



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)**

Accredited by NAAC & NBA (Under Tier - I), ISO

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

**Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.**

Phone: 08659-222933, Fax: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

Name of Course Instructor: G. VIJAYA LAKSHMI

Course Name & Code : Complex Variables, Probability and Statistics & 23FE11

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

Credits: 2

Program/Sem/Sec : II B.Tech/IV sem/MECH

A.Y.: 2024– 25.

PREREQUISITE: Complex numbers, Partial Differentiation

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To familiarize the complex variables
- To familiarize the students with the foundations of probability and statistical methods
- To equip the students to solve application problems in their disciplines.

COURSE OUTCOMES (COs): Upon successful completion of the course, the student will be able to

CO1	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic. (L3)
CO2	Make use of Cauchy, residue theorem to evaluate certain integrals. (L3)
CO3	Infer the statistical inferential methods based on small and large sample tests. (L4)
CO4	Find the differentiation and integration of complex functions used in engineering problems. (L3)
CO5	Design the components of a classical hypothesis test. (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
CO 1	3	2	1	-	-	-	-	-	-	-	-	1			
CO 2	3	2	1	-	-	-	-	-	-	-	-	1			
CO 3	3	2	2	3	-	-	-	-	-	-	-	1			
CO 4	3	2	1	-	-	-	-	-	-	-	-	1			
CO 5	3	3	3	3	-	-	-	-	-	-	-	1			
1 - Low			2 –Medium						3 - High						

TEXTBOOKS:

T1	Dr. B.S. Grewal, “Higher Engineering Mathematics”, 44 th Edition, Khanna Publishers, New Delhi, 2015.
T2	Miller & Freund’s “Probability and Statistics for Engineers”, 7th edition. PHI, New Delhi, 2008.

REFERENCE BOOKS:

R1	J.W. Brown and R.V. Churchill, “Complex Variables and Applications”, 9 th edition, Mc.Graw Hill, 2013.
R2	S.C. Gupta, V.K. Kapoor, “Fundamentals of Mathematical Statistics”, 11th Edition, Sultan Chand and sons, New Delhi, 2012.
R3	Jay L. DeVore, “Probability and Statistics for engineering and the sciences.”, 8th edition, Cengage Learning India, 2012.
R4	Sharon L. Myers, Keying Ye, Ronald E Walpole, “Probability and Statistics for Engineers and Scientists, 8 th edition, Pearson Education International, 2017.
R5	Sheldon M. Ross, “Introduction to Probability and Statistics for Engineers and Scientists”, 4 th edition, Academic Foundation, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Functions of a Complex variable and complex Integration

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.	Continuity	1	9/12/2024		TLM1	
2.	Differentiability	1	10/12/2024		TLM1	
3.	Analytic functions	1	12/12/2024		TLM1	
4.	CR Equations – Cartesian form	1	13/12/2024		TLM1	
5.	CR Equations – Polar form	1	16/12/2024		TLM1	
6.	Harmonic and Conjugate Harmonic	1	17/12/2024		TLM1	
7.	Milne Thompson method	1	19/12/2024		TLM1	
8.	Line Integration	1	20/12/2024		TLM1	
9.	Cauchy’s Integral theorem – problems	1	23/12/2024		TLM1	
10.	Cauchy’s Integral formulas – problems	1	24/12/2024		TLM1	
11.	Generalized Cauchy’s Integral formula	1	26/12/2024		TLM1	
12.	Tutorial I	1	27/12/2024		TLM3	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: Numerical solutions of Equations and Numerical Integration

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Radius of Convergence	1	30/12/2024		TLM1	
14.	Expansion of function in Taylor series	1	31/12/2024		TLM1	
15.	Expansion of function in Maclaurin’s series	1	02/01/2025		TLM1	
16.	Expansion of function in Laurent series	1	03/01/2025		TLM1	
17.	Expansion of function in Laurent series	1	06/01/2025		TLM1	
18.	Singularities and types of Singularities	1	07/01/2025		TLM1	
19.	Singularities and types	1	09/01/2025		TLM1	

	of Singularities					
20.	Poles and Residues	1	10/01/2025		TLM1	
21.	Residue theorem problems	1	17/01/2025		TLM1	
22.	Evaluation of real integrals of Type-I	1	20/01/2025		TLM1	
23.	Evaluation of real integrals of Type-II	1	21/01/2025		TLM1	
24.	Tutorial 2	1	23/01/2025		TLM3	
25.	Revision on Unit-II	1	24/01/2025			
No. of classes required to complete UNIT-II: 13				No. of classes taken:		

I MID EXAMINATIONS (27-01-2025 TO 01-02-2025)

UNIT-III: Multiple Integrals

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction	1	03/02/2025		TLM1	
27.	Baye's theorem, problems	1	04/02/2025		TLM1	
28.	Random variables, Expectations	1	06/02/2025		TLM1	
29.	Problems on PMF	1	07/02/2025		TLM1	
30.	Problems on PDF	1	10/02/2025		TLM2	
31.	Mathematical Expectations and Variance	1	11/02/2025		TLM1	
32.	Binomial distribution	1	13/02/2025		TLM1	
33.	Poisson distribution	1	14/02/2025		TLM1	
34.	Uniform distribution	1	17/02/2025		TLM1	
35.	Normal distribution	1	18/02/2025		TLM1	
36.	TUTORIAL - III	1	20/02/2025		TLM3	
37.		1	21/02/2025		TLM1	
No. of classes required to complete UNIT-III: 12				No. of classes taken:		

UNIT-IV: Fourier Series

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Introduction	1	24/02/2025		TLM1	
39.	Sampling distribution, definitions	1	25/02/2025		TLM1	
40.	Sampling distribution of mean, variance	1	27/02/2025		TLM1	
41.	Problems	1	28/02/2025		TLM1	
42.	Problems on central limit theorem	1	03/03/2025		TLM1	
43.	Estimation	1	04/03/2025		TLM1	
44.	Normal theory distributions	1	06/03/2025		TLM1	
45.	Estimation using t distribution	1	07/03/2025		TLM1	

46.	Estimation using χ^2 and F-distributions	1	10/03/2025		TLM1	
47.	Tutorial-4	1	11/03/2025		TLM3	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Testing of Hypothesis definitions	1	14/03/2025		TLM1	
49.	Z-test for means	1	17/03/2025		TLM1	
50.	Z-test for means	1	18/03/2025		TLM1	
51.	Z-test for proportions	1	20/03/2025		TLM1	
52.	Z-test for proportions	1	21/03/2025		TLM1	
53.	t-test for means	1	24/03/2025		TLM1	
54.	F-test for variances	1	25/03/2025		TLM1	
55.	F-test for variances	1	27/03/2025		TLM1	
56.	χ^2 -test for goodness of fit	1	28/03/2025		TLM1	
57.	χ^2 -test for goodness of fit	1	31/03/2025		TLM1	
58.	χ^2 -test for independence of attributes	1	01/04/2025		TLM1	
59.	χ^2 -test for independence of attributes	1	03/04/2025		TLM1	
60.	Tutorial-5	1	04/04/2025		TLM3	
No. of classes required to complete UNIT-V: 10				No. of classes taken:		
II MID EXAMINATIONS (07-04-2025 TO 12-04-2025)						

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

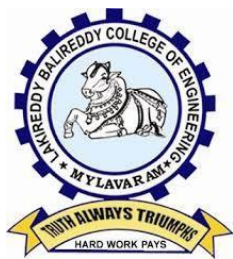
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester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

PART-D

PROGRAMME OUTCOMES (POs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	G.VIJAYA LAKSHMI		Dr. A. Rami Reddy	Dr. A. Rami Reddy
Signature				



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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Seelam Pichi Reddy

Course Name & Code : **Manufacturing Processes & 23ME06**

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

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

Credits: 3

A.Y.: 2024-25

PREREQUISITE: Material Science and Metallurgy

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- Understand the working principle of different metal casting processes and gating system.
- Classify the welding processes, working of different types of welding processes and welding defects.
- Recognize the nature of plastic deformation, cold and hot working process, working of rolling mill and types, extrusion processes.
- Understand the principles of forging, tools and dies, working of forging processes.
- Explain about the powder metallurgy processes.

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

CO1	Recognize the patterns and core boxes for metal casting processes. (Remembering -L1)
CO2	Understand the different welding processes. (Understanding-L2)
CO3	Explain the different types of bulk forming processes. (Understanding-L2)
CO4	Understand sheet metal forming processes. (Understanding-L2)
CO5	Differentiate different types of powder metallurgy processes. (Understanding-L2)

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

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

TEXTBOOKS:

T1	Kalpajain S and Steven R Schmid, Manufacturing Processes for Engineering Materials, 5/e, Pearson Publications, 2007.
T2	P.N. Rao, Manufacturing Technology -Vol I, 5/e, McGraw Hill Education, 2018.

REFERENCE BOOKS:

R1	A.Ghosh & A.K.Malik, Manufacturing Science, East West Press Pvt. Ltd, 2010.
R2	Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Casting

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, Course Objectives and Outcomes	1	09-12-2024		TLM1, TLM2	
2.	Casting: Steps involved in making a casting	1	10-12-2024		TLM1, TLM2	
3.	Advantage of casting and its applications.	1	13-12-2024			
4.	Patterns and Pattern making	1	14-12-2024		TLM1, TLM2	
5.	Types of patterns – Materials used for patterns	1	16-12-2024		TLM1, TLM2	
6.	pattern allowances and their construction, Molding, different types of cores	1	17-12-2024		TLM1, TLM2	
7.	Principles of Gating	1	20-12-2024		TLM1, TLM2	
8.	Risers, casting design considerations.	1	21-12-2024		TLM1, TLM2	
9.	Basic principles and applications of special casting processes	1	23-12-2024		TLM1, TLM2	
10.	Centrifugal casting,	1	24-12-2024		TLM1, TLM2	
11.	Die casting	1	27-12-2024		TLM1, TLM2	
12.	Investment casting and shell molding.	1	28-12-2024		TLM1, TLM2	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: Welding

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Welding: Classification of welding processes	1	30-12-2024		TLM1, TLM2	
14.	types of welded joints and their characteristics	1	31-12-2024		TLM1, TLM2	
15.	Gas welding, Different types of flames and uses, Oxy- Acetylene Gas cutting	1	03-01-2025		TLM1, TLM2	
16.	Basic principles of Arc welding	1	04-01-2025		TLM1, TLM2	
17.	Manual metal arc welding, submerged arc welding, TIG & MIG welding	1	06-01-2025		TLM1, TLM2	
18.	Electro-slag welding.	1	07-01-2025		TLM1, TLM2	
19.	Resistance welding	1	10-01-2025		TLM1, TLM2	
20.	Friction welding, Friction stir welding	1	11-01-2025			
21.	Forge welding, Explosive welding	1	13-01-2025		TLM1, TLM2	
22.	Thermit welding, Plasma Arc welding	1	20-01-2025		TLM1, TLM2	
23.	Laser welding, electron beam welding	1	21-01-2025		TLM1, TLM2	
24.	Soldering & Brazing	1	24-01-2025		TLM1, TLM2	
25.	Heat affected zones in welding; pre & post heating.	1	25-01-2025		TLM1, TLM2	
I Mid Examination -27-01-2025 TO 01-02-2025						
No. of classes required to complete UNIT-II: 13				No. of classes taken:		

UNIT-III: Bulk Forming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Plastic deformation in metals and alloys	1	03-02-2024			
27.	Recovery, recrystallization and grain growth.	1	04-02-2024		TLM1, TLM2	
28.	Hot working and Cold working	1	07-02-2024		TLM1, TLM2	
29.	Strain hardening and Annealing	1	10-02-2024			
30.	Bulk forming processes: Forging-Types of Forging	1	11-02-2024		TLM1, TLM2	
31.	Forging defects and remedies	1	14-02-2024		TLM1, TLM2	
32.	Rolling – fundamentals, types of rolling mills and products	1	15-02-2024		TLM1, TLM2	
33.	Forces in rolling and power requirements	1	17-02-2024		TLM1, TLM2	
34.	Extrusion and its characteristics.	1	18-02-2024		TLM1, TLM2	
35.	Types of extrusion	1	21-02-2024		TLM1, TLM2	
36.	Impact extrusion	1	22-02-2024		TLM1, TLM2	
37.	Hydrostatic extrusion	1	24-02-2024		TLM1, TLM2	
38.	Wire drawing and Tube drawing.	1	25-02-2024		TLM1, TLM2	
No. of classes required to complete UNIT-III: 13				No. of classes taken:		

UNIT-IV: Sheet metal forming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Blanking and piercing -Introduction	1	28-02-2024			
40.	Forces and power requirement in these operations	1	01-03-2024		TLM1, TLM2	
41.	Deep drawing, Stretch forming, Bending	1	03-03-2024		TLM1, TLM2	
42.	Spring back and its remedies, Coining, Spinning	1	04-03-2024		TLM1, TLM2	
43.	Types of presses and press tools.	1	07-03-2024		TLM1, TLM2	
	High energy rate forming processes	1	08-03-2024		TLM1, TLM2	
44.	Principles of explosive forming	1	10-03-2024		TLM1, TLM2	
45.	Electromagnetic forming	1	11-03-2024			
46.	Electro hydraulic forming	1	14-03-2024		TLM1, TLM2	
47.	Rubber pad forming, advantages and limitations	1	15-03-2024		TLM1, TLM2	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V: Powder Metallurgy

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Basic processes- Methods of producing metal powders	1	17-03-2024		TLM1, TLM2	
49.	Milling atomization Granulation-Reduction-Electrolytic Deposition	1	18-03-2024		TLM1, TLM2	
50.	Compacting methods – Sintering	1	21-03-2024		TLM1, TLM2	
51.	Methods of manufacturing sintered parts	1	22-03-2024		TLM1, TLM2	
53.	Secondary operations	1	24-03-2025		TLM1, TLM2	
54.	Applications of powder metallurgical products	1	25-03-2025		TLM1, TLM2	
No. of classes required to complete UNIT-V: 06				No. of classes taken:		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
55.	3D Printing	1	31-03-2025		TLM1, TLM2	
56.	BioManufacturing	1	01-04-2025		TLM1, TLM2	
57.	Digital Manufacturing	1	04-04-2025		TLM1, TLM2	
58.	Revision	1	05-04-2024		TLM1, TLM2	

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

ACADEMIC CALENDER:

Commencement of Class work		15-07-2024	
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	27-01-2024	01-02-2025	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	07-04-2025	12-04-2025	1 W
Preparation and Practical's	14-04-2025	19-04-2025	1 W
Semester End Examinations	21-04-2025	03-05-2025	2 W

PART-C

EVALUATION PROCESS (R 23 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.S. Pichi Reddy	Dr.S. Pichi Reddy	J.Subba Reddy	Dr.M.B.S.Sreekara Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: S.RAMI REDDY

Course Name & Code : FLUID MECHANICS & HYDRAULIC MACHINES & 23 ME07

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

Credits: 3

Program/Sem/Sec : B.Tech/IV

A.Y.: 2024-25

PREREQUISITE: Engineering physics

Course Objective: The students completing this course are expected to

1. Understand the properties of fluids, manometry, hydrostatic forces acting on different surfaces
2. Understand the kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations.
3. Understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

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

CO1	Understand the fundamentals of fluid mechanics and summarize the properties of fluidflows. (Understanding L2)
CO2	Calculate the properties of fluids in static and dynamic conditions. (Applying-L3)
CO3	Apply the boundary layer theory to determine flow separation in fluid flow systems. (Applying-L3)
CO4	Solve the hydrodynamic forces of jet on vanes in different positions and turbine performance parameters. (Applying-L3)
CO5	Distinguishes the performance parameters of turbines and pumps. (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	2	2	3	-	-	-	-	-	3	-	3	2	-	3
CO2	3	3	3	2	-	-	-	-	-	-	-	3	2	-	2
CO3	2	1	3	2	1	-	-	-	-	-	-	3	2	-	3
CO4	2	1	2	3	-	-	-	-	-	-	-	3	3	-	3
CO5	3	2	3	2	1	-	-	-	-	-	-	3	2	-	2
1 - Low			2 - Medium			3 - High									

TEXTBOOKS:

- T1** P.N.Modi and S.M.Seth, Hydraulics, "Fluid Mechanics and Hydraulic Machinery, 15th Edition, Standard Book House, 2004.

T2 Philip J, Robert W.fox, Fluid mechanics, 7th edition, John Wiley & sons, 2011.

REFERENCE BOOKS:

R1 R.K.Bansal, "Fluid Mechanics and Hydraulic Machines", 9th Edition, laxmi publications

R2 Banga & Sharma, "Hydraulic Machines", Edition, Khanna publishers, 6th Edition, 1999.

R3 Rama Durgaiah, "Fluid Mechanics and Machinery", Edition, New Age International, 1st edition, 2006

R4 D.S.Kumar, "Fluid Mechanics and Fluid power engineering", 5th Edition, S.K.Kataria & Sons.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: FLUID STATITICS AND BUOYANCY AND FLOATATION

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 FMHM	1	11/12/2024		TLM1	
2.	Physical properties of fluids	1	12/12/2024		TLM2	
3.	Specific gravity,viscosity,surface tension,vapour pressure	1	13/12/2024		TLM1	
4.	Problems on physical properties	1	14/12/2024		TLM1	
5.	Manometers, classification	1	18/12/2024		TLM2	
6.	Problems on manometers	1	19/12/2024		TLM3	
7.	Pascal's and hydrostatic law	1	20/12/2024		TLM1	
8.	Metacentr,stability of floating body	1	21/12/2024		TLM1	
9.	Submerged bodies	1	26/12/2024		TLM1	
10.	Calculation of meta centre height	1	27/12/2024		TLM1	
11.	Stability analysis and applications	1	28/12/2024		TLM2	
12.	Problems on meta centre height	1	02/01/2025		TLM1	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: FLUID KINEMATICS, FLUID DYNAMICS &CLOSED CONDUIT FLOW

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction, flow types	1	03/01/2025		TLM1	
14.	Equation of continuity for one dimensional flow,	1	04/01/2025		TLM2	
15.	circulation and vorticity, Stream line, path line and streak lines and stream tube	1	08/01/2025		TLM1	
16.	Stream function and velocity potential function	1	09/01/2025		TLM1	
17.	differences and relation between them	1	10/01/2025		TLM2	
18.	surface and body forces –Euler's and Bernoulli's equations for flow along a streamline	1	17/01/2025		TLM1	
19.	momentum equation and its applications	1	18/01/2025		TLM1	
20.	force on pipe bend	1	22/01/2025		TLM3	
21.	Reynold's experiment	1	23/01/2025		TLM1	
22.	Darcy Weisbach equation	1	24/01/2025		TLM1	
23.	Minor losses in pipes	1	25/01/2025		TLM3	
24.	pipes in series and pipes in parallel&HGL,TEL	1	05/02/2025		TLM2	

No. of classes required to complete UNIT-II: 12	No. of classes taken:
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UNIT-III: BOUNDARY LAYER THEORY & DIMENSIONAL 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
25.	Introduction, momentum integral equation	1	06/02/2025		TLM2	
26.	Displacement thickness	1	07/02/2025		TLM1	
27.	Momentum thickness	1	08/02/2025		TLM1	
28.	energy thickness	1	12/02/2025		TLM1	
29.	Problems on displacement thickness	1	13/02/2025		TLM1	
30.	Problems on energy thickness	1	14/02/2025		TLM3	
31.	separation of boundary layer, control of flow separation, Stream lined body	1	19/02/2025		TLM2	
32.	Bluff body and its applications, basic concepts of velocity profiles.	1	20/02/2025		TLM2	
33.	Dimensions and Units, Dimensional Homogeneity	1	21/02/2025		TLM2	
34.	Non dimensionalizationof equations	1	22/02/2025		TLM3	
35.	Method of repeating variables	1	27/02/2025		TLM1	
36.	Buckingham Pi Theorem	1	28/02/2025		TLM1	
37.	Problems on repeating variables,Buckingham Pi Theorem	1	01/03/2025		TLM1	
No. of classes required to complete UNIT-III: 14				No. of classes taken:		

UNIT-IV: BASICS OF TURBO MACHINERY & HYDRAULIC TURBINES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	hydrodynamic force of jets on stationary plates	1	05/03/2025		TLM2	
39.	hydrodynamic force of jets on stationary plates	1	06/03/2025		TLM2	
40.	hydrodynamic force of jets on moving plates	1	07/03/2025		TLM1	
41.	hydrodynamic force of jets on moving plates	1	08/03/2025		TLM3	
42.	Problems on stationary and moving plates	1	12/03/2025		TLM1	
43.	jet striking at tip, velocity diagrams, work done and efficiency, flow over radial vanes, classification of turbines	1	14/03/2025		TLM2	
44.	Pelton wheel, Francis and Kaplan turbine, working proportions, work done, efficiencies, hydraulic design	1	15/03/2025		TLM1	
45.	draft tube-theory-functions and efficiency		19/03/2025		TLM2	

No. of classes required to complete UNIT-IV: 9	No. of classes taken:
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UNIT-V: PERFORMANCE OF HYDRAULIC TURBINES,CENTRIFUGAL PUMPS AND RECIPROCATING PUMPS

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.	Geometric similarity, Unit and specific quantities	1	20/03/2025		TLM2	
47.	characteristic curves, governing of turbines	1	21/03/2025		TLM2	
48.	selection of type of turbine, cavitation	1	22/03/2025		TLM2	
49.	Classification of centrifugal pumps,working, work done – manometric head	1	26/03/2025		TLM1	
50.	losses and efficiencies-specific speed- pumps in series and parallel	1	27/03/2025		TLM1	
51.	performance characteristic curves, cavitation & NPSH	1	28/03/2025		TLM1	
52.	Problems on centrifugal pumps	1	29/03/2025		TLM1	
53.	Reciprocating pumps Working, Discharge, slip	1	02/04/2025		TLM2	
54.	indicator diagrams	1	03/04/2025		TLM1	
55.	Problems on reciprocating pumps	1	04/04/2025		TLM2	
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

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

PART-C

VALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III , IV & V)	A2=5
II- Descriptive Examination (UNIT-III , IV & V)	M2=15
II-Quiz Examination (UNIT-III, IV & V)	Q2=10
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

PART-D**PROGRAMME OUTCOMES (POs):**

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	S.RAMI REDDY	S.RAMI REDDY	Dr.P.VIJAY KUMAR	Dr.M.B.S.S REDDY
Signature				



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

DEPARTMENT OF MECHANICAL ENGINEERING COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. P.V. Chandra Sekhara Rao
Course Name & Code : Theory of Machines (23ME08)
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., ME., IV-Sem. A.Y : 2024-25

PRE-REQUISITE: Engineering Mechanics, Mechanics of Solids

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objectives of the course are to make the students learn about

- Identify the basic components, layout and kinematics of mechanisms
- Familiarize velocity and acceleration in mechanisms.
- Explain the importance of gyroscopic couples and turning moment diagrams.
- Familiarize balancing principles for rotating masses
- Introduce the equation of motion for single degree of freedom vibrating system.

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

CO 1	Understand different mechanisms and their inversions. (Understanding- L2)
CO 2	Analyze velocity and acceleration of different links in a mechanism. (Analyzing-L4)
CO 3	Apply the gear kinematics in various machines and Gyroscopic principles in various vehicles. (Applying-L3)
CO 4	Evaluate unbalance mass in rotating machines and draw various cam profiles. (Analyzing-L4)
CO 5	Analyze vibrations of single degree freedom systems and turning moment diagrams of various engines. (Analyzing-L4)

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

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

TEXT BOOKS:

- T1 Rattan S.S, “Theory of Machines”, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi,2011.
- T2 Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", 2ndEdition, McGraw-Hill, Inc.,1995.

REFERENCE BOOKS:

- R1 Thomas Bevan, "Theory of Machines", 3rd edition, 3rd impress, CBS Publishers and Distributors, 2013.
- R2 Rao J.S and Dukkupati R.V, “Mechanism and Machine Theory”, 2ndEdition, New Age International, New Delhi, 2007.

- R3** Sadhu Singh “Theory of Machines”, 3rd edition, Pearson Education, 1997.
R4 Ballaney.P.L “Theory of Machines”, 20th edition, Khanna Publishers, 1996.
R5 A. Ghosh and A.K.Mallik, “Theory of Mechanisms and Machines”, EW Press, 1988.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MECHANISMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction to Theory of Machines CEO & COs	1	09-12-2024		TLM1	CO1	
2.	MECHANISMS: Mechanism & Machine, Differences between Mechanism & Machine	1	10-12-2024		TLM1	CO1	
3.	Elements-classification Joints -classification Difference between Chain, Mechanism and Inversion, Types of constrained motions	1	11-12-2024		TLM1/TLM4	CO1	
4.	Pair, Types of kinematic Pairs	1	13-12-2024		TLM1/TLM4	CO1	
5.	Grashof Law	1	16-12-2024		TLM1	CO1	
6.	inversion of mechanism, inversions of quadric cycle chain (4-bar chain)	1	17-12-2024		TLM1/TLM4	CO1	
7.	Inversions of single slider crank chain	1	18-12-2024		TLM1/TLM4	CO1	
8.	Inversions of double slider crank chain	1	20-12-2024		TLM1/TLM4	CO1	
9.	Degree of freedom-Gruebler’s criterion and Problems	1	23-12-2024		TLM1/TLM4	CO1	
10.	Limit positions, Mechanical advantage, Transmission angle	1	24-12-2024		TLM1	CO1	
11.	straight line mechanisms	1	27-12-2024		TLM1	CO1	
12.	straight line mechanisms	1	30-12-2024		TLM1	CO1	
13.	Universal Joint	1	31-12-2024		TLM3	CO1	
14.	Universal Joint	1	03-01-2025		TLM3	CO1	
15.	Tutorial-1	1	06-01-2025		TLM1	CO1	
No. of classes required to complete UNIT-I: 15					No. of classes taken:		

UNIT-II: VELOCITY AND ACCELERATION ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction to Velocity & Acceleration Analysis Absolute and relative motions	1	07-01-2025		TLM1	CO2	
2.	Instantaneous centre - Kennedy’s theorem	1	08-01-2025		TLM1	CO2	
3.	Determination of angular velocity of points and links for simple mechanisms	1	10-01-2025		TLM1	CO2	
4.	Relative velocity –Velocity Polygon, Velocity diagrams for simple mechanisms	1	20-01-2025		TLM3	CO2	
5.	Acceleration Polygon- acceleration diagrams for simple mechanisms	1	21-01-2025		TLM1	CO2	
6.	Coriolis acceleration & problem, Klein’s construction	1	22-01-2025		TLM1	CO2	
7.	Tutorial-2	1	24-01-2025		TLM1	CO2	
No. of classes required to complete UNIT-II: 07					No. of classes taken:		

UNIT-III: GYROSCOPE & GEAR PROFILE

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	GEARS: Terminology - law of gearing- Profile for gears	1	03-02-2025		TLM1/TLM2	CO3	
2.	Involute gearing- Velocity of sliding	1	04-02-2025		TLM1/ TLM2	CO3	
3.	Path of Contact, Arc of Contact & Contact Ratio	1	05-02-2025		TLM1/TLM2	CO3	
4.	Interference and Undercutting	1	07-02-2025		TLM1/ TLM2	CO3	
5.	Principle of gyroscope	1	10-02-2025		TLM1	CO3	
6.	gyroscopic effect in an aeroplane	1	11-02-2025		TLM1	CO3	
7.	gyroscopic effect in a ship	1	12-02-2025		TLM1	CO3	
8.	gyroscopic effect in 4 wheeler and 2 wheeler	1	14-02-2025		TLM1	CO3	
9.	Tutorial-III	1	17-02-2025		TLM3	CO3	
10.	Revision Unit-III	1	18-02-2025		TLM3	CO3	
No. of classes required to complete UNIT-III: 10					No. of classes taken:		

UNIT-IV : BALANCING OF ROTATING MASSES & CAMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	HOD Sign Weekly
1.	Introduction to Balancing - Balancing of rotating masses in single plane	1	19-02-2025		TLM1/ TLM2	CO4	
2.	Balancing of several masses rotating in different planes	1	21-02-2025		TLM1/TLM2	CO4	
3.	Analytical and graphical methods	1	24-02-2025		TLM1/ TLM2	CO4	
4.	Classification of cams and followers	1	25-02-2025		TLM1	CO4	
5.	Cam Terminology contour cams- circular and tangent cams.	1	28-02-2025		TLM1	CO4	
6.	Displacement diagrams –Uniform velocity, parabolic	1	03-03-2025		TLM1	CO4	
7.	Displacement diagrams –simple harmonic and cycloidal motions	1	04-03-2025		TLM1	CO4	
8.	Derivation for displacement of Circular cam	1	05-03-2025		TLM1	CO4	
9.	Derivation for displacement of Tangent cam	1	07-03-2025		TLM1	CO4	
10.	Tutorial-IV	1	10-03-2025		TLM3	CO4	
No. of classes required to complete UNIT-V: 10					No. of classes taken:		

UNIT-V : VIBRATIONS & TURNING MOMENT DIAGRAMS AND FLYWHEELS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	HOD Sign Weekly
1.	Introduction Types of Vibrations (Longitudinal, Transverse & Torsional)	1	11-03-2025		TLM1/TLM2	CO5	
2.	Undamped free longitudinal vibrations of spring mass system	1	12-03-2025		TLM1	CO5	
3.	Critical Damping, Under Damping & Over damping (Definitions only). Under-damped free vibrations of spring mass system Logarithmic decrement	1	17-03-2025		TLM1/TLM2	CO5	
4.	Problems on Under-damped free vibrations of spring mass system	1	18-03-2025		TLM1	CO5	
5.	Introduction about Turning moment	1	19-03-2025		TLM1	CO5	

6.	Angular velocity and acceleration of piston, connecting rod	1	21-03-2025		TLM1	CO5	
7.	Engine force analysis-piston and crank effort & Inertia torque of connecting rod	1	24-03-2025		TLM1	CO5	
8.	Introduction to turning moment diagrams-single and multi-cylinder engines	1	25-03-2025		TLM1	CO5	
9.	Problems on single cylinder engines & multi cylinder engines	1	26-03-2025		TLM1	CO5	
10.	Fluctuation of energy- Problems	1	28-03-2025		TLM1	CO5	
11.	Tutorial-V	1	01-04-2025		TLM3	CO5	
12.	Revision	1	02-04-2025		TLM1	CO5	
No. of classes required to complete UNIT-V: 12					No. of classes taken:		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	HOD Sign Weekly
1.	Whirling Speed of Shaft (Used for lab also)	01	31-03-2025		TLM1/TLM4	-	

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 (R23 Regulations):

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	27-01-2025	01-02-2025	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	07-04-2025	12-04-2025	1 W
Preparation and Practicals	14-04-2025	19-04-2025	1 W
Semester End Examinations	21-04-2025	03-05-2025	2 W

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. P.V.Chnadra Sekhara Rao)	Course Coordinator (Mr.K.V.Viswanadh)	Module Coordinator (Mr. B. Sudheer Kumar)	HOD (Dr.M.B.S.Sreekara Reddy)
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LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.A. DHANUNJAY KUMAR

Course Name & Code : INDUSTRIAL MANAGEMENT&23 HS03

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

Credits: 3

Program/Sem/Sec : B.Tech/IV

A.Y.: 2024-25

PREREQUISITE: Engineering physics

Course Objective: The students completing this course are expected to

1. Introduce the scope and role of industrial engineering and the techniques for optimal design of layouts
2. Illustrate how work study is used to improve productivity.
3. Explain TQM and quality control techniques
4. Introduce financial management aspects and
5. Discuss human resource management and value analysis.

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

C01	Design the key factors and techniques for optimizing and maintaining plant layouts. (Applying-L3)
C02	Demonstrate various work study techniques and evaluate the principles of ergonomics and tools. (Applying-L3)
C03	Investigate statistical quality control methods and value the concepts of total quality management. (Applying-L3)
C04	Investigate the scope and nature of financial management techniques. (Applying-L3)
C05	Integrate human resource management, personnel management, and industrial relations concepts and functions. (Applying-L3)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
C01						3		1	2	1	3	2		3	
C02						3		1	2	1	3	2		3	
C03						3		1	2	1	3	2		3	
C04						3		1	2	1	3	2		3	
C05						3		1	2	1	3	2		3	
1 - Low			2 -Medium			3 - High									

TEXTBOOKS:

T1 O.P Khanna, Industrial Engineering and Management, Dhanpat Rai Publications (P) Ltd, 2018.

T2 Mart and Telsang, Industrial Engineering and Production Management, S.Chand &Company Ltd. New Delhi, 2006

REFERENCE BOOKS:

R1	Bhattacharya DK, Industrial Management,S.Chand, publishers, 2010
R2	J.G Monks, Operations Management,3/e, McGraw Hill Publishers1987.
R3	T.R. Banga, S.C.Sharma, N. K. Agarwal, Industrial Engineering and Management Science, Khanna Publishers, 2008.
R4	KoontzO' Donnell, Principles of Management, 4/e, McGraw Hill Publishers, 1968.
R5	R.C. Gupta, Statistical Quality Control, Khanna Publishers, 1998
R6	NVS Raju, Industrial Engineering and Management,1/e, Cengage India Private Limited, 2013.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION & PLANT LAYOUT

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.	Definition Of Industrial Engineering (I.E), Development, Applications, Role of An Industrial Engineer	1	10/12/2024		TLM2	
2.	Differences Between Production Management and Industrial Engineering, Quantitative Tools of IE And Productivity Measurement	1	13/12/2024		TLM2	
3.	Concepts Of Management, Importance, Functions of Management	1	14/12/2024		TLM2	
4.	Scientific Management, Taylor's Principles, Theory X And Theory Y	1	17/12/2024		TLM2	
5.	Fayol's Principles of Management.	1	20/12/2024		TLM2	
6.	Factors Governing Plant Location	1	21/12/2024		TLM2	
7.	Types of Plant Layouts	1	24/12/2024		TLM2	
8.	Advantages And Disadvantages of Process Layout and Product Layout, Applications	1	27/12/2024		TLM2	
9.	Quantitative Techniques for Optimal Design of Layouts	1	28/12/2025		TLM1	
10.	Plant Maintenance, Preventive and Break Down Maintenance.	1	31/12/2025		TLM2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: 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
11.	Importance, Types of Production, Applications	1	03/01/2025		TLM2	
12.	Work Study, Method Study and Time Study	2	07/01/2025		TLM2	
13.	Work Sampling, PMTS,	1	10/01/2025		TLM1	
14.	Micro-Motion Study, Rating Techniques,	1	11/701/2025		TLM1	
15.	MTM, Work Factor System,	1	17/01/2025		TLM2	
16.	Principles Of Ergonomics,	1	18/01/2025		TLM2	
17.	Flow Process Charts	2	24/01/2025		TLM1	
18.	String Diagrams and Therbligs.	1	25/02/2025		TLM1	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III: STATISTICAL QUALITY CONTROL & TOTAL QUALITY 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
19.	Quality control, Queuing assurance and its importance,	1	04/02/2025		TLM2	
20.	SQC	1	07/02/2025		TLM2	
21.	Attribute Sampling Inspection with Single And Double Sampling	1	08/02/2025		TLM2	
22.	Control charts - $\bar{X}$ and R -Charts	1	11/02/2025		TLM1	
23.	X and S charts and their applications,	1	14/02/2025		TLM1	
24.	numerical examples.	1	15/02/2025		TLM1	
25.	TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles,	1	18/02/2025		TLM2	
26.	implementation, applications	1	21/02/2025		TLM2	
27.	ISO quality systems.	1	22/02/2025		TLM2	
28.	Six Sigma–definition, basic concepts	1	24/02/2025		TLM2	
No. of classes required to complete UNIT-III: 11				No. of classes taken:		

UNIT-IV: FINANCIAL 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
29.	Scope and nature of financial management, Sources of finance	1	27/02/2025		TLM2	
30.	Ratio analysis, Management of working capital,	1	28/02/2025		TLM2	
31.	estimation of working capital requirements,	1	01/03/2025		TLM2	
32.	stock management,	1	04/03/2025		TLM2	
33.	Cost accounting and control, budget and budgetary control,	1	07/03/2025		TLM2	
34.	Capital budgeting – Nature of Investment Decisions	1	08/03/2025		TLM2	
35.	Investment Evaluation criteria- NPV, IRR, PI, Payback Period, and ARR	1	11/03/2025		TLM1	
36.	numerical problems.	2	15/03/2025		TLM1	
No. of classes required to complete UNIT-IV: 9				No. of classes taken:		

UNIT-V: HUMAN RESOURCE MANAGEMENT & VALUE 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
37.	Concept of human resource management,	1	18/03/2025		TLM2	
38.	personnel management and	1	21/03/2025		TLM2	

	industrial relations					
39.	functions of personnel management,	1	22/03/2025		TLM2	
40.	Job- evaluation, its importance and types	1	25/03/2025		TLM2	
41.	Merit Rating, Quantitative Methods,	1	28/03/2025		TLM2	
42.	Wage Incentive Plans, And Types.	1	29/03/2025		TLM2	
43.	VALUE ANALYSIS: Value engineering, implementation procedure,	1	01/04/2025		TLM2	
44.	Enterprise Resource Planning	1	04/04/2025		TLM2	
45.	Supply Chain Management	1	05/04/2025		TLM2	
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

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

PART-C

VALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.A. DHANUNJAY KUMAR	Dr.A. NAGESWARA RAO	J. SUBBA REDDY	Dr.M.B.S.S REDDY
Signature				



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Instructors : S.RR/SUMR

Branch : ME

Academic Year: 2024-25

Course & SEM: B.Tech&IV

Regulation: R23

COURSE OBJECTIVE: To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

COURSE OUTCOMES:

After completion of the course students are able to:

CO1: Demonstrate the devices used for measuring flow. (Applying-L3)

CO2: Compute major losses in pipes. (Evaluating-L5)

CO3: Illustrate the operating parameters of turbines. (Understanding-L2)

CO4: Explain the working of different types of pumps. (Understanding-L2)

Course Articulation Matrix:

23ME55	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	-	-	-	1	-	-	2	-	-	3
CO2	-	-	1	3	-	-	-	-	-	-	-	2	-	-	-
CO3	2	2	3	1	-	-	-	-	1	-	-	2	-	-	3
CO4	2	2	3	1	-	-	-	-	1	-	-	2	-	-	3

Course Instructor

Course Coordinator

Module Coordinator

HOD



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB
Instructors : S.RR/SUMR
Branch : ME

Academic Year: 2024-25
Course & SEM: B.Tech&IV
Regulation: R23

LIST OF EXPERIMENTS:

PART-A: FLUID MECHANICS

Any 6 Experiments are required to be conducted

1. Verification of Bernoulli's Theorem **(FM1)**
2. Calibration of Venturimeter **(FM2)**
3. Calibration of Orifice meter **(FM3)**
4. Determination of friction factor for a given pipeline **(FM4)**
5. Calibration of V Notch **(FM5)**
6. Calibration of SUMRuthpiece apparatus **(FM6)**
7. Impact of jets on Vanes **(FM7)**

PART-B: HYDRAULIC MACHINES

Any 6 Experiments are required to be conducted

1. Performance Test on Pelton Wheel **(HM1)**
2. Performance Test on Kaplan Turbine **(HM2)**
3. Performance Test on Single Stage Centrifugal Pump **(HM3)**
4. Performance Test on Reciprocating Pump **(HM4)**
5. Turbine flowmeter **(HM5)**
6. Reynolds experiment **(HM6)**

REFERENCES

Lab Manual

Course Instructor

Course Coordinator

Module Coordinator

HOD



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB
Instructors : S.RR/SUMR
Branch : ME

Academic Year: 2024-25
Course & SEM: B.Tech&IV
Regulation: R23

Batches

Total No. of students: 23761A0301 TO 23761A0364 & 24765A0301 TO 308

Batch B1 : 23761A0301 TO 337 = 35

Batch B2 : 23761A0338 TO 23761A0364 & 24765A0301 TO 308 = 35

Sub Batches of B1:

S. No	Batch	Registered Nos	Total
1	B1 ₁	23761A0301 TO 306	6
2	B1 ₂	23761A0307 TO 312	6
3	B1 ₃	23761A0314 TO 319	6
4	B1 ₄	23761A0320 TO 326	6
5	B1 ₅	23761A0327 TO 332	6
6	B1 ₆	23761A0333 TO 337	5
Total			35

Sub Batches of B2:

S. No	Batch	Registered Nos	Total
1	B2 ₁	23761A0338 TO 343	6
2	B2 ₂	23761A0344 TO 349	6
3	B2 ₃	23761A0350 TO 355	6
4	B2 ₄	23761A0356 TO 361	6
5	B2 ₅	23761A0362 TO 364 & 24765A0301 TO 303	6
6	B1 ₆	24765A0304 TO 308	5
Total			35

Course Instructor

Course Coordinator

Module Coordinator

HOD



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Instructors : S.RR/SUMR

Branch : ME

Academic Year: 2024-25

Course & SEM: B.Tech&IV

Regulation: R23

NOTIFICATION OF CYCLES

CYCLE-I

1. Verification of Bernoulli's Theorem
2. Calibration of Venturi meter
3. Calibration of Orifice meter.
4. Determination of friction factor for a given pipe line
5. Calibration of SUMRuthpiece apparatus
6. Calibration of notch

CYCLE-II

7. Performance Test on Kaplan Turbine.
8. Performance Test on Single Stage Centrifugal Pump.
9. Performance Test on Reciprocating Pump.
10. Turbine flow meter.
11. Impact of jets on Vanes.
12. Performance Test on Pelton Wheel.

Notification of Cycles

Batches	Laboratory	Cycle	Experiment No.s
B1 & B2	FLUID MECHANICS AND HYDRAULIC MACHINES LAB	I	FM 1 to FM 6
		II	HM 7 to HM 12

Total No. of students: 23761A0301 TO 23761A0364 & 24765A0301 TO 308

Batch B1 : 23761A0301 TO 337 = 35

Batch B2 : 23761A0338 TO 23761A0364 & 24765A0301 TO 308 = 35

Course Instructor

Course Coordinator

Module Coordinator

HOD



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DEPARTMENT OF MECHANICAL ENGINEERING

VIVA QUESTIONS

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB
Instructors : S.RR/SUMR
Branch : ME

Academic Year: 2024-25
Course & SEM: B.Tech&IV

Regulation: R23

1. Differentiate between Absolute and gauge pressures.
2. Mention two pressure measuring instruments.
3. What is the difference weight density and mass density?
4. What is the difference between dynamic and kinematic viscosity?
5. Differentiate between specific weight and specific volume.
6. Define relative density.
7. What is vacuum pressure?
8. What is absolute zero pressure?
9. Write down the value of atmospheric pressure head in terms of water and Hg.
10. Differentiate between laminar and turbulent flow.
11. How will you classify the flow as laminar and turbulent?
12. Mention few discharge measuring devices
13. Draw the venturimeter and mention the parts.
14. Why the divergent cone is longer than convergent cone in venturimeter?
15. Compare the merits and demerits of venturimeter with orifice meter.
16. Why Cd value is high in venturimeter than orifice meter?
17. What is orifice plate?
18. What do you mean by vena contracta?
19. Define coefficient of discharge.
20. Write down Darcy -weisback's equation.
21. What is the difference between friction factor and coefficient of friction?
22. What do you mean by major energy loss?
23. List down the type of minor energy losses.
24. Define turbine
25. What are the classifications of turbine
26. Define impulse turbine.
27. Define reaction turbine.
28. Differentiate between impulse and reaction turbine.
29. What is the function of draft tube?
30. Define specific speed of turbine.

31. What are the main parameters in designing a Pelton wheel turbine?
32. What is breaking jet in Pelton wheel turbine?
33. What is the function of casing in Pelton turbine
34. Draw a simple sketch of Pelton wheel bucket.
35. What is the function of surge tank fixed to penstock in Pelton turbine?
36. How the inlet discharge is controlled in Pelton turbine?
37. What is water hammer?
38. What do you mean by head race?
39. What do you mean by tail race?
40. What is the difference between propeller and Kaplan turbine?
41. Mention the parts of Kaplan turbine.
42. Differentiate between inward and outward flow reaction turbine.
43. What is the difference between Francis turbine and SUMRdern Francis turbine?
44. What is mixed flow reaction turbine? Give an example.
45. Why draft tube is not required in impulse turbine?
46. How turbines are classified based on head. Give example.
47. How turbines are classified based on flow. Give example
48. How turbines are classified based on working principle. Give example.
49. What does velocity triangle indicates?
50. Draw the velocity triangle for radial flow reaction turbine.
51. Draw the velocity triangle for tangential flow turbine.
52. Mention the type of characteristic curves for turbines.
53. How performance characteristic curves are drawn for turbine.
54. Mention the types of efficiencies calculated for turbine.
55. Define pump.
56. How pumps are classified?
57. Differentiate pump and turbine.
58. Define Rotodynamic pump.
59. Define Positive displacement pump.
60. Differentiate between Rotodynamic and positive displacement pump.
61. Define cavitation in pump.
62. What is the need for priming in pump?
63. Give examples for Rotodynamic pump
64. Give examples for Positive displacement pump.
65. Mention the parts of centrifugal pump.
66. Mention the type of casing used in centrifugal pump.
67. Why the foot valve is fitted with strainer?
68. Why the foot valve is a non return type valve?
69. Differentiate between volute casing and vortex casing.
70. What is the function of volute casing?
71. What is the function of guide vanes?
72. Why the vanes are curved radially backward?
73. What is the function of impeller?
74. Mention the types of impeller used.
75. Define specific speed of pump.

76. Mention the type of characteristic curves for pump
77. How performance characteristic curves are drawn for pump.
78. Mention the parts of reciprocating pump.
79. What is the function of air vessel?
80. What is slip of reciprocating pump?
81. What is negative slip?
82. What is the condition for occurrence of negative slip?
83. What does indicator diagram indicates?
84. What is the difference between actual and ideal indicator diagram?
85. Briefly explain Gear pump.
86. Differentiate between internal gear pump and external gear pump.
87. Briefly explain vane pump.
88. What is rotary pump?
89. Draw the velocity triangle for centrifugal pump.
90. Draw the indicator diagram fro reciprocating pump.
91. What is the aSUMRunt of work saved by air vessel?
92. Mention the merits and demerits of centrifugal pump.
93. Mention the merits and demerits of reciprocating pump.
94. What is separation in reciprocating pump?
95. How separation occurs in reciprocating pump?
96. Differentiate single acting and double acting reciprocating pump.

Course Instructor

Course Coordinator

Module Coordinator

HOD



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DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Academic Year: 2024-25

Instructors : S.RR/SUMR

Course & SEM: B.Tech&IV

Branch : ME

Regulation: R23

Date	Experiment (Batch-1)					
Cycle-I	Ex - 1	Ex - 2	Ex - 3	Ex - 4	Ex - 5	Ex - 6
9/12/24	Demonstration of all experiments, CEOs and COs of the Laboratory					
16/12/24	B1	B2	B3	B4	B5	B6
23/12/24	B2	B3	B4	B5	B6	B1
30/12/24	B3	B4	B5	B6	B1	B2
6/1/25	B4	B5	B6	B1	B2	B3
20/1/25	B5	B6	B1	B2	B3	B4
3/2/25	B6	B1	B2	B3	B4	B5
27/1/25	I MID EXAMINATIONS					
Cycle-II	Ex - 7	Ex - 8	Ex - 9	Ex - 10	Ex - 11	Ex - 12
10/2/25	B1	B2	B3	B4	B5	B6
17/2/25	B2	B3	B4	B5	B6	B1
24/2/25	B3	B4	B5	B6	B1	B2
3/3/25	B4	B5	B6	B1	B2	B3
10/3/25	B5	B6	B1	B2	B3	B4
17/3/25	B6	B1	B2	B3	B4	B5
17/3/25	REPETITION					
24/4/25	INTERNAL EXAMINATION					

S. No	Batch	Registered Nos	Total		S. No	Batch	Registered Nos	Total
1	B11	23761A0301 TO 306	6		4	B14	23761A0320 TO 326	6
2	B12	23761A0307 TO 312	6		5	B15	23761A0327 TO 332	6
3	B13	23761A0314 TO 319	6		6	B16	23761A0333 TO 337	5

Course Instructor

Course Coordinator

Module Coordinator

HoD



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Academic Year: 2024-25

Instructors : S.RR/SUMR

Course & SEM: B.Tech&IV

Branch : ME

Regulation: R23

Date	Experiment (Batch-2)					
Cycle-I	Ex - 1	Ex - 2	Ex - 3	Ex - 4	Ex - 5	Ex - 6
12/12/24	Demonstration of all experiments, CEOs and COs of the Laboratory					
19/12/24	B1	B2	B3	B4	B5	B6
26/12/24	B2	B3	B4	B5	B6	B1
2/1/25	B3	B4	B5	B6	B1	B2
9/1/25	B4	B5	B6	B1	B2	B3
23/1/25	B5	B6	B1	B2	B3	B4
30/1/25	B6	B1	B2	B3	B4	B5
Cycle-II	I MID EXAMINATIONS					
6/2/25	Ex - 7	Ex - 8	Ex - 9	Ex - 10	Ex - 11	Ex - 12
13/2/25	B1	B2	B3	B4	B5	B6
20/2/25	B2	B3	B4	B5	B6	B1
27/2/25	B3	B4	B5	B6	B1	B2
6/3/25	B4	B5	B6	B1	B2	B3
20/3/25	B5	B6	B1	B2	B3	B4
27/3/25	B6	B1	B2	B3	B4	B5
27/3/25	REPETITION					
3/4/25	INTERNAL EXAMINATION					

Batches:

S. No	Batch	Registered Nos	Total		S. No	Batch	Registered Nos	Total
1	B21	23761A0338 TO 343	6		4	B24	23761A0356 TO 361	6
2	B22	23761A0344 TO 349	6		5	B25	23761A0362 TO 364&24765A0301 TO 303	6
3	B23	23761A0350 TO 355	6		6	B26	24765A0304 TO 308	5

Course Instructor

Course Coordinator

Module Coordinator

HoD



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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Course Instructor	: Dr.SeelamPichi Reddy, Dr.Murahari Kolli	Course Name	: 23ME56
Course Coordinator	: Dr.SeelamPichi Reddy	Credits	: 1.5
Course Name	: Manufacturing Processes Lab	Department	: Mechanical Engg
L-T-P Structure	: 0-0-3	A.Y	: 2024-25
Program	: B.Tech., II Year IV-Sem.,		
Section	: Mech (A)		

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

PRE-REQUISITE: Engineering Workshop, Engineering Graphics

COURSE OBJECTIVE: Acquire practical knowledge on metal casting, welding, press working and processing of plastics.

COURSE OUTCOMES: After completion of the course students are able to:

C01	Make mould for sand casting. (Understanding-L2)
C02	Fabricate different types of components using various manufacturing techniques. (Applying-L3)
C03	Adapt conventional manufacturing methods. (Applying-L3)
C04	Develop Different weld joints. (Applying-L3)

Mapping of COs with POs and PSOs:

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

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) & PSOs – Manufacturing Processes Lab (23ME56)																
		POs												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
COs	C01	3	2	3	3	1	1	2	2	3	1	1	2		2	3
	C02	2	1	3	3	1	1	2	1	2	1	1	2		2	2
	C03	2	1	3	3	1	1	2	2	2	1	1	2		2	1
	C04	1	1	2	3	1	1	1	1	2	1	1	2		2	1
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)																

Lab in charge – I

Lab – in charge – II

Head of the Department



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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

Programme Specific Outcomes (PSOs):

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.



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor	: Dr.SeelamPichi Reddy, Dr.Murahari Kolli		
Course Coordinator	: Dr.SeelamPichi Reddy		
Course Name	: Manufacturing Processes Lab	Course Name	: 23ME56
L-T-P Structure	: 0-0-3	Credits	: 1.5
Program	: B.Tech., II Year IV-Sem.,	Department	: Mechanical Engg.
Section	: Mech (A)	A.Y	: 2024-25

LIST OF EXPERIMENTS

List of experiments should be conducted

1. Design and making of Pattern
 - Single Piece pattern
 - Multi pattern
2. Sand properties testing –
 - I. Sieve analysis
 - II. Clay content test
 - III. Moisture content test
 - IV. Strength test (compression and & Shear)
 - V. Permeability test
3. Mould preparation
 - I. Straight pipe
 - II. Bent Pipe
 - III. Dumble
 - IV. Gear Blank
4. Gas cutting and welding
5. Manual metal arc welding
 - I. Lap joint
 - II. Butt Joint
6. Injection Molding
7. Blow molding
8. Simple models using sheet metal extrusion
9. Study of deep drawing and extrusion operation
10. To make weldments using TIG/MIG welding
11. To weld using spot welding machine
12. To join using Brazing and Soldering
13. To make simple parts on a 3D printing machine
14. Demonstration of metal casting.

Lab in charge – I

Lab – in charge – II

Head of the Department



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor : Dr.SeelamPichi Reddy, Dr.Murahari Kolli
Course Coordinator : Dr.SeelamPichi Reddy
Course Name : Manufacturing Processes Lab **Course Name** : 23ME56
L-T-P Structure : 0-0-3 **Credits** : 1.5
Program : B.Tech., II Year IV-Sem., **Department** : Mechanical Engg.
Section : Mech (A) **A.Y** : 2024-25

Batches (Section - A)

S.No	Batches	Regd. No's	Total No. of Students
1	B. Tech -A/S	23761A0301 - 12, 23761A0314-21, 23761A0323-364, 24765A0301-308	70
2	Batch B1	23761A0338-364, 24765A0301-308	35
3	Batch B2	23761A0301 - 12, 23761A0314-21, 23761A0323-337	35

Sub Batches of B1:

S. No	Batch	Registered No's	Total
1	B11	23761A0301-306 ,	06
2	B12	23761A0307-312,	06
3	B13	23761A0314-319	06
4	B14	23761A0320-21,23-26	06
5	B15	23761A0327-332	06
6	B16	23761A0333-337	05
Total (B1)			35

Sub Batches of B2:

S. No	Batch	Registered No's	Total
1	B21	23761A0338-343	06
2	B22	23761A0344-349	06
3	B23	23761A0350-355	06
4	B24	23761A0356-361	06
5	B25	23761A0362-364 24765A0301-303	06
6	B26	24765A0304-308	05
Total (B2)			35

Lab in charge - I

Lab - in charge - II

Head of the Department



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor	: Dr.SeelamPichi Reddy, Dr.Murahari Kolli		
Course Coordinator	: Dr.SeelamPichi Reddy		
Course Name	: Manufacturing Processes Lab	Course Name	: 23ME56
L-T-P Structure	: 0-0-3	Credits	: 1.5
Program	: B.Tech., II Year IV-Sem.,	Department	: Mechanical
Section	: Mech (A)	A.Y	: 2024-25

Cycle – I:

1. Design and making of Pattern
 - Single Piece pattern
 - Multi pattern
2. Sand properties testing –
 - Sieve analysis
 - Clay content test
 - Moisture content test
 - Strength test (compression and & Shear)
 - Permeability test
3. Mould preparation
 - Straight pipe
 - Bent Pipe
 - Dumble
 - Gear Blank
4. Manual metal arc welding
 - Lap joint
 - Butt Joint
5. Injection Molding
6. To weld using spot welding machine

Cycle – II:

7. Simple models using sheet metal extrusion (Blanking & Piercing)
8. To join using Soldering
9. To make simple parts on a 3D printing machine
10. Demonstration of metal casting.
11. Study of deep drawing and extrusion operation
12. To make weldments using TIG/MIG welding

Lab in charge – I

Lab – in charge – II

Head of the Department



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DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor : Dr.SeelamPichi Reddy, Dr.Murahari Kolli
Course Coordinator : Dr.SeelamPichi Reddy
Course Name : Manufacturing Processes Lab **Course Name** : 23ME56
L-T-P Structure : 0-0-3 **Credits** : 1.5
Program : B.Tech., II Year IV-Sem., **Department** : Mechanical
Section : Mech (A) **A.Y** : 2024-25

Schedule of Experiments (Section – A)

Batch B1:23761A0338-364, 24765A0301-308

Date	Experiment (Batch)					
	Exp - 1	Exp – 2	Exp – 3	Exp – 4	Exp – 5	Exp - 6
09-12-2024		Demo				
16-12-2024	B11	B12	B13	B14	B15	B16
23-12-2024	B12	B13	B14	B15	B16	B11
30-12-2024	B13	B14	B15	B16	B12	B13
06-01-2025	B14	B15	B16	B12	B13	B14
20-01-2025	B15	B16	B12	B13	B14	B15
27-01-2025 To 01-02-2025	<i>I Mid Examinations</i>					
	Exp – 7	Exp- 8	Exp – 9	Exp – 10	Exp – 11	Exp – 12
03-02-2025	B11	B12	B13	B14	B15	B16
10-02-2025	B12	B13	B14	B15	B16	B11
17-02-2025	B13	B14	B15	B16	B11	B12
24-02-2025	B14	B15	B16	B11	B12	B13
03-03-2025	B15	B16	B11	B12	B13	B14
10-03-2025	B16	B11	B12	B13	B14	B15
17-03-2025	<i>REPETITION</i>					
24-03-2025	<i>Viva Voce</i>					
31-03-2025	<i>II Mid Examinations</i>					

Lab in charge – I

Lab – in charge – II

Head of the Department



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L.B. Reddy Nagar, Mylavaram, NTR District, Andhra Pradesh - 521230



DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor : Dr.SeelamPichi Reddy, Dr.Murahari Kolli
Course Coordinator : Dr.SeelamPichi Reddy
Course Name : Manufacturing Processes Lab **Course Name** : 23ME56
L-T-P Structure : 0-0-3 **Credits** : 1.5
Program : B.Tech., II Year IV-Sem., **Department** : Mechanical
Section : Mech (A) **A.Y** : 2024-25

Schedule of Experiments (Section - A)

Batch B2:21761A0331, 22765A0301 - 22765A0329,

Date	Experiment (Batch)					
	Exp- 1	Exp- 2	Exp - 3	Exp - 4	Exp - 5	Exp - 6
12.12.2024	Demo					
19.12.2024	B21	B22	B23	B24	B25	B26
26.12.2024	B22	B23	B24	B25	B26	B21
02.01.2025	B23	B24	B25	B26	B21	B21
09.01.2025	B24	B25	B26	B21	B22	B23
23.01.2025	B25	B26	B21	B22	B23	B24
30.01.2025	B26	B21	B22	B23	B24	B25
	REPETITION/ Cycle change					
27-01-2025 To 01-02-2025	I Mid Examinations					
	Exp - 7	Exp - 8	Exp - 9	Exp - 10	Exp - 11	Exp - 11
06.02.2025	B21	B22	B23	B24	B25	B26
13.02.2025	B22	B23	B24	B25	B26	B21
20. 02.2025	B23	B24	B25	B26	B21	B22
27.02.2025	B24	B25	B26	B21	B22	B23
06.03.2025	B25	B26	B21	B22	B23	B24
13.03.2025	B26	B21	B22	B23	B24	B25
20.03.2025	Internal Mid Examinations and Viva Voice					
27.03.2025	II Mid Examinations					

Lab in charge - I

Lab - in charge - II

Head of the Department



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.K.Murahari, Dr.B.Sudheer Kumar, Mr.V.Sankararao

Course Name & Code : Design Thinking & Innovation (23ME57)

Regulation : R23

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

Credits: 02

Program/Sem/Sec : B.Tech – IV Semester – A Section

A.Y.: 2024-25

PREREQUISITE: None

COURSE OBJECTIVES:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process

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

CO1	Apply fundamental design components, principles, and new materials to create and improve design projects. (Applying-L3)
CO2	Apply the design thinking process to develop and present innovative product solutions. (Applying-L3)
CO3	Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions. (Analyzing-L4)
CO4	Analyze to work in a multidisciplinary environment. (Analyzing-L4)
CO5	Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. (Evaluating-L5)

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

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

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003

Online Learning Resources:

- <https://nptel.ac.in/courses/110/106/110106124/>
- <https://nptel.ac.in/courses/109/104/109104109/>
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****Schedule of Experiments: Saturday (from 9.00 AM – 12.00 PM)**

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
01	UNIT–I Introduction to Design Thinking, Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components	3	14-12-2024		TLM2/ TLM4	
02	Principles of design	3	21-12-2024		TLM1	
03	Introduction to design thinking, history of Design Thinking, New materials in Industry	3	28-12-2024		TLM1/ TLM2	
04	UNIT – II Design Thinking Process Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions	3	04-01-2025		TLM1	
05	Design thinking in social innovations. Tools of design thinking - person, costumer	3	11-01-2025		TLM2	

06	journey map, brainstorming, product development (Activity)	3	18-01-2025		TLM4	
07	UNIT – III Innovation Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations	3	25-01-2025		TLM1/ TLM4	
I Mid Exams: 27-01-2025 to 01-02-2025						
08	Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.	3	08-02-2025		TLM2/ TLM4	
09	Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation	3	15-02-2025		TLM4	
10	UNIT – IV Product Design Problem formation, introduction to product design, Product strategies, Product value	3	22-02-2025		TLM1/ TLM4	
11	Product planning, product specifications. Innovation towards product design Case studies.	3	01-03-2025		TLM2	
12	Activity: Importance of modeling, how to set specifications, Explaining their own product design	3	08-03-2025		TLM4	
13	UNIT – V Design Thinking in Business Processes Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business	3	15-03-2025		TLM1/ TLM4	
14	Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization	3	22-03-2025		TLM2/ TLM4	

15	Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.	3	29-03-2025		TLM1/ TLM4	
16	Activity: How to market our own product, about maintenance, Reliability and plan for startup.	3	05-04-2025		TLM4	
II Mid Exams: 07-04-2025 to 12-04-2025						
No. of classes required to complete: 48				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-B

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Internal Examination	30
Semester End Examination	70
Total Marks:	100

Academic calendar

Commencement of IV Semester Classwork	09-12-2024		
Description	From	To	Weeks
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	27-01-2025	01-02-2025	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	07-04-2025	12-04-2025	1 W
Preparation and Practicals	14-04-2025	19-04-2025	1 W
Semester End Examinations	21-04-2025	03-05-2025	2 W
Internship	05-05-2025	28-06-2025	8 W
Commencement of V Semester Classwork	30-06-2025		

Lab Occupancy Time Table (B.Tech IV Sem: A Section)

↓Day/Date→	09.00 – 10.00	10.00 – 11.00	11.00 – 12.00	12.00- 01.00	01.00 – 02.00	02.00 – 03.00	03.00 – 04.00
Monday				LUNCH BREAK			
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday	DTI						

Faculty – In Charges:

S.No	Class	Section	Faculty – In Charge	Lab Technician
1	B.Tech – IV Semester	A	Dr.K.Murahari, Dr.B.Sudheer Kumar, Mr.V.Sankararao	Mr.P.Venkata Ratnam

PART-C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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Signature				
Name of the Faculty	Dr.K.Murahari, Dr.B.Sudheer Kumar, Mr.V.Sankararao	Dr.K.Murahari	Mr.J.Subba Reddy	Dr.M.B.S.Sreekara Reddy
Designation	Course Instructors	Course Coordinator	Module Coordinator	HoD



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

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

Course Name & Code : Structural and Modal Analysis using ANSYS (23MES1)

Regulation : R23

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

Credits: 02

Program/Sem/Sec : B.Tech – IV Semester – A Section

A.Y.: 2024-25

PREREQUISITE: Mechanics of Solids

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to improve the modelling and analysis skills of students in ANSYS Workbench and enable them to solve problems related to structures and machine members.

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

CO1	Understand the basics and fundamentals related to Finite Element Method. (Understanding-L2)
CO2	Comprehend the ANSYS utilities to solve the engineering problems. (Understanding-L2)
CO3	Perform the static structural analysis in 1D, 2D and 3D using ANSYS work bench. (Applying-L3)
CO4	Analyze the mode shapes of structures and machine elements. (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
C01	2	1			3							2		3	
C02	1	2	2		3							2		3	
C03	3	3		2	3							3			3
C04	1	1			3							2			3
1 - Low					2 -Medium					3 - High					

SOFTWARE PACKAGES:ANSYS

Web REFERENCES:

- 1.<https://www.slideshare.net/nageshsurner/introduction-to-ansys-workbench-80635115>
- 2.<https://www.youtube.com/watch?v=C8WvCQpzT2A>
- 3.<https://www.youtube.com/watch?v=FwKkjAr9Kbk>
- 4.<https://www.youtube.com/watch?v=6QaFX1CG-ZE>

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

Schedule of Experiments: Wednesday (from 11.00 AM – 12.00 PM & 1.00 PM – 4.00 PM)

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
01	Introduction to Finite Element Method	4	11-12-2024		TLM4	
Cycle-I						
02	Basics of ANSYS interface and its utilities	4	18-12-2024		TLM4	
03	Structural analysis of Stepped Bar and Tapered Bar	4	08-01-2025		TLM4	
04	Static Analysis of a Planar Truss	4	15-01-2025		TLM4	
05	Static Analysis of a Cantilever Beam	4	22-01-2025		TLM4	
I Mid Exams: 27-01-2025 to 01-02-2025						
06	Static Analysis of a Simply supported Beam with point load.	4	05-02-2025		TLM4	
07	Static Analysis of a Simply supported Beam with Uniformly Distributed load.	4	12-02-2025		TLM4	
Cycle-II						
08	Static Analysis of a Simply supported Beam with Uniformly Varying load. Static Analysis of a Fixed Beam subjected to Axial Load.	4	19-02-2025		TLM4	
09	Stress Analysis of Flat plates and simple shells&Axi-symmetric Components.	4	26-02-2025		TLM4	
10	Vibration Analysis of Spring-Mass Systems.	4	05-03-2025		TLM4	
11	Mode-Frequency Analysis of Beam and Machine Elements.	4	12-03-2025		TLM4	
12	Project work Execution	4	19-03-2025		TLM4	
13	Project work Execution		26-03-2025		TLM4	

14	Review on the Project		02-04-2025		TLM4	
II Mid Exams:07-04-2025 to 12-04-2025						
No. of classes required to complete: 56				No. of classes taken:		

PART-B

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Internal Examination	30
Semester End Examination	70
Total Marks:	100

Academic calendar

Commencement of IV Semester Classwork	09-12-2024		
Description	From	To	Weeks
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	27-01-2025	01-02-2025	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	07-04-2025	12-04-2025	1 W
Preparation and Practicals	14-04-2025	19-04-2025	1 W
Semester End Examinations	21-04-2025	03-05-2025	2 W
Internship	05-05-2025	28-06-2025	8 W
Commencement of V Semester Classwork	30 – 06– 2025		

Lab Occupancy Time Table (B.Tech IV Sem: A Section)

↓Day/Date→	09.00 – 10.00	10.00 – 11.00	11.00 – 12.00	12.00- 01.00	01.00 – 02.00	02.00 – 03.00	03.00 – 04.00
Monday				LUNCH BREAK			
Tuesday							
Wednesday			IV Sem		IV Sem		
Thursday							
Friday							
Saturday							

Faculty – In Charges:

S.No	Class	Section	Faculty – In Charge	Lab Technician
1	B.Tech – IV Semester	A	Mr.K.V.Viswanadh, Dr.Ch. Siva Sankara Babu Mr.V.Sankararao	Mr. Jamala Reddy

PART-C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
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Signature				
Name of the Faculty	Mr.K.V.Viswanadh, Dr.Ch.Siva Sankara Babu Mr.V.Sankararao	K.V.Viswanadh	J Subba Reddy	Dr.M.B.S.Sreekara Reddy
Designation	Course Instructors	Course Coordinator	Module Coordinator	HoD