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: K. Naga Lakshmi
Name of Course Coordinater: K. 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.:** 2025– 26.

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", 44th 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", 9th edition, Mc.Graw Hill, 2013.
R2	S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", 11thEdition, 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, 8th edition, Pearson Education International, 2017.
R5	Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 4th 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	01/12/2025		TLM1	
2.	Differentiability	1	02/12/2025		TLM1	
3.	Analytic functions	1	03/12/2025		TLM1	
4.	CR Equations – Cartesian form	1	05/12/2025		TLM1	
5.	CR Equations – Polar form	1	08/12/2025		TLM1	
6.	Harmonic and Conjugate Harmonic	1	09/12/2025		TLM1	
7.	Milne Thompson method	1	10/12/2025		TLM1	
8.	Line Integration	1	12/12/2025		TLM1	
9.	Cauchy's Integral theorem – problems	1	15/12/2025		TLM1	
10.	Cauchy's Integral formulas – problems	1	16/12/2025		TLM1	
11.	Generalized Cauchy's Integral formula	1	17/12/2025		TLM1	
12.	Tutorial I	1	19/12/2025		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Series expansions and Residue Theorem

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	22/12/2025		TLM1	
14.	Expansion of function in Taylor series	1	23/12/2025		TLM1	
15.	Expansion of function in Maclaurin's series	1	24/12/2025		TLM1	
16.	Expansion of function in Laurent series	1	26/12/2025		TLM1	
17.	Expansion of function in Laurent series	1	29/12/2025		TLM1	
18.	Singularities and types of Singularities	1	30/01/2026		TLM1	

19.	Singularities and types of Singularities	1	31/01/2026		TLM1	
20.	Poles and Residues	1	02/01/2026		TLM1	
21.	Residue theorem problems	1	05/01/2026		TLM1	
22.	Evaluation of real integrals of Type-I	1	06/01/2026		TLM1	
23.	Evaluation of real integrals of Type-I	1	07/01/2026		TLM1	
24.	Evaluation of real integrals of Type-II	1	19/01/2026		TLM1	
25.	Evaluation of real integrals of Type-II	1	20/01/2026		TLM1	
26.	Tutorial 2	1	21/01/2026		TLM3	
27.	Revision on Unit-II	1	23/01/2026			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

I MID EXAMINATIONS (27-01-2026TO 31-01-2026)

UNIT-III: Probability and Distributions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Introduction	1	02/02/2026		TLM1	
29.	Baye's theorem, problems	1	03/02/2026		TLM1	
30.	Random variables, Expectations	1	04/02/2026		TLM1	
31.	Problems on PMF	1	06/02/2026		TLM1	
32.	Problems on PDF	1	09/02/2026		TLM2	
33.	Mathematical Expectations and Variance	1	10/02/2026		TLM1	
34.	Binomial distribution	1	11/02/2026		TLM1	
35.	Poisson distribution	1	13/02/2026		TLM1	
36.	Uniform distribution	1	16/02/2026		TLM1	
37.	Normal distribution	1	17/02/2026		TLM1	
38.	TUTORIAL - III	1	18/02/2026		TLM3	
39.		1	20/02/2026		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Sampling Theory

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Introduction	1	23/02/2026		TLM1	
41.	Sampling distribution, definitions	1	24/02/2026		TLM1	
42.	Sampling distribution of mean, variance	1	25/02/2026		TLM1	
43.	Problems	1	27/03/2026		TLM1	
44.	Problems on central limit theorem	1	02/03/2026		TLM1	
45.	Estimation	1	03/03/2026		TLM1	

46.	Normal theory distributions	1	06/03/2026		TLM1	
47.	Estimation using t distribution	1	09/03/2026		TLM1	
48.	Estimation using $\chi^2$and F-distributions	1	10/03/2026		TLM1	
49.	Tutorial-4	1	11/03/2026		TLM3	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Tests of Hypothesis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Z-test for means	1	13/03/2026		TLM1	
51.	Z-test for proportions	1	16/03/2026		TLM1	
52.	Z-test for proportions	1	17/03/2026		TLM1	
53.	t-test for means	1	18/03/2026		TLM1	
54.	F-test for variances	1	20/03/2026		TLM1	
55.	F-test for variances	1	23/03/2026		TLM1	
56.	χ^2-test for goodness of fit	1	24/03/2026		TLM1	
57.	χ^2-test for goodness of fit	1	25/04/2026		TLM-1	
58.	χ^2-test for independence of attributes	1	27/04/2026		TLM1	
59.	χ^2-test for independence of attributes	1	30/04/2026		TLM1	
60.	Tutorial-5	1	31/04/2026		TLM3	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		
II MID EXAMINATIONS (06-04-2026 TO 11-04-2026)						

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**K. Naga Lakshmi**	**G. Vijaya Lakshmi**	**Dr. A. Rami Reddy**	**Dr. T. Satyanarayana**
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.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.:** 2025-26
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 turbineperformance 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	01/12/2025		TLM1	
2.	Physical properties of fluids	1	02/12/2025		TLM2	
3.	Specific gravity,viscosity,surface tension,vapour pressure	1	04/12/2025		TLM1	
4.	Problems on physical properties	1	06/12/2025		TLM1	
5.	Manometers, classification	1	08/12/2025		TLM2	
6.	Problems on manometers	1	09/12/2025		TLM3	
7.	Pascal's and hydrostatic law	1	11/12/2025		TLM1	
8.	Metacentr,stability of floating body	1	13/12/2025		TLM1	
9.	Submerged bodies	1	15/12/2025		TLM1	
10.	Calculation of meta centre height	1	16/12/2025		TLM1	
11.	Stability analysis and applications	1	18/12/2025		TLM2	
12.	Problems on meta centre height	1	20/12/2025		TLM1	
13.	Problems on meta centre height	1	22/12/2025		TLM1	
No. of classes required to complete UNIT-I: 13				**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
14.	Introduction, flow types	1	23/12/2025		TLM1	
15.	Equation of continuity for one dimensional flow,	1	27/12/2025		TLM2	
16.	circulation and vorticity, Stream line, path line and streak lines and stream tube	1	29/12/2025		TLM1	
17.	Stream function and velocity potential function	1	30/12/2025		TLM1	
18.	differences and relation between them	1	03/01/2026		TLM2	
19.	surface and body forces –Euler's and Bernoulli's equations for flow along a streamline	1	05/01/2026		TLM1	
20.	momentum equation and its applications	1	06/01/2026		TLM1	
21.	force on pipe bend	1	08/01/2026		TLM3	
22.	Reynold's experiment	1	10/01/2026		TLM1	
23.	Darcy Weisbach equation	1	19/01/2026		TLM1	

24.	Minor losses in pipes	1	20/01/2026		TLM3	
25.	pipes in series and pipes in parallel	1	22/01/2026		TLM2	
26.	HGL,TEL	1	24/01/2026		TLM2	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

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
27.	Introduction, momentum integral equation	1	02/02/2026		TLM2	
28.	Displacement thickness	1	03/02/2026		TLM1	
29.	Momentum thickness	1	05/02/2026		TLM1	
30.	energy thickness	1	07/02/2026		TLM1	
31.	Problems on displacement thickness	1	09/02/2026		TLM1	
32.	Problems on energy thickness	1	10/02/2026		TLM3	
33.	separation of boundary layer, control of flow separation, Stream lined body	1	12/02/2026		TLM2	
34.	Bluff body and its applications, basic concepts of velocity profiles.	1	14/02/2026		TLM2	
35.	Dimensions and Units, Dimensional Homogeneity	1	16/02/2026		TLM2	
36.	Non dimensionalizationof equations	1	17/02/2026		TLM3	
37.	Method of repeating variables	1	19/02/2026		TLM1	
38.	Buckingham Pi Theorem	1	21/02/2026		TLM1	
39.	Problems on repeating variables,Buckingham Pi Theorem	1	23/02/2026		TLM1	
No. of classes required to complete UNIT-III: 13				**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
40.	hydrodynamic force of jets on stationary plates	1	24/02/2026		TLM2	
41.	hydrodynamic force of jets on stationary plates	1	26/02/2026		TLM2	
42.	hydrodynamic force of jets on moving plates	1	28/02/2026		TLM1	
43.	hydrodynamic force of jets on moving plates	1	02/03/2026		TLM3	
44.	Problems on staionary and moving plates	1	03/03/2026		TLM1	
45.	jet striking at tip, velocity diagrams, work done and efficiency,flowover radial vanes,classification of turbines	1	05/03/2026		TLM2	

46.	Pelton wheelfrancis and kaplan turbine,working proportions,work done,efficiencies,hydraulic design	1	07/03/2026		TLM1	
47.	draft tube-theory-functions and efficiency		09/03/2026		TLM2	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

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
48.	Geometric similarity, Unit and specific quantities	1	10/03/2026		TLM2	
49.	characteristic curves, governing of turbines	1	12/03/2026		TLM2	
50.	selection of type of turbine, cavitation	1	14/03/2026		TLM2	
51.	Classification of centrifugal pumps,working, work done – manometric head	1	16/03/2026		TLM1	
52.	losses andefficiencies-specific speed- pumps in series and parallel	1	17/03/2026		TLM1	
53.	performance characteristic curves, cavitation & NPSH	1	19/03/2026		TLM1	
54.	Problems on centrifugal pumps	1	21/03/2026		TLM1	
55.	Reciprocating pumps Working, Discharge, slip	1	23/03/2026		TLM2	
56.	indicator diagrams	1	24/03/2026		TLM1	
57.	Problems on reciprocating pumps	1	28/03/2026		TLM2	
58.	Problems on reciprocating pumps	1	30/03/2026		TLM2	
59.	Revision	1	31/03/2026		TLM2	
60.	Revision	1	02/04/2026		TLM2	
61.	Revision	1	04/04/2026		TLM2	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

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

PART-C

VALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**

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

PART-D

PROGRAMME OUTCOMES (POs):

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

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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 : 2025-26

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 Dukkipati 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	02-12-2025		TLM1	CO1	
2.	**MECHANISMS:** Mechanism & Machine, Differences between Mechanism & Machine	1	03-12-2025		TLM1	CO1	
3.	Differences between Mechanism & Machine	1	04-12-2025		TLM1	CO1	
4.	Elements-classification Joints -classification Difference between Chain, Mechanism and Inversion, Types of constrained motions	1	06-12-2025		TLM1/TLM4	CO1	
5.	Pair, Types of kinematic Pairs	1	09-12-2025		TLM1/TLM4	CO1	
6.	Grashof Law	1	10-12-2025		TLM1	CO1	
7.	inversion of mechanism, inversions of quadric cycle chain (4-bar chain)	1	13-12-2025		TLM1/TLM4	CO1	
8.	Inversions of single slider crank chain	1	16-12-2025		TLM1/TLM4	CO1	
9.	Inversions of double slider crank chain	1	17-12-2025		TLM1/TLM4	CO1	
10.	Degree of freedom-Gruebler's criterion and Problems	1	18-12-2025		TLM1/TLM4	CO1	
11.	Limit positions, Mechanical advantage, Transmission angle	1	20-12-2025		TLM1	CO1	
12.	straight line mechanisms	1	23-12-2025		TLM1	CO1	
13.	straight line mechanisms	1	24-12-2025		TLM1	CO1	
14.	Universal Joint	1	27-12-2025		TLM3	CO1	
15.	Universal Joint	1	30-12-2025		TLM3	CO1	
16.	Tutorial-1	1	31-12-2025		TLM1	CO1	
No. of classes required to complete UNIT-I: 16					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	06-01-2026		TLM1	CO2	
2.	Instantaneous centre - Kennedy's theorem	1	07-01-2026		TLM1	CO2	
3.	Determination of angular velocity of points and links for simple mechanisms	1	10-01-2026		TLM1	CO2	
4.	Relative velocity –Velocity Polygon, Velocity diagrams for simple mechanisms	1	13-01-2026		TLM3	CO2	
5.	Problem on velocity analysis	1	14-01-2026		TLM1	CO2	
6.	Problem on velocity analysis	1	15-01-2026		TLM1	CO2	
7.	Acceleration Polygon- acceleration diagrams for simple mechanisms	1	17-01-2026		TLM1	CO2	
8.	Coriolis acceleration & problem	1	20-01-2026		TLM1	CO2	

9.	Klein's construction	1	21-01-2026		TLM1	CO2	
10.	Tutorial-2	1	22-01-2026		TLM1	CO2	
11.	Revision	1	24-01-2026		TLM1	CO2	
No. of classes required to complete UNIT-II: 11					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	03-02-2026		TLM1/TLM2	CO3	
2.	Involute gearing- Velocity of sliding	1	04-02-2026		TLM1/ TLM2	CO3	
3.	Path of Contact, Arc of Contact & Contact Ratio	1	05-02-2026		TLM1/TLM2	CO3	
4.	Interference and Undercutting	1	07-02-2026		TLM1/ TLM2	CO3	
5.	Principle of gyroscope	1	10-02-2026		TLM1	CO3	
6.	gyroscopic effect in an aeroplane	1	11-02-2026		TLM1	CO3	
7.	gyroscopic effect in a ship	1	12-02-2026		TLM1	CO3	
8.	gyroscopic effect in 4 wheeler and 2 wheeler	1	17-02-2026		TLM1	CO3	
9.	Tutorial-III	1	18-02-2026		TLM3	CO3	
10.	Revision Unit-III	1	19-02-2026		TLM3	CO3	
11.	Revision Unit-III	1	21-02-2026		TLM3	CO3	
No. of classes required to complete UNIT-III: 11					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	24-02-2026		TLM1/ TLM2	CO4	
2.	Balancing of several masses rotating in different planes	1	25-02-2026		TLM1/TLM2	CO4	
3.	Analytical and graphical methods	1	26-02-2026		TLM1/ TLM2	CO4	
4.	Classification of cams and followers	1	28-02-2026		TLM1	CO4	
5.	Cam Terminology contour cams- circular and tangent cams.	1	03-03-2026		TLM1	CO4	
6.	Displacement diagrams –Uniform velocity, parabolic	1	04-03-2026		TLM1	CO4	
7.	Displacement diagrams –simple harmonic and cycloidal motions	1	05-03-2026		TLM1	CO4	
8.	Derivation for displacement of Circular cam	1	07-03-2026		TLM1	CO4	
9.	Derivation for displacement of Tangent cam	1	10-03-2026		TLM1	CO4	
10.	Tutorial-IV	1	11-03-2026		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	12-03-2026		TLM1/ TLM2	CO5	
2.	Undamped free longitudinal vibrations of spring mass system	1	17-03-2026		TLM1	CO5	

3.	Critical Damping, Under Damping & Over damping (Definitions only). Under-damped free vibrations of spring mass system Logarithmic decrement	1	18-03-2026		TLM1/ TLM2	CO5	
4.	Problems on Under-damped free vibrations of spring mass system	1	19-03-2026		TLM1	CO5	
5.	Introduction about Turning moment	1	21-03-2026		TLM1	CO5	
6.	Angular velocity and acceleration of piston, connecting rod	1	24-03-2026		TLM1	CO5	
7.	Engine force analysis-piston and crank effort & Inertia torque of connecting rod	1	25-03-2026		TLM1	CO5	
8.	Introduction to turning moment diagrams-single and multi-cylinder engines	1	26-03-2026		TLM1	CO5	
9.	Problems on single cylinder engines & multi cylinder engines	1	28-03-2026		TLM1	CO5	
10.	Fluctuation of energy- Problems	1	31-03-2026		TLM1	CO5	
11.	Tutorial-V	1	01-04-2026		TLM3	CO5	
12.	Revision	1	02-04-2026		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	04-04-2026		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	01-02-2026	1 W
II Phase of Instructions	03-02-2026	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 knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO 5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO 11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Dr. P.V.Chnadra Sekhara Rao)	(Mr.K.V.Viswanadh)	(Mr. B. Sudheer Kumar)	(Dr.M.B.S.Sreekara Reddy)

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Seelam Srinivasa Reddy
Course Name & Code **:** INDUSTRIAL MANAGEMENT&23 HS03
L-T-P Structure **:**2-0-0 **Credits:** 2
Program/Sem/Sec : B.Tech/IV **A.Y.:** 2025-26
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

CO1	Design the key factors and techniques for optimizing and maintaining plant layouts. **(Applying-L3)**
CO2	Demonstrate various work study techniques and evaluate the principles of ergonomics and tools. **(Applying-L3)**
CO3	Investigate statistical quality control methods and value the concepts of total quality management. **(Applying-L3)**
CO4	Investigate the scope and nature of financial management techniques. **(Applying-L3)**
CO5	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	PSO1	PSO2	PSO3
CO1						3		1	2	1	3	2		3	
CO2						3		1	2	1	3	2		3	
CO3						3		1	2	1	3	2		3	
CO4						3		1	2	1	3	2		3	
CO5						3		1	2	1	3	2		3	
1 - Low						**2 –**Medium						**3 -** High			

TEXTBOOKS:

T1 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	Koontz O' 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	04-12-2025		TLM2	
2.	Differences Between Production Management and Industrial Engineering, Quantitative Tools of IE And Productivity Measurement		05-12-2025		TLM2	
3.	Concepts Of Management, Importance, Functions of Management,- Scientific Management, Taylor's Principles, Theory X And Theory Y	1	11-12-2025		TLM2	
4.	Fayol's Principles of Management- Factors Governing Plant Location	1	12-12-2025		TLM2	
5.	Types of Plant Layouts- Advantages And Disadvantages of Process Layout and Product Layout, Applications	1	18-12-2025		TLM2	
6.	Quantitative Techniques for Optimal Design of Layouts- Plant Maintenance, Preventive and Break Down Maintenance.	1	19-12-2025		TLM2	
No. of classes required to complete UNIT-I: 05				**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
7.	Importance, Types of Production, Applications- Work Study, Method Study and Time Study	1	26-12-2025		TLM2	
8.	Work Sampling, PMTS, Micro-Motion Study, Rating Techniques,	2	02-01-2026		TLM2	
9.	MTM, Work Factor System,- Principles Of Ergonomics,	1	08-01-2026		TLM1	
10.	Flow Process Charts	1	09-01-2026		TLM1	
11.	String Diagrams and Therbligs.	1	22-01-2026		TLM2	
No. of classes required to complete UNIT-II: 05				**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
12.	Quality control, Queuing assurance and its importance,	1	23-01-2026		TLM2	
13.	SQC- Control charts - □ and □ - Charts	1	05-02-2026		TLM2	
14.	X and S charts and their applications, numerical examples.	1	06-02-2026		TLM2	
15.	TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation, applications	1	12-02-2026		TLM1	
16.	ISO quality systems.- Six Sigma– definition, basic concepts	1	13-02-2026		TLM1	
No. of classes required to complete UNIT-III: 05				**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
17.	Scope and nature of financial management, Sources of finance	1	19-02-2026		TLM2	
18.	Ratio analysis, Management of working capital, estimation of working capital requirements,	1	20-02-2026		TLM2	
19.	stock management, Cost accounting and control, budget and budgetary control,	1	26-02-2026		TLM2	
20.	Capital budgeting – Nature of Investment Decisions	1	27-02-2026		TLM2	
21.	Investment Evaluation criteria- NPV, IRR, PI, Payback Period, and ARR= numerical problems.	1	05-03-2026		TLM2	
No. of classes required to complete UNIT-IV: 05				**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
22.	Concept of human resource management,- personnel management and industrial relations	1	06-03-2026		TLM2	
23.	functions of personnel management- Job- evaluation, its importance and types,	1	12-03-2026		TLM2	
24.	Merit Rating, Quantitative Methods, Wage Incentive Plans, And Types.	1	13-03-2026		TLM2	
25.	VALUE ANALYSIS: Value engineering, implementation procedure,	1	26-03-2026		TLM2	
26.	Enterprise Resource Planning- Supply Chain Management	1	27-03-2026		TLM2	
27.	Revision	1	02-04-2026		TLM2	

No. of classes required to complete UNIT-V: 06	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	**Mr. SEELAM SRINIVASA REDDY**	**Dr. A. AGESWARA RAO**	**J. SUBBA REDDY**	**Dr. M. B. S. S 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 **Credits:** 3
Program/Sem/Sec : B.Tech, IV Sem **A.Y.:** 2025-26

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	Kalpakjain 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	03-12-2025		TLM1, TLM2	
2.	Casting: Steps involved in making a casting	1	03-12-2025		TLM1, TLM2	
3.	Advantage of casting and its applications.	1	05-12-2025		TLM1, TLM2	
4.	Patterns and Pattern making	1	06-12-2025		TLM1, TLM2	
5.	Types of patterns – Materials used for patterns	1	10-12-2025		TLM1, TLM2	
6.	pattern allowances and their construction, Molding, different types of cores	1	10-12-2025		TLM3, **TLM2**	
7.	Principles of Gating	1	12-12-2025		TLM1, TLM2	
8.	Risers, casting design considerations.	1	17-12-2025		TLM1, TLM2	
9.	Basic principles and applications of special casting processes	1	17-12-2025		TLM3, TLM2	
10.	Centrifugal casting,	1	19-12-2025		TLM1, TLM2	
11.	Die casting	1	20-12-2025		TLM1, TLM2	
12.	Investment casting and shell molding.	1	24-12-2025		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	24-12-2025		TLM3, TLM2	
14.	Types of welded joints and their characteristics	1	26-12-2025		TLM1, TLM2	
15.	Gas welding, Different types of flames and uses, Oxy– Acetylene Gas cutting	1	27-12-2025		TLM1, TLM2	
16.	Basic principles of Arc welding	1	31-12-2025		TLM1, TLM2	
17.	Manual metal arc welding, submerged arc welding, TIG &MIG welding	1	31-12-2025		TLM3, TLM2	
18.	Electro–slag welding.	1	02-01-2026		TLM1, TLM2	
19.	Resistance welding	1	03-01-2026		TLM1, TLM2	
20.	Friction welding, Friction stir welding	1	07-01-2026		TLM1, TLM2	
21.	Forge welding, Explosive welding	1	07-01-2026		TLM3, TLM2	
22.	Thermit welding, Plasma Arc welding	1	09-01-2026		TLM1, TLM2	
23.	Laser welding, electron beam welding	1	21-01-2026		TLM1, TLM2	
24.	Soldering &Brazing	1	21-01-2026		TLM3, TLM2	
25.	Heat affected zones in welding; pre & post heating.	1	23-01-2026		TLM1, TLM2	
I Mid Examination -26-01-2026 TO 31-01-2026						
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	24-01-2026		TLM1, TLM2	
27.	Recovery, recrystallization and grain growth.	1	04-02-2026		TLM1, TLM2	
28.	Hot working and Cold working	1	04-02-2026		TLM3, TLM2	
29.	Strain hardening and Annealing	1	06-02-2026		TLM1, TLM2	
30.	Bulk forming processes: Forging-Types of Forging	1	07-02-2026		TLM1, TLM2	
31.	Forging defects and remedies	1	11-02-2026		TLM1, TLM2	
32.	Rolling – fundamentals, types of rolling	1	11-02-2026		TLM3, TLM2	

	mills and products					
33.	Forces in rolling and power requirements	1	13-02-2026		TLM1, TLM2	
34.	Extrusion and its characteristics.	1	18-02-2026		TLM1, TLM2	
35.	Types of extrusion	1	18-02-2026		TLM3, TLM2	
36.	Impact extrusion	1	20-02-2026		TLM1, TLM2	
37.	Hydrostatic extrusion	1	21-02-2026		TLM1, TLM2	
38.	Wire drawing and Tube drawing.	1	25-02-2026		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	25-02-2026		TLM3, TLM2	
40.	Forces and power requirement in these operations	1	27-02-2026		TLM1, TLM2	
41.	Deep drawing, Stretch forming, Bending	1	28-02-2026		TLM1, TLM2	
42.	Spring back and its remedies, Coining, Spinning	1	04-03-2026		TLM1, TLM2	
43.	Types of presses and press tools.	1	04-03-2026		TLM3, TLM2	
44.	High energy rate forming processes	1	06-03-2026		TLM1, TLM2	
45.	Principles of explosive forming	1	07-03-2026		TLM1, TLM2	
46.	Electromagnetic forming	1	11-03-2026		TLM1, TLM2	
47.	Electro hydraulic forming	1	11-03-2026		TLM3, TLM2	
48.	Rubber pad forming, advantages and limitations	1	13-03-2026		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
49.	Basic processes- Methods of producing metal powders	1	18-03-2026		TLM1,TLM2	
50.	Milling atomization Granulation-	1	18-03-2026		TLM3,TLM2	
51.	Reduction-Electrolytic Deposition	1	20-03-2026		TLM1,TLM2	
52.	Compacting methods	1	21-03-2026		TLM1,TLM2	
53.	Sintering	1	25-03-2026		TLM1,TLM2	
54.	Methods of manufacturing sintered parts	1	25-03-2026		TLM3,TLM2	
55.	Secondary operations	1	28-03-2026		TLM1,TLM2	
56.	Applications of powder metallurgical products	1	01-04-2026		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
57.	3D Printing	1	27-03-2026		TLM1,TLM2	
58.	BioManufacturing	1	01-04-2026		TLM1,TLM2	
59.	Digital Manufacturing	1	03-04-2026		TLM1,TLM2	
60.	Revision	1	04-04-2026		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	01-12-2025	24-01-2026	8 W
I Mid Examinations	**26-01-2026**	**31-01-2026**	**1 W**
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II Mid Examinations	**06-04-2026**	**11-04-2026**	**1 W**
Preparation and Practical's	13-04-2026	18-04-2026	1 W
Semester End Examinations	**20-04-2026**	**02-05-2026**	**2 W**

PART-C

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

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB **Academic Year: 2025-26**
Instructors : Dr.SRR/DMR **Course & SEM: B.Tech&IV**
Branch : ME **Regulation:R23**

COURSE OBJECTIVE: To impart practical exposure on the performance evaluation methods of variousflow 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**

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB **Academic Year: 2025-26**
Instructors : Dr.SRR/DMR **Course & SEM: B.Tech&IV**
Branch : ME **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 pipe line **(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 flow meter(**HM5**)
6. Reynolds experiment.(**HM6**)

REFERENCES

Lab Manual

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

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB **Academic Year: 2025-26**
Instructors : Dr.SRR/DMR **Course & SEM: B.Tech&IV**
Branch : ME **Regulation:R23**

Batches

Total No. of students: 24761A0301 TO24761A0365&25765A0301 TO 307
Batch B1 : 24761A0301 TO 336 = 35
Batch B2 : 24761A0337 TO 24761A0365&25765A0301 TO 307=35
Sub Batches of B1:

S. No	Batch	Registered Nos	Total
1	$B1_1$	24761A0301 TO 306	6
2	$B1_2$	24761A0307 TO 312	6
3	$B1_3$	24761A0314 TO 319	6
4	$B1_4$	24761A0320 TO 326	6
5	$B1_5$	24761A0327 TO 332	6
6	$B1_6$	24761A0333 TO 337	5
Total			35

Sub Batches of B2:

S. No	Batch	Registered Nos	Total
1	$B2_1$	2461A0338 TO 343	6
2	$B2_2$	24761A0344 TO 349	6
3	$B2_3$	24761A0350 TO 355	6
4	$B2_4$	24761A0356 TO 361	6
5	$B2_5$	24761A0362 TO 365&25765A0301 TO 302	6
6	$B1_6$	25765A0303 TO 307	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 **Academic Year: 2025-26**
Instructors : Dr.SRR/DMR **Course & SEM: B.Tech&IV**
Branch : ME **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 : 24761A0301 TO24761A0365&25765A0301 TO 307
Batch B1 : 24761A0301 TO 336 = 35
Batch B2 : 24761A0337 TO 24761A0365&25765A0301 TO 307=35

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

DEPARTMENT OF MECHANICAL ENGINEERING

VIVA QUESTIONS

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINES LAB **Academic Year: 2025-26**
Instructors : Dr.SRR/DMR **Course & SEM: B.Tech&IV**
Branch : ME **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 atSUMRspheric 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: 2025-26**
Instructors : Dr.SRR/DMR **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**
	Demonstration of all experiments, CEOs and COs of the Laboratory					
02/12/2025	B1	B2	B3	B4	B5	B6
09/12/2025	B2	B3	B4	B5	B6	B1
16/12/2025	B3	B4	B5	B6	B1	B2
23/12/2025	B4	B5	B6	B1	B2	B3
30/12/2025	B5	B6	B1	B2	B3	B4
06/01/2025	B6	B1	B2	B3	B4	B5
27/01/2026	**I MID EXAMINATIONS**					
Cycle-II	**Ex - 7**	**Ex – 8**	**Ex – 9**	**Ex – 10**	**Ex – 11**	**Ex – 12**
20/01/2026	B1	B2	B3	B4	B5	B6
03/02/2026	B2	B3	B4	B5	B6	B1
10/02/2026	B3	B4	B5	B6	B1	B2
17/02/2026	B4	B5	B6	B1	B2	B3
24/02/2026	B5	B6	B1	B2	B3	B4
03/03/2026	B6	B1	B2	B3	B4	B5
10/03/2026	**REPETITION**					
17/03/2026	**INTERNAL EXAMINATION**					

S. No	Batch	Registered Nos	Total		S. No	Batch	Registered Nos	Total
1	B11	24761A0301 TO 306	6		4	B14	24761A0320 TO 326	6
2	B12	24761A0307 TO 312	6		5	B15	24761A0327 TO 332	6
3	B13	24761A0314 TO 319	6		6	B16	24761A0333 TO 336	5

Course Instructor **Course Coordinator** **Module Coordinator** **HoD**

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

DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2025-26**
Instructors : Dr.SRR/DMR **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**
05/12/2025	**Demonstration of all experiments, CEOs and COs of the Laboratory**					
12/12/2025	B1	B2	B3	B4	B5	B6
19/12/2025	B2	B3	B4	B5	B6	B1
26/12/2025	B3	B4	B5	B6	B1	B2
02/01/2026	B4	B5	B6	B1	B2	B3
09/01/2026	B5	B6	B1	B2	B3	B4
23/01/2026	B6	B1	B2	B3	B4	B5
27/01/2026	**I MID EXAMINATIONS**					
Cycle-II	**Ex - 7**	**Ex – 8**	**Ex – 9**	**Ex – 10**	**Ex – 11**	**Ex – 12**
06/02/2026	B1	B2	B3	B4	B5	B6
13/02/2026	B2	B3	B4	B5	B6	B1
20/02/2026	B3	B4	B5	B6	B1	B2
27/02/2026	B4	B5	B6	B1	B2	B3
06/03/2026	B5	B6	B1	B2	B3	B4
13/03/2026	B6	B1	B2	B3	B4	B5
20/03/2026	**REPETITION**					
27/03/2026	**INTERNAL EXAMINATION**					

Batches:

S. No	Batch	Registered Nos	Total		S. No	Batch	Registered Nos	Total
1	B21	24761A0338 TO 343	6		4	B24	24761A0356 TO 361	6
2	B22	2761A0344 TO 349	6		5	B25	24761A0362 TO 36&247565A0301 TO 303	6
3	B23	234761A0350 TO 355	6		6	B26	25765A0304 TO 307	5

Course Instructor **Course Coordinator** **Module Coordinator** **HoD**

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Course Instructor	**:** Dr.SeelamPichi Reddy, Dr.Dhanunjay Kumar Ammisetti		
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**	: 2025-26

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:

CO1	Make mould for sand casting. **(Understanding-L2)**
CO2	Fabricate different types of components using various manufacturing techniques.**(Applying-L3)**
CO3	Adapt conventional manufacturing methods. **(Applying-L3)**
CO4	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	CO1	3	2	3	3	1	1	2	2	3	1	1	2		2	3
	CO2	2	1	3	3	1	1	2	1	2	1	1	2		2	2
	CO3	2	1	3	3	1	1	2	2	2	1	1	2		2	1
	CO4	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**

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.

DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor	**:** Dr.SeelamPichi Reddy, Dr.Dhanunjay Kumar Ammisetti		
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**	: 2025-26

LIST OF EXPERIMENTS

List ofexperiments 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**

DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor : Dr.SeelamPichi Reddy, Dr. Dhanunjay Kumar Ammisetti
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** : 2025-26

Batches (Section – A)

S.No	Batches	Regd. No's	Total No. of Students
1	B. Tech –A/S	24761A0301 – 20, 24761A0322-44, 24761A0346-365, 25765A0301-307	70
2	Batch B1	24761A0301 – 20, 24761A0322-36	35
3	Batch B2	24761A0337-365, 25765A0301-307	35

Sub Batches of B1:

S. No	Batch	Registered No's	Total
1	B11	24761A0301–306 ,	06
2	B12	24761A0307-312,	06
3	B13	24761A0313-318	06
4	B14	24761A0319-20,22-25	06
5	B15	24761A0326–331	06
6	B16	24761A0332–336	05
Total (B1)			35

Sub Batches of B2:

S. No	Batch	Registered No's	Total
1	B21	23761A0337-342	06
2	B22	23761A0343-344,346-349	06
3	B23	23761A0350-355	06
4	B24	23761A0356-361	06
5	B25	23761A0362-365 24765A0301–302	06
6	B26	24765A0303–307	05
Total (B2)			35

Lab in charge – I **Lab – in charge – II** **Head of the Department**

DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor	**:** Dr.SeelamPichi Reddy, Dr. Dhanunjay Kumar Ammisetti		
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**	: 2025-26

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**

DEPARTMENT OF MECHANICAL ENGINEERING

Course Instructor : Dr.SeelamPichi Reddy, Dr. Dhanunjay Kumar Ammisetti
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** : 2025-26

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**
05-12-2025		Demo				
12-12-2025	B11	B12	B13	B14	B15	B16
19-12-2025	B16	B11	B12	B13	B14	B15
26-12-2025	B15	B16	B11	B12	B13	B14
02-01-2026	B14	B15	B16	B11	B12	B13
09-01-2026	B13	B14	B15	B16	B11	B12
23-01-2026	B12	B13	B14	B15	B16	B11
26-01-2026 To 31-01-2026	***I Mid Examinations***					
	Exp – 7	**Exp– 8**	**Exp – 9**	**Exp – 10**	**Exp – 11**	**Exp – 12**
06-02-2026	B11	B12	B13	B14	B15	B16
13-02-2026	B16	B11	B12	B13	B14	B15
20-02-2026	B15	B16	B11	B12	B13	B14
27-02-2026	B14	B15	B16	B11	B12	B13
06-03-2026	B13	B14	B15	B16	B11	B12
13-03-2026	B12	B13	B14	B15	B16	B11
20-03-2026	***REPETITION***					
27-03-2026	**Viva Voce**					
03-03-2026	**Internal Exam**					

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. Dhanunjay Kumar Ammisetti
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**
02-12-2025	Demo					
09-12-2025	B21	B22	B23	B24	B25	B26
16-12-2025	B26	B21	B22	B23	B24	B25
23-12-2025	B25	B26	B21	B22	B23	B24
30-12-2025	B24	B25	B26	B21	B22	B23
06-01-2026	B23	B24	B25	B26	B21	B22
20-01-2026	B22	B23	B24	B25	B26	B21
27-01-2025 To 01-02-2025	***I Mid Examinations***					
	Exp - 7	**Exp – 8**	**Exp – 9**	**Exp – 10**	**Exp – 11**	**Exp – 12**
03-02-2026	B21	B22	B23	B24	B25	B26
10-02-2026	B22	B23	B24	B25	B26	B21
17-02-2026	B23	B24	B25	B26	B21	B22
24-02-2026	B24	B25	B26	B21	B22	B23
03-03-2026	B25	B26	B21	B22	B23	B24
10-03-2026	B26	B21	B22	B23	B24	B25
17-03-2026	***REPETITION***					
24-03-2026	**Viva Voce**					
31-03-2026	**Internal Exam**					

Lab in charge – I **Lab – in charge – II** **Head of the Department**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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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.Siva Sankar Babu, Mr.K Sai Babu
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.:** 2025-26

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
CO1	2	1			3							2		3	
CO2	1	2	2		3							2		3	
CO3	3	3		2	3							3			3
CO4	1	1			3							2			3
1 - Low					**2** –Medium							**3** - High			

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 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	Design Thinking Co' and PO's , Syllabus Discussion	3	04-12-2025		TLM1/ TLM2	
02	**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	11-12-2025		TLM2/ TLM4	
03	Principles of design	3	18-12-2025		TLM1	
04	Introduction to design thinking, history of Design Thinking, New materials in Industry	3	01-01-2026		TLM1/ TLM2	
05	**UNIT – II Design Thinking Process** Design thinking process (empathize, analyze, idea & prototype), implementing the	3	08-01-2026		TLM1	

	process in driving inventions					
06	Design thinking in social innovations. Tools of design thinking - person, costumer	3	22-01-2026		TLM2	
I Mid Exams: 26-01-2026 to 31-01-2026						
07	journey map, brainstorming, product development (Activity)	3	05-02-2026		TLM4	
08	**UNIT – III Innovation** Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations	3	12-02-2026		TLM1/ TLM4	
08	Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.	3	19-02-2026		TLM2/ TLM4	
09	**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation	3	26-02-2026		TLM4	
10	**UNIT – IV Product Design** Problem formation, introduction to product design, Product strategies, Product value	3	05-03-2026		TLM1/ TLM4	
11	Product planning, product specifications. Innovation towards product design Case studies.	3	12-03-2026		TLM2	
12	**Activity:** Importance of modeling, how to set specifications,Explaining their own product design	3	19-03-2026		TLM4	
13	**UNIT – V** Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business, Business challenges: Growth, Predictability, Change, Maintaining	3	26-03-2026		TLM1/ TLM4	

	Relevance, Extreme competition, Standardization					
14	Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. **Activity:** How to market our own product, about maintenance, Reliability and plan for startup.	3	02-04-2026		TLM2/ TLM4	
II Mid Exams: 06-04-2026 to 11-04-2026						
No. of classes required to complete: 42				**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	**01-12-2025**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	01-12-2025	24-01-2026	7 W
I Mid Examinations	26-01-2026	31-01-2026	1 W
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II Mid Examinations	06-04-2026	11-04-2026	1 W
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	20-04-2026	02-05-2026	2 W
Internship	04-05-2026	27-06-2027	8 W
Commencement of V Semester Classwork	**29-06-2026**		

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					**DTI**		
Friday							
Saturday							

Faculty – In Charges:

S.No	Class	Section	Faculty – In Charge	Lab Technician
1	B.Tech – IV Semester	A	Dr.K.Murahari, Dr.Siva Sankar Babu, Mr. K.Sai Babu	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.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Signature				
Name of the Faculty	Dr.K.Murahari, Dr.B.Sudheer Kumar, Mr.V.Sankararao	Dr.V.Rama Krishna	Mr.J.Subba Reddy	Dr.M.B.S.Sreekara Reddy
Designation	**Course Instructors**	**Course Coordinator**	**Module Coordinator**	**HoD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.V.Viswanadh, Mrs.B.Kamala Priya, Mr.K.Venkateswara Reddy

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

Regulation : R20

L-T-P Structure : **1-0-2** **Credits:** 02

Program/Sem/Sec : B.Tech – IV Semester – B Section **A.Y.:** 2025-26

Continuous Internal Assessment : --

PREREQUISITE: Engineering Mechanics, 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
CO1	2	1			3							2		3	
CO2	1	2	2		3							2		3	
CO3	3	3		2	3							3			3
CO4	1	1			3							2			3
1 - Low					**2** –Medium							**3** - High			

SOFTWARE PACKAGES: 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: Monday (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	Introduction to Finite Element Method	3	**01-12-2025**		TLM4	
Cycle-I						
02	Basics of ANSYS interface and its utilities	3	**08-12-2025**		TLM4	
03	Structural analysis of Stepped Bar and Tappered Bar	3	**15-12-2025**		TLM4	
04	Static Analysis of a Planar Truss	3	**22-12-2025**		TLM4	
05	Static Analysis of a Cantilever Beam	3	**29-12-2025**		TLM4	
06	Static Analysis of a Simply supported Beam with point load.	3	**05-01-2026**		TLM4	
07	Static Analysis of a Simply supported Beam with Uniformly Distributed load.	3	**12-01-2026**		TLM4	
Cycle-II						
08	Static Analysis of a Simply supported Beam with Uniformly Varying load.	3	**19-01-2026**		TLM4	
09	Static Analysis of a Fixed Beam subjected to Axial Load.	3	**02-02-2026**		TLM4	
I Mid Exams: 26-01-2026 to 31-01-2026						
10	Stress Analysis of Flat plates and simple shells & Axi-symmetric Components.	3	**09-02-2026**		TLM4	
11	Vibration Analysis of Spring-Mass Systems.	3	**16-02-2026**		TLM4	
12	Mode-Frequency Analysis of Beam sand Machine Elements.	3	**23-02-2026**		TLM4	
13	Project work Execution	3	**02-03-2026**		TLM4	
14	Project work Execution	3	**09-03-2026**		TLM4	
15	Project work Execution	3	**16-03-2026**		TLM4	
16	Report writing	3	**23-03-2026**		TLM4	
17	Review on the Project	3	**30-03-2026**		TLM4	
II Mid Exams:06-04-2026 to 11-04-2026						
No. of classes required to complete: 51				**No. of classes taken:**		

PART-B

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Semester End Examination:	50
Total Marks:	**50**

Academic calendar

Commencement of VI Semester Classwork	**01-01-2024**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	01-12-2025	24-01-2026	8 W
I Mid Examinations	26-01-2026	31-01-2026	1 W
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II Mid Examinations	06-04-2026	11-04-2026	1 W
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	20-04-2026	02-05-2026	2 W
Community Service Internship	04-05-2026	27-06-2026	8 W
Commencement of V Semester Classwork	**29 – 06 – 2026**		

Lab Occupancy Time Table (B.Tech IV Sem: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	IV Sem ANSYS Lab			**LUNCH BREAK**			
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							

Faculty – In Charges:

S.No	Class	Section	Lab Assistant	Faculty – In Charge
1	**B.Tech – IV Semester**	B	Mr. Jamala Reddy	Mr. K.V.Viswanadh, Mrs. B.Kamala Priya, Mr. K.Venkatswara 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 knowledge of mathematics, natural science, computing, engineering funda and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of co engineering problems.

PO 2	**Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problen reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and desig systems/components/processes to meet identified needs with consideration for the public health and safe whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems us research-based knowledge including design of experiments, modelling, analysis & interpretation of data to valid conclusions. (WK8).
PO 5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineeri tools, including prediction and modelling recognizing their limitations to solve complex engineering proble and WK6)
PO 6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving comp engineering problems for its impact on sustainability with reference to economy, health, safety, legal frame culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; a national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader diverse/multi-disciplinary teams.
PO 9	**Communication:** Communicate effectively and inclusively within the engineering community and society a such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	**Project Management and Finance:** Apply knowledge and understanding of engineering management princ economic decision-making and apply these to one's own work, as a member and leader in a team, and to r projects and in multidisciplinary environments.
PO 11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context technological change. (WK8)

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Signature				
Name of the Faculty	**Mr. K.V.Viswanadh, Mrs. B.Kamala Priya, Mr. K.Venkatswara Reddy**	**K V Viswanadh**	**Dr.B.Sudheer Kumar**	**Dr.M.B.S.Sreekara Reddy**
Designation	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, (AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
ISO 21001 : 2018, 50001 : 2018, 14001: 2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
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COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. R. Padma Venkat
Course Name & Code : Personality Development & Corporate Communication Skills
L-T-P Structure : **0**-1-0 **Credits:** Mandatory Course
Program/Sem/Sec : B. Tech- IV SEM / MECH.
Academic Year : 2025-26

COURSE OBJECTIVES: By the end of the course, students will be able to:

1. Develop communication and interpersonal skills required for workplace interactions.
2. Enhance speaking proficiency through interviews, role plays, JAM, and group discussions.
3. Improve reading and listening comprehension skills for academic and competitive contexts.
4. Strengthen corporate writing skills such as emails, opinions, and structured responses.
5. Master essential grammar skills aligned with campus recruitment assessments.

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

CO1	Demonstrate improved interpersonal skills, time management, stress management, and professional etiquette.
CO2	Participate confidently in interviews, extempore, JAM, storytelling, and group discussions.
CO3	Apply effective reading and listening strategies to answer comprehension-based MCQs.
CO4	Produce clear and accurate corporate-style emails, essays, and opinion paragraphs.
CO5	Apply grammar rules accurately in sentences, MCQs, and corporate communication tasks.

COURSE ARTICULATION MATRIX

Course Outcomes	**Programme Outcomes**											
PO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1.	1	1			2	2		2	3	3		
CO2.		1			2				3	3		
CO3.	2	2		2	2				1	2		
CO4.	2	2	1	2	2				2	3		1
CO5.	3	2		2	3				1	2		1

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

(Correlation between COs & POs)

Syllabus - English Certification Course-2 (IV Semester) R23

Module-1: Communication & Interpersonal Skills

- Personality development skills - Time Management skills – Stress Management skills (with focus on facing interviews)
- Self-introduction
- Telephone & email etiquette - Successful workplace communication styles

Module-2: Speaking Mastery

- Role plays (Mock Interview Style)
- Extempore + JAM (advanced prompts)
- Story creation from prompts
- Group Discussion: Introduction, justification, closing statements

Module-3: Reading & Listening

- Reading comprehension (TOEFL) & Listening Comprehension passages with MCQs
- Case-study style reading comprehension followed by MCQs
- Essay Writing (150–200 words)

Module-4: Writing for Corporate Contexts

- Opinion writing (argument + conclusion)
- Sentence correction and Sequencing (MCQs)
- Email Writing-Corporate style- Giving responses

Module-5: Grammar- MCQs (aligned with MNCs' Communication Assessment syllabus)

- Articles & Prepositions
- Tenses (Present, Past, Future forms)
- Active and Passive Voice (Identification & correction)
- Basic Error Identification
- Subject-Verb Agreement
- Common Errors in Usage
- Conditional Sentences
- Reported Speech
- Sentence Sequencing (paragraph level)
- Idiomatic Usage
- Error Identification (Advanced patterns)

COURSE DELIVERY PLAN (LESSON PLAN)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching learning method	HOD Sign
1.	**Module-1: Communication & Interpersonal Skills:**Personality development skills - Time Management skills – Stress Management skills (with focus on facing interviews)	1	1-12-25		TLM1 TLM4	
2.	Self-introduction	1	8-12-25		TLM1 TLM5	
3.	Telephone & email etiquette - Successful workplace communication styles	1	15-12-25		TLM1 TLM4 TLM3	
4.	**Module-2: Speaking Mastery** Role plays (Mock Interview Style)	1	22-12-25		TLM2 TLM4	
5.	Extempore + JAM (advanced prompts)	1	29-12-25		TLM2 TLM4	
6.	Story creation from prompts(Writing)	1	5-1-26		TLM2 TLM4	
7.	Group Discussion: Introduction, justification, closing statements.	1	19-1-26		TLM1 TLM3	
8.	**Module-3: Reading & Listening.** Reading comprehension (TOEFL) Listening Comprehension passages with MCQs	1	2-2-26		TLM1 TLM3	
9.	Case-study style reading comprehension followed by MCQs	1	9-2-26		TLM2 TLM5	
10.	Essay Writing (150–200 words)	1	16-2-26		TLM4, TLM6	
11.	**Module-4: Writing for Corporate Contexts** Opinion writing (argument + conclusion)	1	23-2-26		TLM4, TLM6	
12.	Sentence correction and Sequencing (MCQs)	1	2-3-26		TLM1, TLM5	
13.	Email Writing-Corporate style- Giving responses	1	9-3-26		TLM1, TLM6	
14.	**Module-5: Grammar**- MCQs (aligned with MNCs' Communication Assessment syllabus) Articles & Prepositions Tenses (Present, Past, Future forms) Active and Passive Voice (Identification & correction)	1	26-3-36		TLM1 TLM3 TLM5	
15.	Basic Error Identification Subject-Verb Agreement Common Errors in Usage Conditional Sentences Reported Speech	1	23-3-26		TLM1 TLM3 TLM5	
16.	Sentence Sequencing (paragraph level) Idiomatic Usage Error Identification (Advanced patterns)	1	30-3-26		TLM1 TLM3 TLM5	
17.	Assessment	1	4 - 4 -26		Google Form Link	
No. of classes required to complete Syllabus:		**16 + 1(Assessment)**				

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

Evaluation Task	Marks
English Certification Course-II Assessment	100

PROGRAMME OUTCOMES (POs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. R. Padma Venkat**	**Dr. R.Padma Venkat**	**Dr. R.Padma Venkat**	**Dr. T. Satyanarayana**
Signature				