness and safety programs	1	06-10-2023		TLM2	
49.	Community based disaster recovery – voluntary agencies	1	07-10-2023		TLM2	
50.	Community participation at various stages of disaster management	1	09-10-2023		TLM1	
51.	Building community capacity for action	1	10-10-2023		TLM1	
52.	Corporate sector and disaster risk reduction	1	12-10-2023		TLM1	
53.	A community focused approach	1	13-10-2023		TLM2	
54.	Case studies on different disasters in the world	3	16-10-2023 17-10-2023		TLM2	

			19-10-2023		
55.	Impacts, Technology usage	1	20-10-2023		TLM3
56.	Risk prevention, Education and community preparedness	1	21-10-2023		TLM2
57.	Tutorial- 5/ Quick revision	1	24-10-2023		TLM3
58.	Revision		26-10-2023 27-10-2023 28-10-2023		TLM3
MID - II Examination		30.10.2023 - 04.11.2023			
No. of classes required to complete UNIT-V: 13				No. of classes taken:	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

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

Title	Course Instructor	Module Coordinator	Head of the Department
Name of the Faculty	K.Harish Kumar	Dr. J.V.Rao	Dr. Ramakrishna
Signature			



DEPARTMENT OF Electrical & Electronics Engineering

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech, VII Sem., Mechanical Engineering
ACADEMIC YEAR	: 2023-24
COURSE NAME & CODE	: UTILIZATION OF ELECTRICAL ENERGY - 20ME83
L-T-P STRUCTURE	: 3 (L) – 0 (T) –0(P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Dr. A.V.G.A.Marthanda
COURSE COORDINATOR	: Dr. A.V.G.A.Marthanda
RE-REQUISITES	: Basic Electrical Engineering

Course Educational Objective: This course enables the student to acquire knowledge on methods of Electric Heating and welding, different lighting schemes. It also introduces the concepts of Electric Drives for Industrial and traction system, and also different tariff methods

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

CO1: Understand mechanism of electric heating and electric welding. **(Understand-L2)**

CO2: Analyze performance of various lighting schemes. **(Understand-L2)**

CO3: Analyze the performance of electric drive systems. **(Understand-L2)**

CO4: Illustrate the different schemes of traction and its main components **(Understand-L2)**

CO5: Understand various tariff methods and power factor improvement techniques. **(Understand-L2)**

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	-	1
CO3	1	2	2	-	-	-	-	-	-	-	-	2	2	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-	2
CO5	2	2	-	-	-	-	-	-	-	-	-	2	2	-	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:

1. C.L.Wadhwa “Generation, Distribution and Utilization of Electrical energy, New Age International Publishers, 3rd Edition, 2015.
2. N.V.Suryanarayana “Utilization of electric power including electric drives and electric traction, New age international publishers New Delhi, 2nd edition 2014.

RREFERENCE:

1. V K Mehta & Rohit Mehta, “Principles of Power System”, Revised Edition, S.Chand Publications, 2022.
2. A.Chakrabarthy, M.L.Soni, P.V.Gupta and U.S.Bhatnagar, “A Textbook on Power system Engineering”, DhanpatRai Publishing Company (P) Ltd., 2008.

Part-B
COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction to CO's and PO's	1	03.07.2023		TLM1/ TLM2	CO1	T1, T2	
2.	Electric Heating :Advantages and methods of electric heating–	1	04.07.2023		TLM1/ TLM2	CO1	T1, T2	
3.	Resistanceheating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
4.	Resistanceheating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
5.	induction heating and dielectric heating Arc furnaces – Directand indirect arc furnaces.	1	06.07.2023		TLM1/ TLM2	CO1	T1	
6.	induction heating and dielectric heating Arc furnaces –Direct and indirect arc furnaces.	2	10.07.2023		TLM1/ TLM2/	CO1	T1, T2	
7.	ElectricWelding: Electric welding– Resistance	1	11.07.2023		TLM1/ TLM2	CO1	T2	
8.	arc welding– Electric welding equipment–	1	12.07.2023		TLM2/ TLM5	CO1	T1, T2	
9.	– arc welding– Electric welding equipment	1	12.07.2023		TLM2	CO1	T1, T2	
10	arc welding– Electric welding equipment	1	13.07.2023		TLM2	CO1	T1, T2	
11	equipment– Comparison between AC and DC Welding	1	17.07.2023		TLM2	CO1	T1, T2	
12	equipment– Comparison between AC and DC Welding	1	18.07.2023		TLM4/ TLM5	CO1	T1, T2	
13	equipment– Comparison between AC and DC Welding	1	19.07.2023		TLM4/ TLM5	CO1	T1, T2	
14	Revision/seminar	1	19.07.2023		TLM1/ TLM2/	CO1	T1, T2	

					TLM5			
No. of classes required to complete UNIT-I: 14					No. of classes taken:			

UNIT-II ILLUMINATION ENGINEERING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction, Nature of light & Laws of illumination,	2	20.07.2023 24.07.2023		TLM1/ TLM2/ TLM6	CO2	T1, T2	
2.	Nature of light & Laws of illumination	1	25.07.2023		TLM1/ TLM2	CO2	T1, T2	
3.	Nature of light & Laws of illumination	1	26.07.2023		TLM1/ TLM2	CO2	T1, T2	
4.	Lighting schemes	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
5.	, sources of light, Fluorescent Lamp, CFL and LED, Sodium	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
6.	Vapour Lamp, Neon lamps,	1	28.07.2023		TLM1/ TLM2	CO2	T1, T2	
7.	mercury vapour lamps,	1	31.07.2023		TLM1/ TLM2	CO2	T1	
8.	Comparison between tungsten & fluorescent tubes,	1	01.08.2023		TLM1/ TLM2	CO2	T1	
9.	Comparison between tungsten & fluorescent tubes,	1	02.08.2023		TLM1/ TLM2	CO2	T1	
10.	Requirements of good lighting & Street lighting	1	02.08.2023		TLM1/ TLM2	CO2	T1	
11.	Requirements of good lighting & Street lighting	1	03.08.2023		TLM1/ TLM2	CO2	T2	
12.	Class seminar/revision	1	07.08.2023		TLM1/ TLM2/ TLM5	CO2		
No. of classes required to complete UNIT-II: 12					No. of classes taken:			

UNIT-III: ELECTRIC DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
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1.	Introduction, Factors affecting selection of motor,	1	08.08.2023		TLM1/ TLM2	CO3	T1	
2.	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
3.	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
4.	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
5.	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
6.	Transient characteristics,	1	14.08.2023		TLM1/ TLM2	CO3	T1, T2	
7.	Transient characteristics	1	15.08.2023		TLM1/ TLM2	CO3	T1, T2	
8.	Transient characteristics	1	16.08.2023		TLM1	CO3	T1, T2	
9.	Size of motor, load equalization, Industrial applications	1	16.08.2023		TLM2	CO3	T1, T2	
10.	Size of motor	1	17.08.2023		TLM1/ TLM2	CO3	T1, T2	
11.	equalization, Industrial applications	1	22.08.2023		TLM2	CO3	T1, T2	
12.	equalization, Industrial applications	1	23.08.2023		TLM1/ TLM2/ TLM5	CO3	T1, T2	
13.	Revision		24.08.2023		TLM5	CO3	T1, T2	
No. of classes required to complete UNIT-I: 13					No. of classes taken:			

UNIT-IV: UNIT-IV: ELECTRIC TRACTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Introduction, requirements of an ideal traction	1	04.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	

	system, System of electric traction and track electrification–the traction motor–							
2.	traction and track electrification–the traction motor	1	05.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
3.	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
4.	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
5.	train movement, Mechanics of trainmovement–	1	07.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
6.	train movement, Mechanics of trainmovement–	1	11.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
7.	Speed–time curves for different services	1	12.09.2023		TLM1/ TLM2	CO4	T1, T2	
8.	train movement, Mechanics of trainmovement–	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
9.	– Trapezoidal and quadrilateral speed time curves	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
10.	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
11.	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM5	CO4	T1, T2	
12.	Seminar	1	18.09.2023		TLM5	CO4	T1, T2	
No. of classes required to complete UNIT-I:12					No. of classes taken:			

UNIT-V: TARIFF AND POWER FACTOR IMPROVEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1.	Tariff: Desirable characteristics, types - Flat rate,	1	18.09.2023		TLM1/ TLM2	CO5	T1, T2	

	block-rate, KVA maximum demand and Time of Day tariff.							
2.	KVA maximum demand and Time of Day tariff.	1	19.09.2023		TLM1/ TLM2	CO5	T1	
3.	Power factor: Disadvantages of low power factor,	1	20.09.2023		TLM1/ TLM2	CO5	T1	
4.	, advantages of improved p.f.,without using p.f. improvement devices	1	20.09.2023		TLM1/ TLM2/ TLM5	CO5	T2	
5.	, advantages of improved p.f.,	1	21.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
6.	without using p.f. improvement devices	1	25.09.2023		TLM1/ TLM2	CO5	T1, T2	
7.	power factor	1	26.09.2023		TLM1/ TLM2	CO5	T1, T2	
8.	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
9.	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2	CO5	T1, T2	
10.	economical power factor, location of	1	28.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
11.	power factor improvement devices from consumer	1	03.10.2023		TLM1/ TLM2	CO5	T1, T2	
12.	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
13.	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
14.	Class seminar	1	05.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
No. of classes required to complete UNIT-I: 14					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	Textbook followed	HOD Sign
1.	Recent trends Electrical energy utilization in industrial applications	2	25.10.2023 25.10.2023 26.10.2023		TLM2/ TLM5	CO1 -CO5	T1, T2, R1 to R5	

Lesson plan Section-B

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction to CO's and PO's	1	03.07.2023		TLM1/ TLM2	CO1	T1, T2	
2	Electric Heating : Advantages and methods of electric heating–	1	04.07.2023		TLM1/ TLM2	CO1	T1, T2	
3	Resistance heating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
4	Resistance heating	1	05.07.2023		TLM1/ TLM2/	CO1	T1	
5	induction heating and dielectric heating Arc furnaces – Direct and indirect arc furnaces.	1	06.07.2023		TLM1/ TLM2	CO1	T1	
6	induction heating and dielectric heating Arc furnaces – Direct and indirect arc furnaces.	2	10.07.2023		TLM1/ TLM2/	CO1	T1, T2	
7	Electric Welding : Electric welding– Resistance	1	11.07.2023		TLM1/ TLM2	CO1	T2	
8	arc welding– Electric welding equipment–	1	12.07.2023		TLM2/ TLM5	CO1	T1, T2	
9	– arc welding– Electric welding equipment	1	12.07.2023		TLM2	CO1	T1, T2	

10	arc welding– Electric welding equipment	1	13.07.2023		TLM2	CO1	T1, T2
11	equipment– Comparison between AC and DC Welding	1	17.07.2023		TLM2	CO1	T1, T2
12	equipment– Comparison between AC and DC Welding	1	18.07.2023		TLM4/ TLM5	CO1	T1, T2
13	equipment– Comparison between AC and DC Welding	1	19.07.2023		TLM4/ TLM5	CO1	T1, T2
14	Revision/seminar	1	19.07.2023		TLM1/ TLM2/ TLM5	CO1	T1, T2
No. of classes required to complete UNIT-I: 14					No. of classes taken:		

UNIT-II ILLUMINATION ENGINEERING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction, Nature of light &Laws of illumination,	2	20.07.2023 24.07.2023		TLM1/ TLM2/ TLM6	CO2	T1, T2	
2	Nature of light &Laws of illumination	1	25.07.2023		TLM1/ TLM2	CO2	T1, T2	
3	Nature of light &Laws of illumination	1	26.07.2023		TLM1/ TLM2	CO2	T1, T2	
4	Lighting schemes	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
5	, sources of light, Fluorescent Lamp, CFL and LED, Sodium	1	27.07.2023		TLM1/ TLM2	CO2	T1, T2	
6	Vapour Lamp, Neon lamps,	1	28.07.2023		TLM1/ TLM2	CO2	T1, T2	
7	mercury vapour lamps,	1	31.07.2023		TLM1/ TLM2	CO2	T1	
8	Comparison between tungsten & fluorescent tubes,	1	01.08.2023		TLM1/ TLM2	CO2	T1	
9	Comparison between tungsten & fluorescent tubes,	1	02.08.2023		TLM1/ TLM2	CO2	T1	

10	Requirements of good lighting & Street lighting	1	02.08.2023		TLM1/ TLM2	CO2	T1		
11	Requirements of good lighting & Street lighting	1	03.08.2023		TLM1/ TLM2	CO2	T2		
12	Class seminar/revision	1	07.08.2023		TLM1/ TLM2/ TLM5	CO2			
No. of classes required to complete UNIT-II: 12					No. of classes taken:				

UNIT-III: ELECTRIC DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction, Factors affecting selection of motor,	1	08.08.2023		TLM1/ TLM2	CO3	T1	
2	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
3	Introduction, Factors affecting selection of motor,	1	09.08.2023		TLM1/ TLM2	CO3	T1, T2	
4	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
5	Types of loads, Steady state characteristics of drives,	1	10.08.2023		TLM1/ TLM2	CO3	T1, T2	
6	Transient characteristics,	1	14.08.2023		TLM1/ TLM2	CO3	T1, T2	
7	Transient characteristics	1	15.08.2023		TLM1/ TLM2	CO3	T1, T2	
8	Transient characteristics	1	16.08.2023		TLM1	CO3	T1, T2	
9	Size of motor, load equalization, Industrial applications	1	16.08.2023		TLM2	CO3	T1, T2	
10	Size of motor	1	17.08.2023		TLM1/ TLM2	CO3	T1, T2	
11	equalization, Industrial applications	1	22.08.2023		TLM2	CO3	T1, T2	

12	equalization, Industrial applications	1	23.08.2023		TLM1/ TLM2/ TLM5	CO3	T1, T2	
13	Revision		24.08.2023		TLM5	CO3	T1, T2	
No. of classes required to complete UNIT-I: 13					No. of classes taken:			

UNIT-IV: UNIT-IV: ELECTRIC TRACTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Introduction, requirements of an ideal traction system, System of electric traction and track electrification– the traction motor–	1	04.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
2	traction and track electrification– the traction motor	1	05.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
3	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
4	traction and track electrificationthe traction motor	1	06.09.2023		TLM1/ TLM2	CO4	T1, T2	
5	train movement, Mechanics of trainmovement–	1	07.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
6	train movement, Mechanics of trainmovement–	1	11.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	
7	Speed–time curves for different services	1	12.09.2023		TLM1/ TLM2	CO4	T1, T2	
8	train movement, Mechanics of trainmovement–	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
9	– Trapezoidal and quadrilateral speed time curves	1	13.09.2023		TLM1/ TLM2	CO4	T1, T2	
10	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM1/ TLM2/ TLM5	CO4	T1, T2	

11	– Trapezoidal and quadrilateral speed time curves	1	14.09.2023		TLM5	CO4	T1, T2	
12	Seminar	1	18.09.2023		TLM5	CO4	T1, T2	
No. of classes required to complete UNIT-I:12					No. of classes taken:			

UNIT-V: TARIFF AND POWER FACTOR IMPROVEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
1	Tariff: Desirable characteristics, types - Flat rate, block-rate, KVA maximum demand and Time of Day tariff.	1	18.09.2023		TLM1/ TLM2	CO5	T1, T2	
2	KVA maximum demand and Time of Day tariff.	1	19.09.2023		TLM1/ TLM2	CO5	T1	
3	Power factor: Disadvantages of low power factor,	1	20.09.2023		TLM1/ TLM2	CO5	T1	
4	, advantages of improved p.f.,without using p.f. improvement devices	1	20.09.2023		TLM1/ TLM2/ TLM5	CO5	T2	
5	, advantages of improved p.f.,	1	21.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
6	without using p.f. improvement devices	1	25.09.2023		TLM1/ TLM2	CO5	T1, T2	
6	power factor	1	26.09.2023		TLM1/ TLM2	CO5	T1, T2	
7	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
8	improvement using; static capacitor, most	1	27.09.2023		TLM1/ TLM2	CO5	T1, T2	
9	economical power factor, location of	1	28.09.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
10	power factor improvement	1	03.10.2023		TLM1/ TLM2	CO5	T1, T2	

	devices from consumer							
11	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
12	power factor improvement devices from consumer	1	04.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
13	Class seminar	1	05.10.2023		TLM1/ TLM2/ TLM5	CO5	T1, T2	
No. of classes required to complete UNIT-I: 14					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	Textbook followed	HOD Sign
1	Recent trends Electrical energy utilization in industrial applications	2	25.10.2023 25.10.2023 26.10.2023		TLM2/ TLM5	CO1 -CO5	T1, T2, R1 to R5	

Teaching Learning Methods

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 21.02.2022			
I Phase of Instructions	03.07.2023	26.08.2023	8
I Mid Examinations	28.08.2023	02.09.2023	1
II Phase of Instructions	04.09.2023	28.10.2023	8
II Mid Examinations	30.10.2023	04.11.2023	1
Preparation and Practical	06.11.2023	11.11.2023	1
Semester End Examinations	13.11.2023	25.11.2023	2

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment – Cycle -I	1,2,3	A1=05
Quiz – 1	1,2,3	Q1=10
Assignment – Cycle -II	3,4,5	A2=05
Quiz – 2	3,4,5	Q2=10
I-Mid Examination	1,2,3	B1=15

II-Mid Examination	3,4,5	B2=15
Evaluation of Assignment/Quiz Marks: A=(Cycle -I + Cycle - II)/2	1,2,3,4,5	A=05
Evaluation of Mid Marks: B=80% of Max (B1, B2) + 20% of Min(B1, B2)	1,2,3,4,5	B=20
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	A+B+Q=30
Semester End Examinations: E	1,2,3,4,5	E=70
Total Marks: A+B+Q+E	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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.

PROGRAMME 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

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 contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.

7.Environment and sustainability: Understand the impact of 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 engineering practice.

9.Individual and teamwork: 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 c

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.

.Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name	Dr.A.VGA.Marthanda	Dr.A.VGA.Marthanda	Dr.G.Nageswar rao	Dr.JSV Prasad
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: A. NAGESWARA RAO

Course Name & Code : INDUSTRIAL ECONOMICS AND MANAGEMENT & 20HS03

L-T-P Structure : 5-0-0

Credits: 03

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

A.Y.: 2023-24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Comprehend the principles of Management. (Understanding-L2)
CO2	Estimate the budget requirements considering break even analysis for industrial applications.(Applying-L3)
CO3	Implement work study techniques to identify the effective method of production. (Applying-L3)
CO4	Apply the principles of quality control to check the process capability and quality of the product. (Applying-L3)
CO5	Describe the functions of human resource management. (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						3		1	2	1	3	2		3	
CO2						3		1	2	1	3	2		3	
CO3						3		1	2	1	3	2		3	
CO4						3		1	2	1	3	2		3	
CO5						3		1	2	1	3	2		3	
1 - Low 2 -Medium 3 - High															

TEXTBOOKS:

T1 Dr A.R.Aryasri, Management Science; TMH, 4th Edition 2009

REFERENCE BOOKS:

R1 Neville Stanton et al., Handbook of Human Factors and Ergonomics Methods; CRC press, 2009

R2 Khan MI; Industrial Ergonomics; PHI Learning

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION, ORGANIZATIONAL STRUCTURE

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.	INDUSTRIAL ECONOMICS AND MANAGEMENT Introduction	01	03-07-2023			
2.	Management - Definition	01	04-07-2023			
3.	Nature, Importance of management	01	05-07-2023			
4.	Functions of Management	01	06-07-2023			
5.	Taylor's scientific management theory	01	10-07-2023			
6.	Fayal's principles of management	01	11-07-2023			
7.	Contribution of Elton mayo	01	12-07-2023			
8.	Maslow, Herzberg	01	13-07-2023			
9.	Douglas Mc Gregor Theories	01	15-07-2023			
10.	basic concepts of Organization	01	17-07-2023			
11.	Departmentation and Decentralization	01	18-07-2023			
12.	Organization structures, Line organization	01	19-07-2023			
13.	Functional organization, Committee organization	01	20-07-2023			
14.	Matrix organization	01	22-07-2023			
No. of classes required to complete UNIT-I:				No. of classes taken:		

UNIT-II: COST ANALYSIS, CAPITAL BUDGETING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	COST ANALYSIS		24-07-2023			
16.	Cost concepts		25-07-2023			
17.	Break-even Analysis (BEA)		26-07-2023			
18.	Determination of Break-Even Point (simple problems)		27-07-2023			
19.	Simple problems		01-08-2023			
20.	Managerial Significance		02-08-2023			
21.	CAPITAL BUDGETING		03-08-2023			
22.	Capital and its significance		05-08-2023			
23.	Types of Capital		07-08-2023			
24.	Estimation of Fixed and Working capital requirements		08-08-2023			
25.	Methods and sources of raising capital		09-08-2023			
26.	Trading Forecast		10-08-2023			
27.	Capital Budget		12-08-2023			
28.	Cash Budget		14-08-2023			
No. of classes required to complete UNIT-II:				No. of classes taken:		

UNIT-III: OPERATIONS MANAGEMENT, WORK STUDY

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	OPERATIONS MANAGEMENT		16-08-2023			
30.	Plant location		17-08-2023			
31.	Factors influencing location		19-08-2023			
32.	Principles and types of plant layouts		21-08-2023			
33.	Methods of production:		22-08-2023			
34.	Job batch		23-08-2023			
35.	Mass production		24-08-2023			
36.	Applications		26-08-2023			
37.	WORK STUDY		04-09-2023			
38.	Basic procedure		05-09-2023			
39.	Method study		07-09-2023			
40.	Work measurement		09-09-2023			
41.	Advantages, limitations		11-09-2023			
42.	Applications.		12-09-2023			
No. of classes required to complete UNIT-III:				No. of classes taken:		

UNIT-IV: QUALITY AND MATERIALS MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	QUALITY AND MATERIALS MANAGEMENT		13-09-2023			
44.	Statistical quality control		14-09-2023			
45.	Meaning Variables		16-09-2023			
46.	Attributes		19-09-2023			
47.	X chart,		20-09-2023			
48.	R Chart		21-09-2023			
49.	Simple Problems		23-09-2023			
50.	Simple Problems		25-09-2023			
51.	Acceptance sampling		26-09-2023			
52.	Sampling plans		27-09-2023			
53.	Deming's contribution to quality		30-09-2023			
54.			03-10-2023			
55.			04-10-2023			
56.			05-10-2023			
No. of classes required to complete UNIT-IV:				No. of classes taken:		

UNIT-V: HUMAN RESOURCE MANAGEMENT (HRM), FUNCTIONS OF HR MANAGER

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.			07-10-2023			
58.			09-10-2023			
59.			10-10-2023			
60.			11-10-2023			
61.			12-10-2023			
62.			16-10-2023			
63.			17-10-2023			
64.			18-10-2023			
65.			19-10-2023			

66.		21-10-2023			
67.		24-10-2023			
68.		25-10-2023			
69.		26-10-2023			
70.		28-10-2023			
71.					
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 (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	A NAGESWARA RAO			Dr. S. Pichi Reddy

Signature				
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