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

COURSE HANDOUT

PART-A

Name of Course Instructor **:** Dr. K.R. Kavitha
Course Name & Code **:** Numerical Methods & Integral Calculus & 20FE10
L-T-P Structure **:** 2-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ME A **A.Y.:** 2023 - 24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to enable the students learn Numerical Techniques for solving the equations and apply interpolation techniques. They will also learn about the Fourier analysis of single valued functions, Multiple Integrals in different coordinate systems and Vector differentiation.

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

CO1	Estimate the best fit polynomial for the given tabulated data using Interpolation.(Understand – L2)
CO2	Apply numerical techniques in solving of equations and evaluation of integrals. (Apply – L3)
CO3	Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. (Apply – L3)
CO4	Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. (Apply – L3)
CO5	Evaluate the directional derivative, divergence and angular velocity of a vector function. (Apply – 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**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO2	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO3	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO4	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO5	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
1 - Low						**2** –Medium						**3** - High			

TEXTBOOKS:

T1 Dr. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2012.
T2 Dr. B. V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.
T3 S. S. Sastry, "Introductory Methods of Numerical Analysis" 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

REFERENCE BOOKS:

R1 M. D. Greenberg, "Advanced Engineering Mathematics", 2nd Edition, TMH Publications, New Delhi, 2011.
R2 Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley & sons, New Delhi, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Interpolation and Finite Differences

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the course, Course Outcomes	1	07/08/23		TLM1	
2.	Introduction to UNIT I	1	10/08/23		TLM2	
3.	Forward Differences	1	11/08/23		TLM1	
4.	Backward differences	1	14/08/23		TLM1	
5.	Central Differences	1	17/08/23		TLM1	
6.	Symbolic relations and separation of symbols	1	18/08/23		TLM1	
7.	Symbolic relations and separation of symbols	1	19/08/23		TLM1	
8.	Newton's forward formulae for interpolation	1	21/08/23		TLM1	
9.	Newton's backward formulae for interpolation	1	24/08/23		TLM1	
10.	Lagrange's Interpolation	1	25/08/23		TLM1	
11.	Lagrange's Interpolation	1	28/08/23		TLM1	
12.	Tutorial I	1	26/08/23		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Numerical solutions of Equations and Numerical Integration

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to UNIT II	1	31/08/23		TLM2	
14.	Algebraic and Transcendental Equations	1	01/09/23		TLM1	
15.	False Position method	1	02/09/23		TLM1	
16.	False Position method	1	04/09/23		TLM1	
17.	Newton- Raphson Method in one variable	1	08/09/23		TLM1	
18.	Newton- Raphson Method applications	1	11/09/23		TLM1	
19.	Trapezoidal rule	1	14/09/23		TLM1	
20.	Simpson's 1/3 Rule	1	15/09/23		TLM1	
21.	Simpson's 3/8 Rule	1	18/09/23		TLM1	
22.	Tutorial II	1	16/09/23		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Multiple Integrals

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	Introduction to Unit-III	1	21/09/23		TLM1	
24.	Double Integrals -Cartesian coordinates	1	22/09/23		TLM1	
25.	Double Integrals- Polar co ordinates	1	23/09/23		TLM1	
26.	Problems	1	25/09/23		TLM1	
27.	Applications to Double integrals (Content Beyond the syllabus)	1	29/09/23		TLM2	
28.	Revision for mid exam	1	30/09/23			
I MID EXAMINATIONS (02-10-2023 TO 07-10-2023)						

29.	Triple Integrals - Cartesian coordinates	1	09/10/23		TLM1	
30.	Triple Integrals - Spherical coordinates	1	12/10/23		TLM1	
31.	Change of order of Integration	1	13/10/23		TLM1	
32.	Tutorial III	1	16/10/23		TLM3	
33.	Change of order of Integration	1	19/10/23		TLM1	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: Fourier Series

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Introduction to UNIT IV	1	26/10/23		TLM1	
35.	Determination of Fourier coefficients, Even and Odd Functions	1	27/10/23		TLM1	
36.	Fourier Series expansion in the interval $[0,2\pi]$	1	28/10/23		TLM1	
37.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	30/10/23		TLM1	
38.	Fourier Series in an arbitrary interval [0, 2l]	1	02/11/23		TLM1	
39.	Fourier Series in an arbitrary interval [-l, l]	1	03/11/23		TLM1	
40.	Fourier series in an arbitrary interval odd and even functions	1	04/11/23		TLM1	
41.	Half-range Sine and Cosine series	1	06/11/23		TLM1	
42.	Half-range Sine and Cosine series		09/11/23		TLM1	
43.	Tutorial IV	1	10/11/23		TLM3	
44.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	13/11/23		TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Introduction to UNIT V	1	16/11/23		TLM1	
46.	Vector Differentiation	1	17/11/23		TLM1	
47.	Gradient	1	18/11/23		TLM1	
48.	Directional Derivative	1	20/11/23		TLM1	
49.	Divergence	1	23/11/23		TLM1	
50.	Curl	1	24/11/23		TLM1	
51.	Solenoidal and Irrotational functions, potential surfaces	1	25/11/23		TLM1	
52.	Laplacian and second order operators	1	27/11/23		TLM1	
53.	TUTORIAL - V	1	30/11/23		TLM3	
54.	Properties	1	01/12/23		TLM1	
55.	Introduction to Vector Integrals (Content Beyond the Syllabus)	1	02/12/23		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
PO 8	**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. K. R. Kavitha**	**Dr. K. R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: S.RAMI REDDY
Course Name & Code : FLUID MECHANICS & HYDRAULIC MACHINERY&20 ME03
L-T-P Structure : 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech/III/A **A.Y.:** 2023-24
PREREQUISITE: Engineering physics and Mathematics
COURSE EDUCATIONAL OBJECTIVES (CEOs): To understand the fundamental concepts of fluid mechanics, various flow measuring devices, boundary layer separation and performance characteristics of hydraulic machines.

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

CO1	Understand the fundamentals of fluid mechanics and dimensional analysis and similarity concepts
CO2	Comprehend the kinematics and dynamics of fluid flows
CO3	Analyze boundary layer flow and friction losses in pipes
CO4	Apply impulse momentum concept to impact of jet problems
CO5	Evaluate the performance parameters of hydraulic turbines and pumps

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 DIMENSIONAL ANALYSIS AND SIMILARITY

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	07/08/2023		TLM1	
2.	Physical properties of fluids	1	09/08/2023		TLM3	
3.	Specific gravity,viscosity,surface tension,vapour pressure	1	11/08/2023		TLM1	
4.	Problems on physical properties	1	14/08/2023		TLM1	
5.	Manometers, classification	1	16/08/2023		TLM2	
6.	Problems on manometers	1	18/08/2023		TLM3	
7.	Dimensional analysis,rayleigh's method	1	19/08/2023		TLM1	
8.	Buckingham's Pi theorem method	1	21/08/2023		TLM1	
No. of classes required to complete UNIT-I: 8				**No. of classes taken:**		

UNIT-II: FLUID STATICS AND FLUID DYNAMICS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Stream line, path line, streak line, stream tube	1	23/08/2023		TLM1	
10.	Classification of flows, equation of continuity for 1 dimensional flow	1	25/08/2023		TLM3	
11.	Surface and body forces, Euler's equation, Bernoulli's equation	1	26/08/2023		TLM1	
12.	Momentum equation and its application on pipe bend	1	28/08/2023		TLM1	
13.	Reynold's experiment	1	30/08/2023		TLM2	
14.	Darcy's formula	1	01/09/2023		TLM1	
15.	Minor losses in pipes	1	02/09/2023		TLM1	
16.	Problems on major and minor losses	1	04/09/2023		TLM3	
17.	Pipes in series and parallel	1	08/09/2023		TLM1	
18.	Total energy line and hydraulic gradient line	1	11/09/2023		TLM1	
19.	Venturi meter, orifice meter, pitot tube	1	13/09/2023		TLM3	
20.	Problems on venturi and orifice meter	1	15/09/2023		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: BOUNDARY LAYER FLOW AND IMPACT OF JETS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Laminar and turbulent boundary layer	1	16/09/2023		TLM2	
22.	Boundary layer thickness	1	20/09/2023		TLM3	
23.	displacement thickness	1	22/09/2023		TLM1	
24.	momentum thickness	1	23/09/2023		TLM1	
25.	energy thickness	1	25/09/2023		TLM1	
26.	Energy thickness	1	27/09/2023		TLM3	
27.	boundary layer separation	1	29/09/2023		TLM1	
28.	Problems on boundary layer thickness	1	30/09/2023		TLM1	

29.	Hydrodynamic forces of jets on stationary and moving flat, inclined, curved vanes	1	11/10/2023		TLM2	
30.	Jet striking centrally and a tip for symmetrically and unsymmetrically vanes, velocity diagrams	1	13/10/2023		TLM3	
31.	Flow over radial vanes	1	16/10/2023		TLM1	
32.	Problems on stationary plates	1	18/10/2023		TLM1	
33.	Problems on stationary plates	1	25/10/2023		TLM1	
34.	Problems on moving plates	1	27/10/2023		TLM3	
35.	Problems on moving plates	1	28/10/2023		TLM1	
36.	Problems on moving plates	1	30/10/2023		TLM1	
37.	Problems on radial vanes	1	01/11/2023		TLM1	
38.	Problems on radial vanes	1	03/11/2023		TLM3	
No. of classes required to complete UNIT-III: 18				**No. of classes taken:**		

UNIT-IV: HYDRAULIC TURBINES AND PERFORMANCE OF THE 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
39.	Classification of hydraulic turbines	1	04/11/2023		TLM2	
40.	Pelton wheel, work done, efficiency	1	06/11/2023		TLM2	
41.	Francis turbine, work done, efficiency	1	08/11/2023		TLM1	
42.	Kaplan turbine, work done, efficiency	1	10/11/2023		TLM3	
43.	Specific speed, specific quantities	1	13/11/2023		TLM1	
44.	Unit quantities, Draft tube-classification	1	15/11/2023		TLM1	
45.	Performance characteristic curves, governing of turbines	1	17/11/2023		TLM3	
46.	Problems on hydraulic turbines	1	18/11/2023		TLM1	
No. of classes required to complete UNIT-IV: 8						

UNIT-V: 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
47.	Working of centrifugal pump, types	1	20/11/2023		TLM2	
48.	Losses and efficiencies, specific speed	1	22/11/2023		TLM2	
49.	Pumps in series and pumps in parallel	1	24/11/2023		TLM3	
50.	Problems on centrifugal pumps	1	25/11/2023		TLM1	
51.	Main components and working of reciprocating pumps, types	1	27/11/2023		TLM1	
52.	Slip, negative slip	1	29/12/2023		TLM1	
53.	Revision	1	01/12/2023		TLM1	
54.	Revision	1	02/12/2023		TLM1	
No. of classes required to complete UNIT-V: 8				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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	**S.RAMI REDDY**	**S.RAMI REDDY**	**Dr.P.VIJAYA KUMAR**	**Dr.S.PICHI REDDY**
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.P.Ravindra Kumar
Course Name & Code **:** Thermodynamics & 20ME04
L-T-P Structure **:** 3-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech III Sem A/S **A.Y.:** 2023-24

PREREQUISITE: Engineering Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To provide an intuitive understanding of thermodynamics to emphasize on physics of thermodynamic systems and this covers the heat and work interactions. It also provides the insights on laws of thermodynamics and its applications, properties of pure substance, ideal gases and different thermodynamic cycles.

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

CO1	**Classify the various thermodynamic systems, properties and processes with examples and temperature scales of a system [Remembering Level –L1].**
CO2	**Differentiate open and closed system and built up the heat and work transfer relations of thermal systems [Understanding Level –L2].**
CO3	**Apply the laws of thermodynamics to find the thermodynamic properties and parameters of various thermal systems [Applying Level-L3].**
CO4	**Understand the properties of pure substance and gases to compute the non-reactive mixture parameters [Understanding Level –L2].**
CO5	**CO5: Analyze the performance parameters of various thermodynamic cycles [Analyzing Level – 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	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	2	3	-	-	-	-	2	-	-	2	3	-	1
CO3	3	1	1	3	-	-	-	-	1	-	-	2	3	-	2
CO4	3	3	2	2	-	-	-	3	-	-	-	2	1	-	3
CO5	3	3	-	3	-	-	-	-	3	-	-	3	2	-	3
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1	P.K.Nag, "Engineering Thermodynamics"- McGraw-Hill. 5th Edition, 2013
T2	Y.A. Cengel, and M.A.Boles, "Thermodynamics: An Engineering Approach", McGraw-Hill, 7th Edition, 2011.

REFERENCE BOOKS:

R1	G.J.Van Wylen & Sonntag, "Fundamentals of Thermodynamics", John Wiley& sons, publications Inc. 5th Edition, 1998.
R2	E.Rathakrishnan, "Fundamentals of Engineering Thermodynamics", PHI, 2nd Edition, 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Basic Concepts and Zeroth Law of Thermodynamics

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	1	08-8-23		1	
2.	Basic Concepts, Classification of systems, Macroscopic & Microscopic approaches	1	09-8-23		1,2	
3.	System-Types - examples, Control mass and Control volume Properties of system	1	11-8-23		1,2	
4.	State, Path, Process, Cycle, path and point functions.	1	16-8-23		1,2	
5.	Equilibrium, reversible and irreversible processes, Quasistatic process, Applications of TD, Internal Energy, Specific heat, Enthalpy	1	18-8-23		1,2	
6.	Zeroth law of Thermodynamics Temperature scales – Temperature measurement , Comparison of thermometers	1	19-8-23		1,2	
7.	Constant volume gas thermometer Numerical Problems on Temperature scales.	1	22-8-23		1,2	
8.	Advantages of gas thermometers over liquid thermometers	1	23-8-23		1,2	
9.	Numerical problems on Internal energy, enthalpy, specific heat and latent heat, Assignement-1	1	25-8-23		1	
10	Tutorial -I	1	26-8-23		3	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: First Law of Thermodynamics

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11	**First Law Analysis of Closed Systems** : Introduction, First law for a closed system undergoing change of state and cycle	1	29-8-23		1,2	
12	Representation of Thermodynamic processes on P-V planes	1	30-8-23		1,2	
13	First Law Analysis of Closed System undergoing different process.	1	05-9-23		1,2	
14	Different forms of stored energy, Forms of energy, Mechanical and Non mechanical forms of Work transfer	2	08-9-23		1,2	
15	pdV work and other types of work transfer.	1	12-9-23		1,2	
16	Applications of first law, PMM1 Numerical problems on work and energy.	1	13-9-23		1	

17	**First Law Analysis of Open Systems** : Thermodynamic analysis of control volume-conservation of mass, energy principle.	1	15-9-23		1,2	
18	Steady Flow Energy Equation (SFEE), Steady Flow Engineering Devices-Nozzles, Diffusers.	1	05-9-23		1,2	
19	Turbine, Compressors, Throttling Valves, Heat Exchangers, Limitations on first law of thermodynamics, PMM1.	1	16-9-23		1,2	
20	Numerical Problems on SFEE	1	19-9-23		1	
21	Tutorial -2	1	20-9-23		3	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Second Law of Thermodynamics

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	**Second Law Analysis of Thermodynamics:** Introduction, Energy Reservoirs, Heat Engines, Refrigerators, Heat Pumps.	1	22-9-23		1,2	
23	Kelvin-Planks, Clausius statement of second law of thermodynamics.	1	23-9-23		1,2	
24	Numerical Problems on Second law of TD.	1	26-9-23		1	
25	Equivalence of Kelvin -Planck and Clausius statements.	1	27-9-23		1,2	
26	Perpetual Motion Machine-II, Carnot cycle.	1	29-9-23		1,2	
27	Carnot Theorem – Numerical problem.	1	30-9-23		1	
28	**Entropy:** Introduction, Clausius inequality, t-s property diagrams.	1	10-10-23		1,2	
29	Entropy change for ideal gases – Derivations.	1	11-10-23		1,2	
30	Isentropic relations for ideal gases, Principle of increase of entropy.	1	13-10-23		1,2	
31	Applications of Entropy- Third law of Thermodynamics Numerical Problems on Entropy.	1	14-10-23		1,2	
32	Numerical Problems, Assignement-3.	1	17-10-23		1	
33	Tutorial -3	1	18-10-23		3	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Properties of Pure Substances and Gases

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34	**Properties of Pure Substance:** Introduction, Phases of pure substance.	1	25-10-23		1,2	
35	*p-v, p-T, T-s* and *h-s* diagrams for pure substance, *p-v-T* Surface.	1	27-10-23		1,2	
36	Properties of steam, quality or dryness fraction.	1	28-10-23		1,2	
37	Phase change processes, Mollier diagram for a pure substance.	1	31-10-23		1,2,4,6	

38	Numerical Problems.	1	01-11-23		1	
39	**Properties of Ideal Gases:** Equation of state of a gas, Avogadro's law, Ideal gas, perfect gas, real gas.	1	03-11-23		1,2	
40	Properties of mixture of gases – Dalton's law and Amagat's law of partial pressures.	1	04-11-23		1,2	
41	Internal energy, enthalpy and specific heats of gas mixtures, Entropy of gas mixtures.	1	07-11-23		1,2	
42	Numerical Problems.	1	08-11-23		1,2	
43	Tutorial -4	1	10-11-23		3	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Thermodynamic Cycles

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
44.	Introduction**,** working of Carnot vapour cycle, working of simple Rankine cycle	1	11-11-23		1,2	
45.	Problems on Carnot vapour cycle	1	14-11-23		1,2	
46.	Problems on simple Rankine cycle	1	15-11-23		1,2	
47.	Gas power cycles -Otto cycle	1	17-11-23		1,2	
48.	Numerical Problems on Otto cycle	1	18-11-23		1,2	
49.	Efficiency of Diesel cycle	1	21-11-23		1,2	
50.	Numerical Problems on Diesel Cycle	1	22-11-23		3	
51.	Brayton Cycles and its problems	1	24-11-23		1,2	
52.	Reversed Carnot cycle – Refrigeration cycle	1	25-11-23		1,2	
53.	Reversed Carnot Cycles - Numerical Problems	1	28-11-23		3	
54.	Bell-Coleman cycle and simple vapour compression refrigeration Cycle (Theory)	1	29-11-23		1,2	
55.	**Content beyond the syllabus** Heat pipe thermodynamic cycle	1	01-12-23		1,2	
56.	Revision on TD, Concluding remarks	1	02-12-23		1,2	
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		
Content beyond the curriculum						
Heat pipe thermodynamic cycle				01-12-23		

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

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

ACADEMIC CALENDER:

Commencement of Class work		07-8-2023	
I Phase of Instructions	07-8-2023	30-9-2023	8 Weeks
I Mid Examinations	02-10-2023	07-10-2023	1 Week
II Phase of Instructions	09-10-2023	02-12-2023	8 Weeks
II Mid Examinations	04-12-2023	09-12-2023	1 Week
Preparation and Practical's	11-12-2023	16-12-2023	1 Week
Semester End Examinations	18-12-2023	30-12-2023	2 Weeks

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.P.Ravindra Kumar	Dr.P.Ravindra Kumar	Dr.P.Vijay Kumar	Dr.S.Pichi Reddy
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. Murahari Kolli
Name Of Course Instructor Dr. Pichi Reddy Seelam
Course Name & Code : **Metallurgy and Mateials Science & 20ME05**
L-T-P Structure : **3-0-0** **Credits: 3**
Program/Sem/Sec : **B.Tech/III/A** **A.Y.: 2023-24**
Prerequisite Subject: Engineering physics, Engineering Chemistry
Course Educational Objectives: The objectives of this course are to acquire knowledge on structure of metals and alloys, understand the concept of alloys and equilibrium diagrams; demonstrate the concept of heat treatment process.
Course Outcomes: After completion of the course students will be able to:

CO1	Comprehend the structure of materials, alloys and correlated the material properties with structure.(Remembering-L1)
CO2	Illustrate the procedure of drawing the equilibrium diagrams and apply the principle of equilibrium diagrams in evaluating the materials properties.(Understanding-L2)
CO3	Recall the properties, applications of ferrous, non ferrous and composite materials.(Remembering-L1)
CO4	Apply the principle of mechanical working on metals and heat treatment on materials.(Applying-L3)
CO5	Identify the types of composite materials and the manufacturing processes of fiber reinforced composites.(Understanding-L2)

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PS O2	PS O3
CO1	1	2	2	1	1	2	1					1		1	2
CO2	1	2	2	1	1	2	1					1		1	2
CO3	1	2	2	1	1	2	1					1		1	2
CO4	1	2	2	1	1	2	1					1		1	2
CO5	1	2	2	1	1	2	1					1		1	2

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

BOS APPROVED TEXT BOOKS:

T1 V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House,
24thEdition, 2008.

T2 Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw-Hill, 3rdEdition,2011.

BOS APPROVED REFERENCE BOOKS:

R1 Richard A.Flinn, Paul Trojan, Engineering Materials and Their Applications, Jaico
Publishing House, 4thEdition, 1999.

R2 William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.
R3 U.C Jindal and Atish Mozumber, Material since and metallurgy, Pearson education-2012

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: STRUCTURE OF METALS, CONSTITUTION OF ALLOYS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Metallurgy and Materials - Course Educational Objective (CEO) & Course Outcomes (CO's)	01	8/8/2023		**TLM1**	CO1	T1,R6	
2.	Structure of metals Introduction	01	9/8/2023		**TLM1**	CO1	T2,R6	
3.	Body centered cubic, Face cantered cubic Structures	01	10/8/2023		**TLM1**	CO1	T2	
4.	closed packed hexagonal structure	01	16/8/2023		**TLM1**	CO1	T1	
5.	crystallographic planes	01	178/2023		**TLM1**	CO1	T1	
6.	Mechanism of crystallization of metals	01	19/8/2023		**TLM1**	CO1	T2,R1,R6	
7.	Grain and grain boundaries	01	22/8/2023		**TLM1**	CO1	T2,R1,R6	
8.	Effect of grain boundaries on the properties of metal / alloys	01	23/8/2023		**TLM1**	CO1	T2,R1	
9.	Necessity of alloying, Solid solutions	01	24/8/2023		**TLM1**	CO1	T2,R1	
10.	Interstitial Solid Solution and Substitution Solid Solution,	01	26/8/2023		**TLM1**	CO1	T2,R1	
11.	Hume Rothery rules.	01	29/8/2023		**TLM1**	CO1	T2,R1	
No. of classes required to complete UNIT-I		**11**			**No. of classes taken:**			
UNIT – II EQUILIBRIUM DIAGRAMS								
12.	Experimental methods of construction of equilibrium diagrams	01	30/8/2023		**TLM1**	CO2	T2,R1	
13.	Classification of equilibrium diagrams	01	31/8/2023		**TLM1**	CO2	T2,R1	
14.	Isomorphous,eutectic equilibrium diagrams.	01	02/09/2023		**TLM1**	CO2	T2,R1	
15.	Partial eutectic equilibrium diagrams.	01	05/09/2023		**TLM1**	CO2	T2,R1	
16.	Equilibrium cooling and heating of alloys, lever rule	01	06/09/2023		**TLM1**	CO2	T2,R1	
17.	coring. Transformations in thesolid state	01	07/09/2023		**TLM1**	CO2	T2,R1	

18.	Allotropy, Eutectic reaction	01	12/09/2023		**TLM1**	CO2	T2,R1	
19.	Eutectoid reaction	01	13/09/2023		**TLM1**	CO2	T2,R1	
20.	Peritectoid reaction	01	14/09/2023		**TLM1**	CO2	T2,R1	
21.	Study of Cu-Ni equilibrium diagrams.	01	16/09/2023		**TLM1**	CO2	T2,R1	
22.	Bi-Cd equilibrium diagrams.	01	20/09/2023		**TLM1**	CO2	-	
23.	Study of Iron-Iron carbide equilibrium diagram.	01	21/09/2023		**TLM1**	CO2	-	
No. of classes required to complete UNIT-II		**12**			**No. of Classes taken:**			

UNIT-III : STEELS, CAST IRONS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
24.	Classification of steels, structure, properties and applications of plain carbon steel	01	23/09/2023		**TLM1**	CO3	T1,R1,R6	
25.	Low carbon steel	01	26/09/2023		**TLM1**	CO3	T2,R6	
26.	Medium carbon steel	01	27/09/2023		**TLM1**	CO3	T2,R6	
27.	High carbon steel & applications.	01	30/09/2023		**TLM1**	CO3	T2,R6	
28.	Structure, properties and applications of white cast iron	01	10/10/2023		**TLM1**	CO3	T1,T2,R1	
29.	Structure, properties and applications of malleable cast iron.	01	11/10/2023		**TLM1**	CO3	T1,T2,R1	
30.	Grey cast iron	01	12/10/2023		**TLM1**	CO3	-	
31.	Spheroidal graphite cast iron.	01	14/10/2023		**TLM1**	CO3	-	
32.	Structure, properties and applications of copper	01	17/10/2023		**TLM1**	CO3	T2,R1	
33.	Structure, properties and applications of copper alloys	01	18/10/2023		**TLM1**	CO3	T2,R1	
34.	Aluminium and its alloys	01	19/10/2023		**TLM1**	CO3	T2,R1	
No. of classes required to complete UNIT-III		**11**			**No. of classes taken:**			

UNIT-IV : MECHANICAL WORKING, HEAT TREATMENT OF ALLOYS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly

35.	Hot working, Cold working,	01	26/10/2023		**TLM1**	CO4	T1,R1,R6	
36.	Strain hardening	01	28/10/2023		**TLM1**	CO4	T1,R1,R6	
37.	Recovery, Recrystallisation	01	31/10/2023		**TLM1**	CO4	T1,R1,R6	
38.	Grain growth.	01	01/11/2023		**TLM1**	CO4	T1,R1,R6	
39.	Comparison of properties of cold worked parts	01	02/11/2023		**TLM1**	CO4	T2,R1	
40.	Comparison of properties ofhot worked parts	01	04/11/2023		**TLM1**	CO4	T2,R1	
41.	Annealing, Normalizing	01	0711/2023		**TLM1**	CO4	T1,R6	
42.	Hardening.	01	08/11/2023		**TLM1**	CO4	T1,R6	
43.	Construction of TTT diagram for eutectoid steel.	01	09/11/2023		**TLM1**	CO4	-	
44.	Harden ability-determination of harden ability by jominy end quench test	01	11/11/2023		**TLM1**	CO4	T1,T2,R1	
45.	Surface - hardening methods	01	14/11/2023		**TLM1**	CO4	T1,T2,R1	
46.	Age hardening treatment and application	01	15/11/2023		**TLM1**	CO4	T1,T2,R1	
No. of classes required to complete UNIT-IV		**12**			**No. of classes taken:**			

UNIT-V : COMPOSITE MATERIALS

S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**Learning Outcome COs**	**Text Book followed**	**HOD Sign Weekly**
47.	Classification of composites	01	16/11/2023		**TLM1**	CO5	T1,R6	
48.	various methods of component manufacture of fiber reinforced composites-Hand layup process	01	18/11/2023		**TLM1**	CO5	T1,R6	
49.	ilament winding process, SMC processes	01	21/11/2023		**TLM1**	CO5	T1,R6	
50.	Continuous pultrusion processes, Resin transfer moulding.	01	22/11/2023		**TLM1**	CO5	T1,R6	
51.	Introduction to metal ceramic mixtures	01	23/11/2023		**TLM1**	CO5	T1,R6	
52.	Metal – Matrix composites	01	25/11/2023		**TLM1**	CO5	-	
53.	C–Ccomposites, Applications of Composites	01	28/11/2023		**TLM1**	CO5	T1,R1,R6	
54.	Rule of mixture and numericals	01	29/11/2023		**TLM1**	CO5	T2,R1,R6	
No. of classes required to complete UNIT-V		**8**			**No. of classes taken:**			

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Revision for I Phase	09	30/11/2023		TLM1/ TLM4	-		
2.	Revision for II Phase	09	02/12/2023		TLM1/ TLM4	-		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Previous GATE and ESE Questions	01			TLM1/ TLM4	-		
4.	Previous GATE and ESE Questions	01			TLM1/ TLM4	-		
5.	Previous GATE and ESE Questions	01			TLM1/ TLM4	-		

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	07/08/2023	30/09/2023	8
I Mid Examinations	02/10/2023	07/10/2023	1
II Phase of Instructions	08/11/2023	02/12/2023	7
II Mid Examinations	04/12/2023	09/12/2023	1
Preparation and Practical	11/12/2023	16/12/2023	1
Semester End Examinations	18/12/2023	30/12/2023	2

EVALUATION PROCESS:

PART-C

EVALUATION PROCESS (R20 Regulation):

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

Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. Murahari Kolli**	**Dr. Seelam Pici Reddy**	**Dr.M.B.S.S.Reddy**	**Dr. S.Pichi Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. Shaheda Niloufer
Course Name & Code : Environmental Science & 20MC03
L-T-P Structure : 2-0-0 Credits : 0
Program/Sem/Sec : B.Tech., ME-A., IV-Sem., SEC-A A.Y : 2023-24

PRE-REQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs): The purpose of this course is to provide a general background on developing an understanding of systems and cycles on the earth and how individual organisms live together in complex communities and how human activities influence our air, water and soil. It also helps in developing an understanding about our use of fossil fuels and effect on climate and sustainable management of natural resources.

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

CO 1	Identify environmental problems arising due to engineering and technological activities that help to be the part of sustainable solutions.
CO 2	Evaluate local, regional and global environmental issues related to resources and their sustainable management.
CO 3	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO 4	Acknowledge and prevent the problems related to pollution of air, water and soil.
CO5	Identify the significance of implementing environmental laws and abatement devices for environmental management.

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

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

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

TEXT BOOKS:

T1 Anubha Kaushik, C.P.Kaushik, "Perspectives in Environmental Studies", New age international publishers, 5th Edition, Delhi, 2016.

T2 Mahua Basu, S. Xavier, "Fundamentals of Environmental Studies", Cambridge University Press, 1st Edition, Delhi, 2016.

REFERENCE BOOKS:

R1 S. Deswal, A. Deswal, "A Basic course in Environmental Studies", Educational & Technical Publishers, 2nd Edition, Delhi, 2014.

R2 R. Rajagopalan, "*Environmental Studies (From Crisis to Cure)*", Oxford University Press,

2nd Edition, New Delhi, 2012.

R3 De, A.K, "Environmental Chemistry", New Age International (P) Limited, 5th Edition, New Delhi, 2003.

R4 Dr.K.V.S.G. Murali Krishna, "Environmental Studies", VGS Techno Series, 1st Edition, Vijayawada, 2010.

R5 G. Tyler Miller, Scott Spoolman, "Introduction to Environmental Studies", Cengage Learning, 13th Edition, New Delhi, 2009.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS

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 of course and course objectives. Introduction of components of Environment	1	07-08-2023		2	
2.	Population explosion and variations among Nations.	1	09-08-2023		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	14-08-2023		2	
4.	Environmental Hazards	1	16-08-2023		2	
5.	Role of Information Technology in environmental management and human health.	1	21-08-2023		2	
No. of classes required to complete UNIT-I: 5				No. of classes taken:		

UNIT-II: NATURAL RESOURCES AND CONSERVATION

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 and classification of Natural resources, Forest Resources,	1	23-08-2023		2	
2.	Water Resources	1	28-08-2023		2	
3.	Mineral Resources	1	30-08-2023		2	
4.	Food Resources	1	04-09-2023		2	
5.	Food Resources	1	06-09-2023		2	
6.	Food Resources	1	11-09-2023		2	
7.	Energy Resources	1	13-09-2023		2	
No. of classes required to complete UNIT-II: 7				No. of classes taken:		

UNIT-III: ECOLOGY AND BIODIVERSITY

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, structure and functions of an ecosystem	1	18-09-2023		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids,	1	20-09-2023		2	
3.	Major Types of Ecosystems – Forest, Grassland, Desert Land & aquatic Ecosystem, Ecological Niche and Keystone Species, Bio-geographical classification of	1	25-09-2023		2	

	India. India as a mega diversity nation					
4.	Bio-geo-chemical cycles	1	27-09-2023			
5.	**I MID EXAMINATION**	1	04-10-2023			
6.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	09-10-2023		2	
7.	Man and wild life conflicts. Endangered and endemic species of India	1	11-10-2023		2,3	
8.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	16-10-2023		2	
No. of classes required to complete UNIT-III: 7				No. of classes taken:		

UNIT-IV : ENVIRONMENTAL POLLUTION

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.	Air Pollution	1	18-10-2023		2	
2.	Causes, effects and control measures of: Water Pollution	1	25-10-2023		2	
3.	Causes, effects and control measures of: Soil Pollution,	1	30-10-2023			
4.	Noise Pollution		01-11-2023			
5.	Solid Waste Management	1	06-11-2023		2,3	
6.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	13-11-2023		2	
No. of classes required to complete UNIT-IV: 6				No. of classes taken:		

UNIT-V : ENVIRONMENTAL 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
1.	Sustainable Development	1	15-11-2023		2	
2.	Climate disruption- Greenhouse effect, ozone layer depletion and acid rain.	1	20-11-2023		2,3	
3.	Stockholm conference	1	22-11-2023		2	
4.	Environmental Impact Assessment (EIA)		27-11-2023		2	
5.	Green building	1	29-11-2023		2	
6.	II MID EXAMINATIONS	1	04-12-2023		5	
7.	II MID EXAMINATIONS	1	06-12-2023		5	
No. of classes required to complete UNIT-V: 07				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 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.
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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. Shaheda Niloufer	Dr. Shaheda Niloufer	Dr. Shaheda Niloufer	Dr. A. Rami Reddy
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. Muraari Kolli, Dr.Ch.Siva Sankar Babu

Course Name & Code : **Mechanics of Solids and Metallurgy Lab &20ME56**
Regulation: R20
L-T-P Structure : **0-0-3** **Credits: 1.5**
Program/Sem/Sec :B.Tech/III/A **A.Y.:** 2023-24

PREREQUISITE: Mechanics of solids, Metallurgy and Material science

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of the course is to determine various mechanical properties of materials by testing under different load conditions and observe the microstructure of various materials and perform heat treatment of materials.

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

CO1	Evaluate the mechanical properties of materials by conducting various tests. (Applying-L3)
CO2	Estimate the behavior of various materials under different loading. (Understanding-L2)
CO3	Identify the material by observing the microstructure. (Remembering-L1)
CO4	Perform the hardness test and heat treatment of steels. (Applying-L3)

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

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

References:

Lab Manual

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

LIST OF EXPERIMENTS

At least 12 experiments are to be conducted:

PART-A: MECHANICS OF SOLIDS

Any 6 Experiments are required to be conducted

1. Compression test on helical spring. **(MOS1)**
2. Tension test on mild steel rod. **(MOS2)**
3. Double shear test on metals. **(MOS3)**
4. Torsion test on mild steel rod. **(MOS4)**
5. Impact test on metal specimen. (a) Izod Impact Test (b) Charpy Impact Test **(MOS5)**
6. Hardness test on metals. (a) Rockwell Hardness Test (b) Brinell Hardness Test **(MOS6)**
7. Deflection test on beams. (a) Cantilever Beam (b) Simply Supported beam **(MOS7)**
8. Compression test on brittle materials. **(MOS8)**

PART-B: METALLURGY

Any 6 Experiments are required to be conducted

1. Preparation and study of the microstructure of Cu & Al. **(MET1)**
2. Preparation and study of the microstructure of steels. **(MET2)**
3. Preparation and Study of the microstructures of cast iron. **(MET3)**
4. Preparation and Study of the microstructures of brass. **(MET4)**
5. Hardenability of steels by Jominy end quench test. **(MET5)**
6. Hardness of various treated and untreated steels. **(MET6)**
7. Study of Age hardening of Al-Cu alloy. **(MET7)**
8. Study of Fe-Fe3C equilibrium diagram. **(MET8)**
9. Study of T-T-T diagram for eutectoid steel. **(MET9)**
10. Fabrication of FRP Composite by Hand Lay-up method. **(MET10)**
11. Fabrication of FRP Composite by Vacuum bag moulding. **(MET11)**

REFERENCES

Lab Manual (07.08.2023)

Batch-I Schedule

S.no	Date	Batches									
		$B1_1$	$B1_2$	$B1_3$	$B1_4$	$B1_5$	$B1_6$	$B1_7$	$B1_8$	$B1_9$	$B1_{10}$
1	14/08/2023	Demonstration of MOS & MMS Lab									
2	21/08/2023	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
3	28/08/2023	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7
4	04/09/2023	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2
5	11/09/2023	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
6	18/09/2023	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
7	25/09/2023	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
03-10-2023 to 09-10-2023		I Mid Examinations									
8	16/11/2023	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3
9	23/11/2023	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4
10	06/12/2023	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5
11	13/12/2023	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
12	20/12/2023	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
13	27/12/2023	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
14	30/12/2023	Internal Examination									
04-12-2023 to 09-12-2023		II Mid Examinations									
No. of classes required to complete:							No. of classes taken:				

Batches:

S. No	Batch	Registered Nos	Total
1	$B1_1$	22761A0301-303	3
2	$B1_2$	22761A0304-306	3
3	$B1_3$	22761A0307-309	3
4	$B1_4$	22761A0310-312	3
5	$B1_5$	22761A0313 -315	3

S. No	Batch	Registered Nos	Total
6	$B1_6$	22761A0316 -318	3
7	$B1_7$	22761A0319 -320	3
8	$B1_8$	23765A0301 -303	3
9	$B1_9$	23765A0304 -306	3
10	$B1_{10}$	23765A0307 -309	3

Batch-II Schedule (08.08.2023)

S. no	Date	Batches									
		$B2_1$	$B2_2$	$B2_3$	$B2_4$	$B2_5$	$B2_6$	$B2_7$	$B2_8$	$B2_9$	$B2_{10}$
1	08/08/2023	Demonstration of MOS & MMS Lab									
2	17/08/2023	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
3	24/08/2023	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7
4	31/08/2023	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2
5	07/09/2023	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
6	14/09/2023	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
7	21/09/2023	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
03-10-2023 to 09-10-2023		I Mid Examinations									
8	12/10/2023	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3
9	19/10/2023	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4
10	26/10/2023	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5
11	02/11/2023	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
12	09/11/2023	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
13	16/11/2023	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
14	23/11/2023 30.11.2023	Internal Examination									
04-12-2023 to 09-12-2023		II Mid Examinations									
No. of classes required to complete:									No. of classes taken:		

Batches:

S. No	Batch	Registered Nos	Total
1	$B2_1$	23765A0310 -312	3
2	$B2_2$	23765A0313 -315	3
3	$B2_3$	23765A0316 -318	3
4	$B2_4$	23765A0319 -321	3
5	$B2_5$	23765A0324 -327	3

S. No	Batch	Registered Nos	Total
6	$B2_6$	23765A0328 -330	3
7	$B2_7$	23765A0331 -333	3
8	$B2_8$	23765A0334 -336	3
9	$B2_9$	23765A0337 -339	3
10	$B2_{10}$	23765A0340 -342	4

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work = **A**	1,2,3,4,5,6,7,8…	A=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty				
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.P.Somaraju
Course Name & Code : Python Programming Lab(20AD53)
L-T-P Structure : 0-0-3 Credits : 2
Program/Sem/Sec: :B.Tech.,MECH., III Sem-A A.Y: 2023-24

PRE-REQUISITE: Basic Knowledge of Programming.

Course Educational Objective: The Objective of the Python course is to lead the students from the basics of writing and running Python scripts in problem-solving and to design and implement the modules and understands the working of classes and objects in python.

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

CO 1	Identify various programming constructs available in Python and apply them in solving computational problems. (**Apply - L3**)
CO 2	Demonstrate data structures available in Python and apply them in solving computational problems. (**Apply - L3**)
CO 3	Implement modular programming, string manipulations, and Python Libraries **(Apply - L3)**
CO 4	Improve individual/teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX(Correlation betindividual/teamwork:

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

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section C

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:** Language basics and example problems (Two weeks)	3	8-8-2023		**TLM4**	

2.	**Introduction:** Language basics and example problems (Two weeks)	3	22-8-2023		**TLM4**	
3.	**Module 1:** Exercise Programs on Lists.	3	5-9-2023& 12-9-2023		**TLM4**	
4.	**Module 2**: Exercise Programs on Tuples	3	19-9-2023&26-9-2023		**TLM4**	
5.	**Module 3:** Exercise Programs on Sets	3	9-10-2023		**TLM4**	
6.	**Module 4:** Exercise Programs on Dictionaries	3	16-10-2023		**TLM4**	
7.	**Module 5**: Exercise Programs on functions and recursion.	3	30-10-2023		**TLM4**	
8.	**Module 6**: Exercise programs on Strings	3	6-11-2023		**TLM4**	
9.	**Module 7:**Exercise Programs on Regular Expressions	3	13-11-2023		**TLM4**	
10.	**Module 8:**Exercise Programs on Matplot Library	3	20-11-2023		**TLM4**	
11.	**Lab Internal**	3	27-11-2023		**TLM4**	
No. of classes required to complete		**33**		**No of classes taken**	**33**	

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

PART-C

PROGRAMME OUTCOMES (POs):

PO 1	**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 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.
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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using an open-source programming environment for the success of the organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per society's needs.
PSO 3	To inculcate an ability to analyze, design, and implement database applications.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.P.Somaraju	Dr. Y . Vijay Bhaskar Reddy	Dr. K. Naga Prasnthi	Dr. S. Pichi Reddy

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.B.Sudheer Kumar/Mr.K.Venkateswara Reddy
Mr.S.Uma Maheswara Reddy
Course Name & Code : Technical Drawing using Drafting Package Lab (20MES1)
L-T-P Structure : 1-0-2 Credits : 2
Program/Sem/Sec : B.Tech., Mech., III-Sem., A/S A.Y : 2023-24

PRE-REQUISITE : Engineering Graphics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to improve the skill sets of students in drafting packages (Auto CAD/CATIA) and enable them to draw the diagrams related to mechanical engineering components/applications.

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

CO 1	Understand the Auto-CAD basics for 2D sketches used in industries **(Understanding - L2)**
CO 2	Draw the machine components using 3D modelling commands. **(Applying –L3)**
CO 3	Edit the 3D solid Models using solid editing commands. **(Understanding - L2)**
CO 4	Extract the Orthographic views of the models in Wire Frame, Surface & Solid Modelling. **(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				2					2		1		3	3
CO2	2				3					2		1		3	3
CO3	2				3					2		1		3	3
CO4	2				3					2		1		3	3

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

S.No.	Programs 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 Technical Drawing using Drafting Package-CEO&COs	04	11.08.2023		TLM2	CO-1,2,3,4	
2.	Demonstration to AutoCAD Software	04	18.08.2023		TLM4	CO-1,2,3,4	
3.	Exercise on Basic Drawing Commands **(Exp-1)**	04	25.08.2023		TLM4	CO-1	
4.	Exercise on Modify Commands **(Exp-2)**	04	01.09.2023		TLM4	CO-1	
5.	Exercise on isometric views **(Exp-3)**	04	08.09.2023		TLM4	CO-1	
6.	Exercise on 3D Modelling Commands-I **(Exp-4)**	04	15-09-2023		TLM4	CO-2	
7.	Exercise on 3D Modelling Commands-II **(Exp-5)**	04	22-09-2023		TLM4	CO-2	
8.	Exercise on 3D Modelling Commands-III **(Exp-6)**	04	29-09-2023		TLM4	CO-2	
MID-I EXAMINATIONS (3-10-23 TO 9-10-23)							
9.	Exercise on 3D Solid Editing Commands-I **(Exp-7)**	04	13-10-2023		TLM4	CO-3	
10.	Exercise on 3D Solid Editing Commands-II **(Exp-8)**	04	20-10-2023		TLM4	CO-3	
11.	Extraction of Wire-Frame & Solid Models from 3D Models **(Exp-9)**	04	27-10-2023		TLM4	CO-4	
12.	Extraction of Ortho Graphics Views from 3D model-I **(Exp-10)**	01	01-10-2023		TLM4	CO-4	
13.	Repetition	04	03-10-2023		TLM4	CO-4	

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

LIST OF EXPERIMENTS:

Exp. No.	Name of the Experiment	Related CO
MES-1	Exercise on Basic Drawing Commands	CO1
MES2	Exercise on Modify Commands	CO1
MES3	Exercise on isometric views	CO1
MES4	Exercise on 3D Modelling Commands-I	CO2
MES5	Exercise on 3D Modelling Commands-II	CO2
MES6	Exercise on 3D Modelling Commands-III	CO2
MES7	Exercise on 3D Solid Editing Commands-I	CO3
MES8	Exercise on 3D Solid Editing Commands-II	CO3
MES9	Extraction of Wire-Frame & Solid Models from 3D Models	CO4
MES10	Extraction of Ortho Graphics Views from 3D model-I	CO4

NOTIFICATION OF CYCLES

Cycle	Exp. No.	Name of the Experiment	Related CO
Cycle-1	MES-1	Exercise on Basic Drawing Commands	CO1
	MES2	Exercise on Modify Commands	CO1
	MES3	Exercise on isometric views	CO1
Cycle-2	MES4	Exercise on 3D Modelling Commands-I	CO2
	MES5	Exercise on 3D Modelling Commands-II	CO2
	MES6	Exercise on 3D Modelling Commands-III	CO2
Cycle-3	MES7	Exercise on 3D Solid Editing Commands-I	CO3
	MES8	Exercise on 3D Solid Editing Commands-II	CO3
Cycle-4	MES9	Extraction of Wire-Frame & Solid Models from 3D Models	CO4
	MES10	Extraction of Ortho Graphics Views from 3D model-I	CO4

PART-C

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
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PO4	**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.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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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. B.Sudheer Kumar	Mr. K.V.Viswanadh	Dr.B.Sudheer Kumar	M.B.S.SreekarReddy

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. P.V.Chandra Sekhar Rao
Course Name & Code **:** MECHANICS OF SOLIDS &20 ME06
L-T-P Structure **:** 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech/III/A **A.Y.:** 2023-24
PREREQUISITE: Engineering Mechanics
COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to identify nature of the stress and compute the deformations in mechanical members due to various loads.
COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Compute the stresses and deformations of a member subjected to various types of loading. **(Applying-L3)**
CO2	Construct the shear force and bending moment diagrams along the length of beam. **(Applying-L3)**
CO3	Comprehend the variation of bending and shear stresses across the cross section of the beams. **(Understanding-L2)**
CO4	Analyze the structural members subjected to biaxial stresses. **(Analyzing-L4)**
CO5	Formulate the equations for stresses and deformations due to various loads. **(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	2	-	-	-	-	-	-	-	-	-	2	-	-	3
CO2	3	3	1	-	-	-	-	-	-	-	-	2	-	-	3
CO3	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3
CO4	3	2	1	-	-	-	-	-	-	-	-	2	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3
1 - Low			**2 –**Medium							**3 -** High					

TEXTBOOKS:

T1 E.P. Popov, Engineering Mechanics of Solids, PHI Learning, 2009.
T2 Sadhu Singh, Strength of Materials, Khanna Publishers, 2013.

REFERENCE BOOKS:

R1 S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons, 2011.
R2 M.L. Gambhir, Fundamentals of Solid Mechanics, PHI Learning, 2009.
R3 M. Chakraborti, "Strength of Materials", S.K.Kataria & Sons.
R4 R.Subramanian, "Strength of Materials", Oxford University Press, 2010.
R5 R.K.Bansal, "Strength of Materials", Laxmi Publishers, 2013.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):
UNIT-I: SIMPLE STRESSES AND STRAINS

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 Mechanics of Solids - Course Educational Objective (CEO) & Course Outcomes (CO's)	1	08-08-2023		TLM1,2	
2.	Concept of Stress & Strain	1	09-08-2023		TLM2	
3.	Mechanical properties of Materials	1	10-08-2023		TLM2	
4.	Stress Strain diagrams for Mild Steel -Hooke's Law Evaluation of Proof stress by Offset method	1	11-08-2023		TLM2,4	
5.	Stresses, Strains & Deformations of a body due to axial force Factor of Safety	1	15-08-2023		TLM1	
6.	Deformation of Stepped bar due to axial loads	1	16-08-2023		TLM1	
7.	Tutorial-I	1	17-08-2023		TLM3	
8.	Stresses in composite bars & Problems	1	18-08-2023		TLM1	
9.	Lateral strain, Poisson's ratio & change in volume; Shear stress & shear strain	1	22-08-2023		TLM1	
10.	Relation between Young's Modulus and shear Modulus	1	23-08-2023		TLM1	
11.	Relation between Elastic modulii & Problems	1	24-08-2023		TLM1	
12.	Tutorial-II	1	25-08-2023		TLM3	
13.	Assignment / Quiz (UNIT-I)	1	29-08-2023		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: SHEAR FORCE AND BENDING MOMENT

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 to Shear force and bending moment; Relation between Shear Force, Bending Moment & rate of Loading	1	30-08-2023		TLM1	
15.	Shear force & Bending moment Diagrams for cantilever beam subjected to Concentrated loads& UDL.	1	31-08-2023		TLM1	
16.	Shear force & Bending moment Diagrams for Simply supported beam subjected to Concentrated loads & UDL.	1	01-09-2023		TLM1	
17.	Estimation of Maximum bending moment for simply supported beam	1	05-09-2023		TLM1	

18.	Shear force & Bending moment Diagrams for Overhanging beam subjected to Concentrated loads & UDL	1	06-09-2023		TLM1	
19.	Estimation of Maximum bending moment & point of contra flexure for Overhanging beams	1	07-09-2023		TLM1	
20.	Problems on Overhanging Beam	1	08-09-2023		TLM1	
21.	Tutorial-III	1	12-09-2023		TLM3	
22.	Tutorial-IV	1	13-09-2023		TLM3	
23.	Assignment / Quiz (UNIT-II)	1	14-09-2023		TLM1	
24.	Revision	1	15-09-2023		TLM1	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: STRESSES IN BEAMS AND SHEAR STRESSES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Theory of Simple bending, assumptions	1	19-09-2023		TLM1	
26.	Derivation of flexure equation	1	20-09-2023		TLM1	
27.	Section modulus and problems	1	21-09-2023		TLM1	
28.	Normal stresses due to flexure applications problems	1	22-09-2023		TLM1	
29.	Normal stresses due to flexure applications problems	1	26-09-2023		TLM1	
30.	Tutorial-V	1	27-09-2023		TLM3	
31.	Revision	1	28-09-2023		TLM1	
32.	Revision	1	29-09-2023		TLM1	
33.	Concept of shear stress variation over cross section due to flexural loads Derivation of lateral shear stress	1	10-10-2023		TLM1	
34.	Shear stress distribution across rectangular & circular sections	1	11-10-2023		TLM1	
35.	Problems on distribution of Shear stress	1	12-10-2023		TLM1	
36.	Tutorial-V	1	13-10-2023		TLM3	
37.	Assignment / Quiz (UNIT-III)	1	17-10-2023		TLM1	
38.	Revision	1	18-10-2023		TLM1	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: ANALYSIS OF COMBINED STRESSES

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.	State of stress at a point, normal and tangential stresses on inclined planes	1	19-10-2023		TLM1	
40.	Problem on normal and tangential stresses on inclined planes	1	20-10-2023		TLM1	
41.	Principle stresses and their planes, maximum shear stress plane	1	24-10-2023		TLM1	
42.	Problems	1	25-10-2023		TLM1	
43.	Problems	1	26-10-2023		TLM1	
44.	Tutorial-VI	1	27-10-2023		TLM3	
44.	Mohr's circle diagram	1	31-10-2023		TLM1	
45.	Problems on Mohr's circle	1	01-11-2023		TLM1	
46.	Problems on Mohr's circle	1	02-11-2023		TLM1	
47.	Tutorial-VII	1	03-11-2023		TLM3	
48.	Assignment / Quiz (UNIT-IV)	1	07-11-2023		TLM1	
49.	Revision	1	08-11-2023		TLM1	
50.	Videos	1	09-11-2023		TLM5	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: DEFLECTION OF BEAMS & THIN AND THICK CYLINDRICAL SHELLS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Derivation of Differential equation for elastic line (Deflection Equation)	1	10-11-2023		TLM1	
52.	Deflection & Slope equations for cantilever beam	1	14-11-2023		TLM1	
53.	Deflection & Slope equations for simply supported beam	1	15-11-2023		TLM1	
54.	Macaulay's method	1	16-11-2023		TLM1	
55.	Tutorial	1	17-11-2023		TLM1	
56.	Introduction to thin & thick shells	1	21-11-2023		TLM2	
57.	Hoop stress and longitudinalstresses for thin cylinders	1	22-11-2023		TLM1	
58.	Change in volume of thin cylinder	1	23-11-2023		TLM2	
59.	Derivation of Lame's equations of Thick cylinders; Problems on thick cylinders	1	24-11-2023		TLM1	
60.	Tutorial-VIII	1	28-11-2023		TLM3	
61.	Assignment / Quiz (UNIT-V)	1	29-11-2023		TLM1	
62.	Beyond Syllabus	1	30-11-2023		TLM2	
63.	Revision	1	01-12-2023		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. P.V.Chandra Sekhar Rao**	**K. V. VISWANADH**	**B. SUDHEER KUMAR**	**Dr. S. PICHI REDDY**
Signature				

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

Determine the discharge of various flow measuring devices, estimation of friction factor and performance parameters of hydraulic machines.

COURSE OUTCOMES:

After completion of the course students are able to:

CO1: Identify the need and use of various flow measuring devices. (Understanding-L2)

CO2: Apply the Bernoulli's equation for energy balance of fluid flow system. (Applying - L3)

CO3: Determine the friction losses of fluid flow through different pipes. (Applying-L3)

CO4: Evaluate the performance characteristics of hydraulic pumps, turbines and impact of jets. (Applying-L3)

Course Articulation Matrix:

20ME55	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	2	2	2	3	-	-	-	-	1	-	-	2	-	-	-
CO3	-	-	1	3	-	-	-	-	-	--	-	2	-	-	-
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 MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

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 Mouthpiece apparatus **(FM6)**
7. Impact of jets on Vanes **(FM7)**

PART-B: HYDRAULIC MACHINERY

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**

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

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

Batches (Section – B)

Total No. of students: 21761A0347,361& 22761A0301 TO 22761A0320,22761A0330 &23765A0301 TO 310
Batch B1 : 21761A0347,361& 22761A0301 TO 22761A0320,22761A0330 = 29
Batch B2 : 23765A0311 TO 23765A0338=28
Sub Batches of B1:

S. No	Batch	Registered Nos	Total
1	$B1_1$	21761A0347,361& 22761A0301 TO 22761A0304	5
2	$B1_2$	22761A0305-312	5
3	$B1_3$	22761A0313-317	5
4	$B1_4$	22761A0318-330&23765A0301	5
5	$B1_5$	23765A0302-306	5
6	$B1_6$	23765A0307-310	4
Total			29

Sub Batches of B2:

S. No	Batch	Registered Nos	Total
1	$B2_1$	23765A0311-314	4
2	$B2_2$	23765A0315-318	4
3	$B2_3$	23765A0319-323	5
4	$B2_4$	23765A0324-328	5
5	$B2_5$	23765A0329-333	5
6	$B1_6$	23765A0334-338	5
Total			28

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

NOTIFICATION OF CYCLES

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

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 mouthpiece 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 (Section – B)

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

Total No. of students : 21761A0347,361& 22761A0301 TO 22761A0320,22761A0330 &23765A0301 TO 310
Batch B1 : 21761A0347,361& 22761A0301 TO 22761A0320,22761A0330 = 29
Batch B2 : 23765A0311 TO 23765A0338=28

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

DEPARTMENT OF MECHANICAL ENGINEERING

VIVA QUESTIONS

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

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

32. What is breaking jet in Pelton wheel turbine?
33. What is the function of casing in Pelton turbine
34. Draw a simple sketch of Pelton wheel bucket.
35. What is the function of surge tank fixed to penstock in Pelton turbine?
36. How the inlet discharge is controlled in Pelton turbine?
37. What is water hammer?
38. What do you mean by head race?
39. What do you mean by tail race?
40. What is the difference between propeller and Kaplan turbine?
41. Mention the parts of Kaplan turbine.
42. Differentiate between inward and outward flow reaction turbine.
43. What is the difference between Francis turbine and Modern 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 amount 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**

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

Notification of Cycles (Section – B)

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

Total No. of students : 21761A0347,361& 22761A0301 TO 22761A0320,22761A0330 &23765A0301 TO 310
Batch B1 : 21761A0347,361& 22761A0301 TO 22761A0320,22761A0330 = 29
Batch B2 : 23765A0311 TO 23765A0338=28

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

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DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of FLUID MECHANICS AND HYDRAULIC MACHINERY LAB (Section – B)

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

Date	Experiment (Batch-1)					
Cycle-I	**Ex - 1**	**Ex – 2**	**Ex – 3**	**Ex – 4**	**Ex – 5**	**Ex – 6**
10/08/2023	**Demonstration of all experiments, CEOs and COs of the Laboratory**					
17/08/2023	B1	B2	B3	B4	B5	B6
24/08/2023	B2	B3	B4	B5	B6	B1
31/08/2023	B3	B4	B5	B6	B1	B2
07/09/2023	B4	B5	B6	B1	B2	B3
14/09/2023	B5	B6	B1	B2	B3	B4
21/09/2023	B6	B1	B2	B3	B4	B5
05/10/2023	**I MID EXAMINATIONS**					
Cycle-II	**Ex - 7**	**Ex – 8**	**Ex – 9**	**Ex – 10**	**Ex – 11**	**Ex – 12**
12/10/2023	B1	B2	B3	B4	B5	B6
19/10/2023	B2	B3	B4	B5	B6	B1
26/10/2023	B3	B4	B5	B6	B1	B2
02/11/2023	B4	B5	B6	B1	B2	B3
09/11/2023	B5	B6	B1	B2	B3	B4
16/11/2023	B6	B1	B2	B3	B4	B5
23/11/2023	**REPETITION**					
30/11/2023	**INTERNAL EXAMINATION**					

S. No	Batch	Registered Nos	Total		S. No	Batch	Registered Nos	Total
1	B11	23765A0311-314	4		4	B14	23765A0324-328	5
2	B12	23765A0315-318	4		5	B15	23765A0329-333	5
3	B13	23765A0319-323	5		6	B16	23765A0334-338	5

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

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DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of FLUID MECHANICS AND HYDRAULIC MACHINERY LAB (Section – B)

Course Title : FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **Academic Year: 2023-24**
Instructors : S.RR/MO **Course & SEM: B.Tech&III**
Branch : ME **Section :A**

Date	Experiment (Batch-2)					
Cycle-I	**Ex - 1**	**Ex – 2**	**Ex – 3**	**Ex – 4**	**Ex – 5**	**Ex – 6**
07/08/2023	**Demonstration of all experiments, CEOs and COs of the Laboratory**					
14/08/2023	B1	B2	B3	B4	B5	B6
21/08/2023	B2	B3	B4	B5	B6	B1
28/08/2023	B3	B4	B5	B6	B1	B2
28/08/2023	B4	B5	B6	B1	B2	B3
04/09/2023	B5	B6	B1	B2	B3	B4
04/09/2023	B6	B1	B2	B3	B4	B5
09/10/2023	**I MID EXAMINATIONS**					
	Ex - 7	**Ex – 8**	**Ex – 9**	**Ex – 10**	**Ex – 11**	**Ex – 12**
16/10/2023	B1	B2	B3	B4	B5	B6
16/10/2023	B2	B3	B4	B5	B6	B1
30/10/2023	B3	B4	B5	B6	B1	B2
30/10/2023	B4	B5	B6	B1	B2	B3
06/11/2023	B5	B6	B1	B2	B3	B4
13/11/2023	B6	B1	B2	B3	B4	B5
20/11/2023	**REPETITION**					
27/11/2023	**INTERNAL EXAMINATION**					

Batches:

S. No	Batch	Registered Nos	Total		S. No	Batch	Registered Nos	Total
1	B21	21761A0347,361& 22761A0301-304	05		4	B24	22761A0318-23765A0301	04
2	B22	22761A0305-312	04		5	B25	23765A0302-306	04
3	B23	22761A0313-317	04		6	B26	23765A0307-310	04

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)
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FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. K. Jhansi Rani
Course Name & Code : Numerical Methods & Integral Calculus & 20FE10
L-T-P Structure : 2-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ME B **A.Y.:** 2023 - 24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to enable the students learn Numerical Techniques for solving the equations and apply interpolation techniques. They will also learn about the Fourier analysis of single valued functions, Multiple Integrals in different coordinate systems and Vector differentiation.

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

CO1	Estimate the best fit polynomial for the given tabulated data using Interpolation.(Understand – L2)
CO2	Apply numerical techniques in solving of equations and evaluation of integrals. (Apply – L3)
CO3	Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. (Apply – L3)
CO4	Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. (Apply – L3)
CO5	Evaluate the directional derivative, divergence and angular velocity of a vector function. (Apply – 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**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO2	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO3	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO4	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO5	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
1 - Low **2** –Medium **3** - High															

TEXTBOOKS:

T1 Dr. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2012.
T2 Dr. B. V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.
T3 S. S. Sastry, "Introductory Methods of Numerical Analysis" 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

REFERENCE BOOKS:

R1 M. D. Greenberg, "Advanced Engineering Mathematics", 2nd Edition, TMH Publications, New Delhi, 2011.
R2 Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley & sons, New Delhi, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Interpolation and Finite Differences

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the course, Course Outcomes	1	07/08/23		TLM1	
2.	Introduction to UNIT I	1	08/08/23		TLM2	
3.	Forward Differences	1	10/08/23		TLM1	
4.	Backward differences	1	11/08/23		TLM1	
5.	Central Differences	1	14/08/23		TLM1	
6.	Symbolic relations and separation of symbols	1	17/08/23		TLM1	
7.	Symbolic relations and separation of symbols	1	18/08/23		TLM1	
8.	Newton's forward formulae for interpolation	1	21/08/23		TLM1	
9.	Newton's backward formulae for interpolation	1	22/08/23		TLM1	
10.	Lagrange's Interpolation	1	24/08/23		TLM1	
11.	Lagrange's Interpolation	1	28/08/23		TLM1	
12.	Tutorial I	1	25/08/23		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Numerical solutions of Equations and Numerical Integration

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to UNIT II	1	29/08/23		TLM2	
14.	Algebraic and Transcendental Equations	1	31/08/23		TLM1	
15.	False Position method	1	01/09/23		TLM1	
16.	False Position method	1	04/09/23		TLM1	
17.	Newton- Raphson Method in one variable	1	05/09/23		TLM1	
18.	Newton- Raphson Method applications	1	07/09/23		TLM1	
19.	Trapezoidal rule	1	08/09/23		TLM1	
20.	Simpson's 1/3 Rule	1	11/09/23		TLM1	
21.	Simpson's 3/8 Rule	1	12/09/23		TLM1	
22.	Tutorial II	1	15/09/23		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Multiple Integrals

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	Introduction to Unit-III	1	14/09/23		TLM1	
24.	Double Integrals -Cartesian coordinates	1	19/09/23		TLM1	
25.	Double Integrals- Polar co ordinates	1	21/09/23		TLM1	
26.	Problems	1	22/09/23		TLM1	
27.	Applications to Double integrals (Content Beyond the syllabus)	1	25/09/23		TLM1	
28.	Applications to Double integrals (Content Beyond the syllabus)	1	26/09/23		TLM1	
29.	Revision for mid exam	1	29/09/23			

I MID EXAMINATIONS (02-10-2023 TO 07-10-2023)						
30.	Triple Integrals - Cartesian coordinates	1	09/10/23		TLM1	
31.	Triple Integrals - Spherical coordinates	1	10/10/23		TLM1	
32.	Change of order of Integration	1	12/10/23		TLM1	
33.	Tutorial III	1	13/10/23		TLM3	
34.	Change of order of Integration	1	16/10/23		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Fourier Series

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Introduction to UNIT IV	1	17/10/23		TLM1	
36.	Determination of Fourier coefficients, Even and Odd Functions	1	27/10/23		TLM1	
37.	Fourier Series expansion in the interval $[0,2\pi]$	1	30/10/23		TLM1	
38.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	31/10/23		TLM1	
39.	Fourier Series in an arbitrary interval [0, 2l]	1	02/11/23		TLM1	
40.	Fourier Series in an arbitrary interval [-l, l]	1	03/11/23		TLM1	
41.	Fourier series in an arbitrary interval odd and even functions	1	06/11/23		TLM1	
42.	Half-range Sine and Cosine series	1	07/11/23		TLM1	
43.	Half-range Sine and Cosine series		09/11/23		TLM1	
44.	Tutorial IV	1	10/11/23		TLM3	
45.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	13/11/23		TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction to UNIT V	1	14/11/23		TLM1	
47.	Vector Differentiation	1	16/11/23		TLM1	
48.	Gradient	1	17/11/23		TLM1	
49.	Directional Derivative	1	20/11/23		TLM1	
50.	Divergence	1	21/11/23		TLM1	
51.	Curl	1	23/11/23		TLM1	
52.	Solenoidal and Irrotational functions, potential surfaces	1	24/11/23		TLM1	
53.	Laplacian and second order operators	1	27/11/23		TLM1	
54.	TUTORIAL - V	1	30/11/23		TLM3	
55.	Properties	1	28/11/23		TLM1	
56.	Introduction to Vector Integrals (Content Beyond the Syllabus)	1	01/12/23		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
PO 8	**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. K. Jhansi Rani**	**Dr. K. R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: S.RAMI REDDY
Course Name & Code : FLUID MECHANICS & HYDRAULIC MACHINERY&20 ME03
L-T-P Structure : 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech/III/B **A.Y.:** 2023-24
PREREQUISITE: Engineering physics and Mathematics
COURSE EDUCATIONAL OBJECTIVES (CEOs): To understand the fundamental concepts of fluid mechanics, various flow measuring devices, boundary layer separation and performance characteristics of hydraulic machines.

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

CO1	Understand the fundamentals of fluid mechanics and dimensional analysis and similarity concepts
CO2	Comprehend the kinematics and dynamics of fluid flows
CO3	Analyze boundary layer flow and friction losses in pipes
CO4	Apply impulse momentum concept to impact of jet problems
CO5	Evaluate the performance parameters of hydraulic turbines and pumps

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 DIMENSIONAL ANALYSIS AND SIMILARITY

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	09/08/2023		TLM1	
2.	Physical properties of fluids	1	10/08/2023		TLM3	
3.	Specific gravity,viscosity,surface tension,vapour pressure	1	11/08/2023		TLM1	
4.	Problems on physical properties	1	16/08/2023		TLM1	
5.	Manometers, classification	1	17/08/2023		TLM2	
6.	Problems on manometers	1	18/08/2023		TLM3	
7.	Dimensional analysis,rayleigh's method	1	19/08/2023		TLM1	
8.	Buckingham's Pi theorem method	1	23/08/2023		TLM1	
No. of classes required to complete UNIT-I: 8				**No. of classes taken:**		

UNIT-II: FLUID STATICS AND FLUID DYNAMICS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Stream line, path line, streak line, stream tube	1	24/08/2023		TLM1	
10.	Classification of flows, equation of continuity for 1 dimensional flow	1	25/08/2023		TLM3	
11.	Surface and body forces, Euler's equation, Bernoulli's equation	1	26/08/2023		TLM1	
12.	Momentum equation and its application on pipe bend	1	30/08/2023		TLM1	
13.	Reynold's experiment	1	31/08/2023		TLM2	
14.	Darcy's formula	1	01/09/2023		TLM1	
15.	Minor losses in pipes	1	02/09/2023		TLM1	
16.	Problems on major and minor losses	1	07/09/2023		TLM3	
17.	Pipes in series and parallel	1	08/09/2023		TLM1	
18.	Total energy line and hydraulic gradient line	1	13/09/2023		TLM1	
19.	Venturi meter, orifice meter, pitot tube	1	14/09/2023		TLM3	
20.	Problems on venturi and orifice meter	1	15/09/2023		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: BOUNDARY LAYER FLOW AND IMPACT OF JETS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Laminar and turbulent boundary layer	1	16/09/2023		TLM2	
22.	Boundary layer thickness	1	20/09/2023		TLM3	
23.	displacement thickness	1	21/09/2023		TLM1	
24.	momentum thickness	1	22/09/2023		TLM1	
25.	energy thickness	1	23/09/2023		TLM1	
26.	Energy thickness	1	27/09/2023		TLM3	
27.	boundary layer separation	1	29/09/2023		TLM1	
28.	Problems on boundary layer thickness	1	30/09/2023		TLM1	
29.	Hydrodynamic forces of jets on stationary and moving flat, inclined, curved vanes	1	11/10/2023		TLM2	

30.	Jet striking centrally and a tip for symmetrically and unsymmetrically vanes, velocity diagrams	1	12/10/2023		TLM3	
31.	Flow over radial vanes	1	13/10/2023		TLM1	
32.	Problems on stationary plates	1	14/10/2023		TLM1	
33.	Problems on stationary plates	1	18/10/2023		TLM1	
34.	Problems on moving plates	1	19/10/2023		TLM3	
35.	Problems on moving plates	1	25/10/2023		TLM1	
36.	Problems on moving plates	1	26/10/2023		TLM1	
37.	Problems on radial vanes	1	27/10/2023		TLM1	
38.	Problems on radial vanes	1	28/10/2023		TLM3	
No. of classes required to complete UNIT-III: 18				**No. of classes taken:**		

UNIT-IV: HYDRAULIC TURBINES AND PERFORMANCE OF THE 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
39.	Classification of hydraulic turbines	1	01/11/2023		TLM2	
40.	Pelton wheel, work done, efficiency	1	02/11/2023		TLM2	
41.	Francis turbine, work done, efficiency	1	03/11/2023		TLM1	
42.	Kaplan turbine, work done, efficiency	1	04/11/2023		TLM3	
43.	Specific speed, specific quantities	1	08/11/2023		TLM1	
44.	Unit quantities, Draft tube-classification	1	09/11/2023		TLM1	
45.	Performance characteristic curves, governing of turbines	1	10/11/2023		TLM3	
46.	Problems on hydraulic turbines	1	15/11/2023		TLM1	
47.	Problems on hydraulic turbines	1	16/11/2023		TLM1	
48.	Problems on hydraulic turbines	1	17/11/2023		TLM1	
49.	Problems on hydraulic turbines	1	18/11/2023		TLM3	
50.	Problems on hydraulic turbines	1	22/11/2023		TLM1	
No. of classes required to complete UNIT-IV: 12						

UNIT-V: 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
51.	Working of centrifugal pump, types	1	23/11/2023		TLM2	
52.	Losses and efficiencies, specific speed	1	24/11/2023		TLM2	
53.	Pumps in series and pumps in parallel	1	25/11/2023		TLM3	
54.	Problems on centrifugal pumps	1	29/11/2023		TLM1	
55.	Main components and working of reciprocating pumps, types	1	30/11/2023		TLM1	
56.	Slip, negative slip	1	01/12/2023		TLM1	
57.	Revision	1	02/12/2023		TLM3	
No. of classes required to complete UNIT-V: 7				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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	**S.RAMI REDDY**	**S.RAMI REDDY**	**Dr.P.VIJAYA KUMAR**	**Dr.S.PICHI REDDY**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.V.Dhana Raju
Course Name & Code : Thermodynamics
L-T-P Structure : 3-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech III Sem B/S **A.Y.:** 2023-24

PREREQUISITE: Engineering Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To provide an intuitive understanding of thermodynamics to emphasize on physics of thermodynamic systems and this covers the heat and work interactions. It also provides the insights on laws of thermodynamics and its applications, properties of pure substance, ideal gases and different thermodynamic cycles.

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

CO1	Classify the various thermodynamic systems, properties and processes with examples and temperature scales of a system [Remembering Level –L1].
CO2	Differentiate open and closed system and built up the heat and work transfer relations of thermal systems [Understanding Level –L2].
CO3	Apply the laws of thermodynamics to find the thermodynamic properties and parameters of various thermal systems [Applying Level-L3].
CO4	Understand the properties of pure substance and gases to compute the non-reactive mixture parameters [Understanding Level –L2].
CO5	Analyze the performance parameters of various thermodynamic cycles [Analyzing Level – 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	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	2	3	-	-	-	-	2	-	-	2	3	-	1
CO3	3	1	1	3	-	-	-	-	1	-	-	2	3	-	2
CO4	3	3	2	2	-	-	-	3	-	-	-	2	1	-	3
CO5	3	3	-	3	-	-	-	-	3	-	-	3	2	-	3
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1	P.K.Nag, "Engineering Thermodynamics"- McGraw-Hill. 5th Edition, 2013
T2	Y.A. Cengel, and M.A.Boles, "Thermodynamics: An Engineering Approach", McGraw-Hill, 7th Edition, 2011.

REFERENCE BOOKS:

R1	G.J.Van Wylen & Sonntag, "Fundamentals of Thermodynamics", John Wiley& sons, publications Inc. 5th Edition, 1998.
R2	E.Rathakrishnan, "Fundamentals of Engineering Thermodynamics", PHI, 2nd Edition, 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Basic Concepts and Zeroth Law of Thermodynamics

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	1	07-08-23		1	
2.	Basic Concepts, Classification of systems, Macroscopic & Microscopic approaches	1	08-08-23		1,2	
3.	System-Types - examples, Control mass and Control volume Properties of system	1	09-08-23		1,2	
4.	State, Path, Process, Cycle, path and point functions.	1	10-08-23		1,2	
5.	Equilibrium, reversible and irreversible processes, Quasistatic process, Applications of TD, Internal Energy, Specific heat, Enthalpy	1	14-08-23		1,2	
6.	Zeroth law of Thermodynamics Temperature scales – Temperature measurement , Comparison of thermometers	1	16-08-23		1,2	
7.	Constant volume gas thermometer Numerical Problems on Temperature scales.	1	17-08-23		1,2	
8.	Advantages of gas thermometers over liquid thermometers	1	21-08-23		1,2	
9.	Numerical problems on Internal energy, enthalpy, specific heat and latent heat, Assignement-1	1	22-08-23		1	
10.	Tutorial -I	1	23-08-23		3	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: First Law of Thermodynamics

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	**First Law Analysis of Closed Systems** : Introduction, First law for a closed system undergoing change of state and cycle	1	24-08-23		1,2	
12.	Representation of Thermodynamic processes on P-V planes	1	28-08-23		1,2	
13.	First Law Analysis of Closed System undergoing different process.	1	29-08-23		1,2	
14.	Different forms of stored energy, Forms of energy, Mechanical and Non mechanical forms of Work transfer	2	30-08-23		1,2	
15.	pdV work and other types of work transfer.	1	31-08-23		1,2	
16.	Applications of first law, PMM1 Numerical problems on work and energy.	1	04-09-23		1	

17.	**First Law Analysis of Open Systems** : Thermodynamic analysis of control volume-conservation of mass, energy principle.	1	05-09-23		1,2	
18.	Steady Flow Energy Equation (SFEE), Steady Flow Engineering Devices-Nozzles, Diffusers.	1	07-09-23		1,2	
19.	Turbine, Compressors, Throttling Valves, Heat Exchangers, Limitations on first law of thermodynamics, PMM1.	1	11-09-23		1,2	
20.	Numerical Problems on SFEE	1	12-09-23		1	
21.	Tutorial -2	1	13-09-23		3	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: Second Law of Thermodynamics

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.	**Second Law Analysis of Thermodynamics:** Introduction, Energy Reservoirs, Heat Engines, Refrigerators, Heat Pumps.	1	14-09-23		1,2	
23.	Kelvin-Planks, Clausius statement of second law of thermodynamics.	1	18-09-23		1,2	
24.	Numerical Problems on Second law of TD.	1	20-09-23		1	
25.	Equivalence of Kelvin -Planck and Clausius statements.	1	21-09-23		1,2	
26.	Perpetual Motion Machine-II, Carnot cycle.	1	25-09-23		1,2	
27.	Carnot Theorem – Numerical problem.	1	26-09-23		1	
28.	**Entropy:** Introduction, Clausius inequality, t-s property diagrams.	1	27-09-23		1	
29.	Entropy change for ideal gases – Derivations.	1	28-09-23		1	
30.	Isentropic relations for ideal gases, Principle of increase of entropy.	1	09-10-23		1,2	
31.	Applications of Entropy- Third law of Thermodynamics Numerical Problems on Entropy.	1	10-10-23		1,2	
32.	Numerical Problems, Assignement-3.	1	11-10-23		1	
33.	Tutorial -3	1	12-10-23		3	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Properties of Pure Substances and Gases

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	**Properties of Pure Substance:** Introduction, Phases of pure substance.	1	16-10-23		1,2	

35.	*p-v, p-T, T-s* and *h-s* diagrams for pure substance, *p-v-T* Surface.	1	17-10-23		1,2	
36.	Properties of steam, quality or dryness fraction.	1	18-10-23		1,2	
37.	Phase change processes, Mollier diagram for a pure substance.	1	19-10-23		1,2,4,6	
38.	Numerical Problems.	1	26-10-23		1	
39.	**Properties of Ideal Gases:** Equation of state of a gas, Avogadro's law, Ideal gas, perfect gas, real gas.	1	30-10-23		1,2	
40.	Properties of mixture of gases –	1	31-10-23		1,2	
41.	Dalton's law and Amagat's law of partial pressures.	1	02-11-23		1,2	
42.	Internal energy, enthalpy of gas	1	06-11-23		1,2	
43.	specific heats of gas mixtures,Entropy of gas mixtures.	1	07-11-23		1,2	
44.	Numerical Problems.	1	08-11-23		1,2	
45.	Tutorial-4	1	09-11-23		3	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Thermodynamic Cycles

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction**,** working of Carnot vapour cycle, working of simple Rankine cycle	1	13-11-23		1,2	
47.	Problems on Carnot vapour cycle and simple Rankine cycle	1	14-11-23		1,2	
48.	Gas power cycles -Otto, Numerical Problems	1	15-11-23		1,2	
49.	Diesel cycle, Dual cycle - Numerical Problems	1	16-11-23		1,2	
50	Brayton Cycles and its problems	1	20-11-23		1,2	
51.	Refrigeration Cycles - Reversed Carnot cycle, Numerical Problems	1	21-11-23		1,2	
52.	Bell-Coleman cycle and simple	1	22-11-23		1,2	
53.	VCR Cycle	1	23-11-23			
54.	Problems	1	27-11-23			
55.	Tutorial -5	1	28-11-23		3	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of	Tentative	Actual	Teaching	HOD

		Classes Required	Date of Completion	Date of Completion	Learning Methods	Sign Weekly
51	Exergy analysis of thermodynamic systems	**1**	29-11-23		**1,2**	
52	Fuels and combustion	**1**	30-11-23		**2**	

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		**07-08-2023**	
I Phase of Instructions	07-08-2023	30-09-2023	8Weeks
I Mid Examinations	**02-10-2023**	**07-10-2023**	1 Week
II Phase of Instructions	09-10-2023	02-12-2023	8 Weeks
II Mid Examinations	**04-12-2023**	**09-12-2023**	1 Week
Preparation and Practical's	11-12-2023	16-12-2023	1 Week
Semester End Examinations	18-12-2023	30-12-2023	2 Weeks

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+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 ofmathematics, 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 consequentresponsibilities 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 toengage 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, analysisand manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power,conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.V.Dhana Raju	Dr.P.Ravindra Kumar	Dr.P.Vijay Kumar	Dr.S.PichiReddy
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name Of Course Instructor Dr. Pichi Reddy Seelam
Course Name & Code **: Metallurgy and Mateials Science & 20ME05L-T-**
P Structure **: 3-0-0** **Credits: 3**
Program/Sem/Sec **: B.Tech/III/B** **A.Y.: 2023-24**
Prerequisite Subject: Engineering physics, Engineering Chemistry
Course Educational Objectives: The objectives of this course are to acquire knowledge on structure of metals and alloys, understand the concept of alloys and equilibrium diagrams; demonstrate the concept of heat treatment process.

Course Outcomes: After completion of the course students will be able to:

CO1	Comprehend the structure of materials, alloys and correlated the material properties with structure.(Remembering-L1)
CO2	Illustrate the procedure of drawing the equilibrium diagrams and apply the principle of equilibrium diagrams in evaluating the materials properties.(Understanding-L2)
CO3	Recall the properties, applications of ferrous, non ferrous and composite materials.(Remembering-L1)
CO4	Apply the principle of mechanical working on metals and heat treatment on materials.(Applying-L3)
CO5	Identify the types of composite materials and the manufacturing processes of fiber reinforced composites.(Understanding-L2)

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PS O2	PS O3
CO1	1	2	2	1	1	2	1					1		1	2
CO2	1	2	2	1	1	2	1					1		1	2
CO3	1	2	2	1	1	2	1					1		1	2
CO4	1	2	2	1	1	2	1					1		1	2
CO5	1	2	2	1	1	2	1					1		1	2

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

BOS APPROVED TEXT BOOKS:

T1 V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 24thEdition, 2008.

T2 Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw-Hill, 3rdEdition,2011.

BOS APPROVED REFERENCE BOOKS:

R1 Richard A.Flinn, Paul Trojan, Engineering Materials and Their Applications, Jaico Publishing House, 4thEdition, 1999.

R2 William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.

R3 U.C Jindal and Atish Mozumber, Material since and metallurgy, Pearson education-2012

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: STRUCTURE OF METALS, CONSTITUTION OF ALLOYS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Metallurgy and Materials - Course Educational Objective (CEO) & Course Outcomes (CO's)	01	7/8/2023		**TLM1**	CO1	T1,R6	
2.	Structure of metals Introduction	01	8/8/2023		**TLM1**	CO1	T2,R6	
3.	Body centered cubic, Face cantered cubic Structures	01	9/8/2023		**TLM1**	CO1	T2	
4.	closed packed hexagonal structure	01	10/8/2023		**TLM1**	CO1	T1	
5.	crystallographic planes	01	14/8/2023		**TLM1**	CO1	T1	
6.	Mechanism of crystallization of metals	01	16/8/2023		**TLM1**	CO1	T2,R1,R6	
7.	Grain and grain boundaries	01	17/8/2023		**TLM1**	CO1	T2,R1,R6	
8.	Effect of grain boundaries on the properties of metal / alloys	01	21/8/2023		**TLM1**	CO1	T2,R1	
9.	Necessity of alloying, Solid solutions	01	22/8/2023		**TLM1**	CO1	T2,R1	
10.	Interstitial Solid Solution and Substitution Solid Solution,	01	23/8/2023		**TLM1**	CO1	T2,R1	
11.	Hume Rothery rules.	01	24/8/2023		**TLM1**	CO1	T2,R1	
No. of classes required to complete UNIT-I		**11**			**No. of classes taken:**			
UNIT – II EQUILIBRIUM DIAGRAMS								
12.	Experimental methods of construction of equilibrium diagrams	01	28/8/2023		**TLM1**	CO2	T2,R1	
13.	Classification of equilibrium diagrams	01	29/8/2023		**TLM1**	CO2	T2,R1	
14.	Isomorphous,eutectic equilibrium diagrams.	01	30/8/2023		**TLM1**	CO2	T2,R1	
15.	Partial eutectic equilibrium	01	31/8/2023		**TLM1**	CO2	T2,R1	

18.	Allotropy, Eutectic reaction	01	07/09/2023		**TLM1**	CO2	T2,R1	
19.	Eutectoid reaction	01	11/09/2023		**TLM1**	CO2	T2,R1	
20.	Peritectoid reaction	01	12/09/2023		**TLM1**	CO2	T2,R1	
21.	Study of Cu-Ni equilibrium diagrams.	01	13/09/2023		**TLM1**	CO2	T2,R1	
22.	Bi-Cd equilibrium diagrams.	01	14/09/2023		**TLM1**	CO2	-	
23.	Study of Iron-Iron carbide equilibrium diagram.	01	19/09/2023		**TLM1**	CO2	-	
No. of classes required to complete UNIT-II		**12**			**No. of Classes taken:**			

UNIT-III : STEELS, CAST IRONS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
24.	Classification of steels, structure, properties and applications of plain carbon steel	01	20/09/2023		**TLM1**	CO3	T1,R1,R6	
25.	Low carbon steel	01	21/09/2023		**TLM1**	CO3	T2,R6	
26.	Medium carbon steel	01	25/09/2023		**TLM1**	CO3	T2,R6	
27.	High carbon steel & applications.	01	26/09/2023		**TLM1**	CO3	T2,R6	
28.	Structure, properties and applications of white cast iron	01	28/09/2023		**TLM1**	CO3	T1,T2,R1	
29.	Structure, properties and applications of malleable cast iron.	01	09/10/2023		**TLM1**	CO3	T1,T2,R1	
30.	Grey cast iron	01	10/10/2023		**TLM1**	CO3	-	
31.	Spheroidal graphite cast iron.	01	11/10/2023		**TLM1**	CO3	-	
32.	Structure, properties and applications of copper	01	12/10/2023		**TLM1**	CO3	T2,R1	
33.	Structure, properties and applications of copper alloys	01	16/10/2023		**TLM1**	CO3	T2,R1	
34.	Aluminium and its alloys	01	17/10/2023		**TLM1**	CO3	T2,R1	
No. of classes required to complete UNIT-III		**11**			**No. of classes taken:**			

UNIT-IV : MECHANICAL WORKING, HEAT TREATMENT OF ALLOYS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly

35.	Hot working, Cold working,	01	18/10/2023		**TLM1**	CO4	T1,R1,R6	
36.	Strain hardening	01	19/10/2023		**TLM1**	CO4	T1,R1,R6	
37.	Recovery, Recrystallisation	01	26/10/2023		**TLM1**	CO4	T1,R1,R6	
38.	Grain growth.	01	30/10/2023		**TLM1**	CO4	T1,R1,R6	
39.	Comparison of properties of cold worked parts	01	31/10/2023		**TLM1**	CO4	T2,R1	
40.	Comparison of properties ofhot worked parts	01	01/11/2023		**TLM1**	CO4	T2,R1	
41.	Annealing, Normalizing	01	02/11/2023		**TLM1**	CO4	T1,R6	
42.	Hardening.	01	06/11/2023		**TLM1**	CO4	T1,R6	
43.	Construction of TTT diagram for eutectoid steel.	01	07/11/2023		**TLM1**	CO4	-	
44.	Harden ability-determination of harden ability by jominy end quench test	01	08/11/2023		**TLM1**	CO4	T1,T2,R1	
45.	Surface - hardening methods	01	09/11/2023		**TLM1**	CO4	T1,T2,R1	
46.	Age hardening treatment and application	01	13/11/2023		**TLM1**	CO4	T1,T2,R1	
No. of classes required to complete UNIT-IV		**12**			**No. of classes taken:**			

UNIT-V : COMPOSITE MATERIALS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning OutcomeCOs	Text Book followed	HOD Sign Weekly
47.	Classification of composites	01	14/11/2023		**TLM1**	CO5	T1,R6	
48.	various methods of component manufacture of fiber reinforced composites-Hand layup process	01	15/11/2023		**TLM1**	CO5	T1,R6	
49.	ilament winding process, SMC processes	01	16/11/2023		**TLM1**	CO5	T1,R6	
50.	Continuous pultrusion processes, Resin transfer moulding.	02	20/11/2023 21/11/2023		**TLM1**	CO5	T1,R6	
51.	Introduction to metal ceramic mixtures	01	22/11/2023		**TLM1**	CO5	T1,R6	
52.	Metal – Matrix composites	01	23/11/2023		**TLM1**	CO5	-	
53.	C–Ccomposites, Applications of Composites	01	27/11/2023		**TLM1**	CO5	T1,R1,R6	
54.	Rule of mixture and numericals	01	28/11/2023		**TLM1**	CO5	T2,R1,R6	
No. of classes required to complete UNIT-V		**8**			**No. of classes taken:**			

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Revision for I Phase	09	29/11/2023		TLM1/ TLM4	-		
2.	Revision for II Phase	09	30/11/2023		TLM1/ TLM4	-		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Previous GATE and ESE Questions	01			TLM1/ TLM4	-		
4.	Previous GATE and ESE Questions	01			TLM1/ TLM4	-		
5.	Previous GATE and ESE Questions	01			TLM1/ TLM4	-		

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	07/08/2023	30/09/2023	8
I Mid Examinations	02/10/2023	07/10/2023	1
II Phase of Instructions	08/11/2023	02/12/2023	7
II Mid Examinations	04/12/2023	09/12/2023	1
Preparation and Practical	11/12/2023	16/12/2023	1
Semester End Examinations	18/12/2023	30/12/2023	2

EVALUATION PROCESS:

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: K.V.Viswanadh

Course Name & Code **:** MECHANICS OF SOLIDS &20 ME06

L-T-P Structure **:** 2-1-0 **Credits:** 3

Program/Sem/Sec : B.Tech/III/B **A.Y.:** 2023-24

PREREQUISITE: Engineering Mechanics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to identify nature of thestress and compute the deformations in mechanical members due to various loads.

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

CO1	Compute the stresses and deformations of a member subjected to various types of loading. **(Applying-L3)**
CO2	Construct the shear force and bending moment diagrams along the length of beam. **(Applying-L3)**
CO3	Comprehend the variation of bending and shear stresses across the cross section of the beams. **(Understanding-L2)**
CO4	Analyze the structural members subjected to biaxial stresses. **(Analyzing-L4)**
CO5	Formulate the equations for stresses and deformations due to various loads. **(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	2	-	-	-	-	-	-	-	-	-	2	-	-	3
CO2	3	3	1	-	-	-	-	-	-	-	-	2	-	-	3
CO3	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3
CO4	3	2	1	-	-	-	-	-	-	-	-	2	-	-	3
CO5	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 E.P. Popov, Engineering Mechanics of Solids, PHI Learning, 2009.

T2 Sadhu Singh, Strength of Materials, Khanna Publishers, 2013.

REFERENCE BOOKS:

R1 S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons, 2011.
R2 M.L. Gambhir, Fundamentals of Solid Mechanics, PHI Learning, 2009.
R3 M. Chakraborti, “Strength of Materials”, S.K.Kataria & Sons.
R4 R.Subramanian, “Strength of Materials”, Oxford University Press, 2010.
R5 R.K.Bansal, “Strength of Materials”, Laxmi Publishers, 2013.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: SIMPLE STRESSES AND STRAINS

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 Mechanics of Solids - Course Educational Objective (CEO) & Course Outcomes (CO's)	1	07-08-2023		TLM1,2	
2.	Concept of Stress & Strain	1	08-08-2023		TLM2	
3.	Mechanical properties of Materials	1	09-08-2023		TLM2	
4.	Stress Strain diagrams for Mild Steel -Hooke's Law Evaluation of Proof stress by Offset method	1	10-08-2023		TLM2,4	
5.	Stresses, Strains & Deformations of a body due to axial force Factor of Safety	1	14-08-2023		TLM1	
6.	Deformation of Stepped bar due to axial loads	1	15-08-2023		TLM1	
7.	Tutorial-I	1	16-08-2023		TLM3	
8.	Stresses in composite bars & Problems	1	17-08-2023		TLM1	
9.	Lateral strain, Poisson's ratio & change in volume; Shear stress & shear strain	1	21-08-2023		TLM1	
10.	Relation between Young's Modulus and shear Modulus	1	22-08-2023		TLM1	
11.	Relation between Elastic modulii & Problems	1	23-08-2023		TLM1	
12.	Tutorial-II	1	24-08-2023		TLM3	
13.	Assignment / Quiz (UNIT-I)	1	28-08-2023		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: SHEAR FORCE AND BENDING MOMENT

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 to Shear force and bending moment; Relation between Shear Force, Bending Moment & rate of Loading	1	29-08-2023		TLM1	
15.	Shear force & Bending moment Diagrams for cantilever beam subjected to Concentrated loads& UDL.	1	30-08-2023		TLM1	
16.	Shear force & Bending moment Diagrams for Simply supported beam subjected to Concentrated loads & UDL.	1	31-08-2023		TLM1	
17.	Estimation of Maximum bending moment for simply supported beam	1	04-09-2023		TLM1	

18.	Shear force & Bending moment Diagrams for Overhanging beam subjected to Concentrated loads & UDL	1	05-09-2023		TLM1	
19.	Estimation of Maximum bending moment & point of contra flexure for Overhanging beams	1	06-09-2023		TLM1	
20.	Problems on Overhanging Beam	1	07-09-2023		TLM1	
21.	Tutorial-III	1	11-09-2023		TLM3	
22.	Tutorial-IV	1	12-09-2023		TLM3	
23.	Assignment / Quiz (UNIT-II)	1	13-09-2023		TLM1	
24.	Revision	1	14-09-2023		TLM1	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: STRESSES IN BEAMS AND SHEAR STRESSES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Theory of Simple bending, assumptions	1	18-09-2023		TLM1	
26.	Derivation of flexure equation	1	19-09-2023		TLM1	
27.	Section modulus and problems	1	20-09-2023		TLM1	
28.	Normal stresses due to flexure applications problems	1	21-09-2023		TLM1	
29.	Normal stresses due to flexure applications problems	1	25-09-2023		TLM1	
30.	Tutorial-V	1	26-09-2023		TLM3	
31.	Revision	1	27-09-2023		TLM1	
32.	Revision	1	28-09-2023		TLM1	
33.	Concept of shear stress variation over cross section due to flexural loads Derivation of lateral shear stress	1	09-10-2023		TLM1	
34.	Shear stress distribution across rectangular & circular sections	1	10-10-2023		TLM1	
35.	Problems on distribution of Shear stress	1	11-10-2023		TLM1	
36.	Tutorial-V	1	12-10-2023		TLM3	
37.	Assignment / Quiz (UNIT-III)	1	16-10-2023		TLM1	
38.	Revision	1	17-10-2023		TLM1	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: ANALYSIS OF COMBINED STRESSES

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.	State of stress at a point, normal and tangential stresses on inclined planes	1	18-10-2023		TLM1	
40.	Problem on normal and tangential stresses on inclined planes	1	19-10-2023		TLM1	
41.	Principle stresses and their planes, maximum shear stress plane	1	23-10-2023		TLM1	

42.	Problems	1	25-10-2023		TLM1	
43.	Problems	1	26-10-2023		TLM1	
44.	Tutorial-VI	1	30-10-2023		TLM3	
44.	Mohr's circle diagram	1	31-10-2023		TLM1	
45.	Problems on Mohr's circle	1	01-11-2023		TLM1	
46.	Problems on Mohr's circle	1	02-11-2023		TLM1	
47.	Tutorial-VII	1	06-11-2023		TLM3	
48.	Assignment / Quiz (UNIT-IV)	1	07-11-2023		TLM1	
49.	Revision	1	08-11-2023		TLM1	
50.	Videos	1	09-11-2023		TLM5	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: DEFLECTION OF BEAMS & THIN AND THICK CYLINDRICAL SHELLS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Derivation of Differential equation for elastic line (Deflection Equation)	1	13-11-2023		TLM1	
52.	Deflection & Slope equations for cantilever beam	1	14-11-2023		TLM1	
53.	Deflection & Slope equations for simply supported beam	1	15-11-2023		TLM1	
54.	Macaulay's method	1	16-11-2023		TLM1	
55.	Introduction to thin & thick shells	1	20-11-2023		TLM2	
56.	Hoop stress and longitudinalstresses for thin cylinders	1	21-11-2023		TLM1	
57.	Change in volume of thin cylinder	1	22-11-2023		TLM2	
58.	Derivation of Lame's equations of Thick cylinders; Problems on thick cylinders	1	23-11-2023		TLM1	
59.	Tutorial-VIII	1	27-11-2023		TLM3	
60.	Assignment / Quiz (UNIT-V)	1	28-11-2023		TLM1	
61.	Beyond Syllabus	1	29-11-2023		TLM2	
62.	Revision	1	30-11-2023		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)

TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineeringspecialization to the solution of complex engineering problems.
PO 2	Identify, formulate, review research literature, and analyze complex engineering problemsreaching 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, andthe cultural, societal, and environmental considerations.
PO 4	Use research-based knowledge and research methods including design of experiments, analysisand 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 toolsincluding 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 engineeringpractice.
PO 7	Understand the impact of the professional engineering solutions in societal and environmentalcontexts, 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 inmultidisciplinary settings.
PO 10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
PO 12	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvementof 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 otherprocess equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**K.V.VISWANADH**	**K. V. VISWANADH**	**B. SUDHEER KUMAR**	**Dr. S. PICHI REDDY**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. Shaheda Niloufer
Course Name & Code : Environmental Science & 20MC03
L-T-P Structure : 2-0-0 Credits : 0
Program/Sem/Sec : B.Tech., ME-B., IV-Sem., SEC-B A.Y : 2023-24

PRE-REQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs): The purpose of this course is to provide a general background on developing an understanding of systems and cycles on the earth and how individual organisms live together in complex communities and how human activities influence our air, water and soil. It also helps in developing an understanding about our use of fossil fuels and effect on climate and sustainable management of natural resources.

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

CO 1	Identify environmental problems arising due to engineering and technological activities that help to be the part of sustainable solutions.
CO 2	Evaluate local, regional and global environmental issues related to resources and their sustainable management.
CO 3	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO 4	Acknowledge and prevent the problems related to pollution of air, water and soil.
CO5	Identify the significance of implementing environmental laws and abatement devices for environmental management.

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

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

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

TEXT BOOKS:

T1 Anubha Kaushik, C.P.Kaushik, "Perspectives in Environmental Studies", New age international publishers, 5th Edition, Delhi, 2016.

T2 Mahua Basu, S. Xavier, "Fundamentals of Environmental Studies", Cambridge University Press, 1st Edition, Delhi, 2016.

REFERENCE BOOKS:

R1 S. Deswal, A. Deswal, "A Basic course in Environmental Studies", Educational & Technical Publishers, 2nd Edition, Delhi, 2014.

R2 R. Rajagopalan, "*Environmental Studies (From Crisis to Cure)*", Oxford University Press, 2nd Edition, New Delhi, 2012.

R3 De, A.K, "Environmental Chemistry", New Age International (P) Limited, 5th Edition, New Delhi, 2003.
R4 Dr.K.V.S.G. Murali Krishna, "Environmental Studies", VGS Techno Series, 1st Edition, Vijayawada, 2010.
R5 G. Tyler Miller, Scott Spoolman, "Introduction to Environmental Studies", Cengage Learning, 13th Edition, New Delhi, 2009.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS

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 of course and course objectives. Introduction of components of Environment	1	11-08-2023		2	
2.	Population explosion and variations among Nations.	1	12-08-2023		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	18-08-2023		2	
4.	Environmental Hazards	1	19-08-2023		2	
5.	Role of Information Technology in environmental management and human health.	1	25-08-2023		2	
No. of classes required to complete UNIT-I: 5				No. of classes taken:		

UNIT-II: NATURAL RESOURCES AND CONSERVATION

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 and classification of Natural resources, Forest Resources,	1	26-08-2023		2	
2.	Water Resources	1	01-09-2023		2	
3.	Mineral Resources	1	02-09-2023		2	
4.	Food Resources	1	08-09-2023		2	
5.	Food Resources	1	15-09-2023		2	
6.	Food Resources	1	16-09-2023		2	
7.	Energy Resources	1	22-09-2023		2	
No. of classes required to complete UNIT-II: 7				No. of classes taken:		

UNIT-III: ECOLOGY AND BIODIVERSITY

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, structure and functions of an ecosystem	1	23-09-2023		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids,	1	29-09-2023		2	
3.	Major Types of Ecosystems – Forest, Grassland, Desert Land & aquatic Ecosystem, Ecological Niche and Keystone Species, Bio-geographical classification of India. India as a mega diversity nation. Bio-geo-chemical cycles	1	30-09-2023		2	

4.	**I MID EXAMINATION**	1	06-10-2023			
5.	**I MID EXAMINATION**	1	07-10-2023			
6.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	13-10-2023		2	
7.	Man and wild life conflicts. Endangered and endemic species of India	1	14-10-2023		2,3	
8.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	20-10-2023		2	
No. of classes required to complete UNIT-III: 7				No. of classes taken:		

UNIT-IV : ENVIRONMENTAL POLLUTION

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.	Air Pollution	1	21-10-2023		2	
2.	Causes, effects and control measures of: Water Pollution	1	27-10-2023		2	
3.	Causes, effects and control measures of: Soil Pollution,	1	28-10-2023			
4.	Noise Pollution		03-11-2023			
5.	Solid Waste Management	1	04-11-2023		2,3	
6.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	10-11-2023		2	
No. of classes required to complete UNIT-IV: 6				No. of classes taken:		

UNIT-V : ENVIRONMENTAL 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
1.	Sustainable Development	1	17-11-2023		2	
2.	Climate disruption- Greenhouse effect, ozone layer depletion and acid rain.	1	18-11-2023		2,3	
3.	Stockholm conference	1	24-11-2023		2	
4.	Environmental Impact Assessment (EIA)		25-11-2023		2	
5.	Green building	1	01-12-2023		2	
6.	Revision	1	02-12-2023		5	
7.	II MID EXAMINATIONS	1	08-12-2023		5	
No. of classes required to complete UNIT-V: 07				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 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	Dr. Shaheda Niloufer	Dr. Shaheda Niloufer	Dr. Shaheda Niloufer	Dr. A. Rami Reddy
Signature				

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title :FLUID MECHANICS AND HYDRAULIC MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

Course Objective: Determine the discharge of various flow measuring devices, estimation of friction factor and performance parameters of hydraulic machines.

COURSE OUTCOMES:

After completion of the course students are able to:

CO1 Identify the need and use of various flow measuring devices. (Understanding-L2)

CO2 Apply the Bernoulli's equation for energy balance of fluid flow system. (Applying - L3)

CO3 Determine the friction losses of fluid flow through different pipes. (Applying-L3)

CO4 Evaluate the performance characteristics of hydraulic pumps, turbines and impact of jets. (Applying-L3)

Course Articulation Matrix:

20ME55	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	-	-	-	1	-	-	2	-	-	3
CO2	2	2	2	3	-	-	-	-	1	-	-	2	-	-	-
CO3	-	-	1	3	-	-	-	-	-	--	-	2	-	-	-
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 MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

LIST OF EXPERIMENTS:

PART-A: FLUID MECHANICS

Any 5 Experiments are required to be conducted

1. Verification of Bernoulli'sTheorem **(FM1)**
2. Calibration ofVenturimeter**(FM2)**
3. Calibration ofOrifice meter **(FM3)**
4. Determination of friction factor for a given pipeline **(FM4)**
5. Calibration of VNotch **(FM5)**
6. Calibration of Mouthpieceapparatus**(FM6)**
7. Impact of jets onVanes **(FM7)**

PART-B: HYDRAULIC MACHINERY

Any 5 Experiments are required to be conducted

1. Performance Test on PeltonWheel **(HM1)**
2. Performance Test on KaplanTurbine**(HM2)**
3. Performance Test on Single Stage CentrifugalPump **(HM3)**
4. Performance Test on ReciprocatingPump**(HM4)**
5. Turbine flowmeter(**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 MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

Batches (Section – B)

Total No. of students: 22761A0321 to 22761A0340 & 23765A0339 to 23765A0377

Batch B1 : 22761A0321 to 22761A0340 & 23765A0339 to 23765A0377= 28

Batch B2 : 23765A0311 TO 23765A0338=28

Sub Batches of B1:

S. No	Batch	Registered Nos	Total
1	$B1_1$	22761A0321, 322, 323, 324, 325, 326.	6
2	$B1_2$	22761A0327, 328, 329, 332, 333, 334.	6
3	$B1_3$	22761A0335, 337, 338, 339, 340, 23765A0339.	6
4	$B1_4$	23765A0340, 341, 342, 343, 344.	5
5	$B1_5$	23765A0345, 346, 347, 348, 349.	5
Total			28

Sub Batches of B2:

S. No	Batch	Registered Nos	Total
1	$B2_1$	23765A0350, 351, 352, 353, 354, 355.	6
2	$B2_2$	23765A0356, 357, 358, 359, 360, 361.	6
3	$B2_3$	23765A0362, 363, 364, 365, 366, 367.	6
4	$B2_4$	23765A0368, 369, 370, 371, 372.	5
5	$B2_5$	23765A0373, 374, 375, 376, 377.	5
Total			28

Course Instructor Course Coordinator Module Coordinator HoD

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title :FLUID MECHANICS AND HYDRAULIC MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

NOTIFICATION OF CYCLES

CYCLE-I

01. Verification of Bernoulli's Theorem
02. Calibration of Venturi meter
03. Calibration of Orifice meter.
04. Determination of friction factor for a given pipe line
05. Calibration of mouthpiece apparatus

CYCLE-II

06. Performance Test on Kaplan Turbine.
07. Performance Test on Single Stage Centrifugal Pump.
08. Turbine flow meter.
09. Impact of jets on Vanes.
10. Performance Test on Pelton Wheel.

Notification of Cycles (Section – B)

Batches	Laboratory	Cycle	Experiment No.s
B1 & B2	FLUID MECHANICS AND HYDRAULIC MACHINARY LAB	I	FM 1 to FM 5
		II	HM 6 to HM 10

Total No. of students: 22761A0321 to 22761A0340 & 23765A0339 to 23765A0377

Batch B1 : 22761A0321 to 22761A0340 & 23765A0339 to 23765A0377= 28

Batch B2 : 23765A0311 TO 23765A0338=28

Course Instructor Course Coordinator Module Coordinator HoD

DEPARTMENT OF MECHANICAL ENGINEERING

VIVA QUESTIONS

Course Title :FLUID MECHANICS AND HYDRAULIC MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

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

26. Define impulse turbine.

27. Define reaction turbine.

28. Differentiate between impulse and reaction turbine.

29. What is the function of draft tube?

30. Define specific speed of turbine.

31. What are the main parameters in designing a Pelton wheel turbine?

32. What is breaking jet in Pelton wheel turbine?

33. What is the function of casing in Pelton turbine

34. Draw a simple sketch of Pelton wheel bucket.

35. What is the function of surge tank fixed to penstock in Pelton turbine?

36. How the inlet discharge is controlled in Pelton turbine?

37. What is water hammer?

38. What do you mean by head race?

39. What do you mean by tail race?

40. What is the difference between propeller and Kaplan turbine?

41. Mention the parts of Kaplan turbine.

42. Differentiate between inward and outward flow reaction turbine.

43. What is the difference between Francis turbine and Modern 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 amount 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**

DEPARTMENT OF MECHANICAL ENGINEERING

Course Title :FLUID MECHANICS AND HYDRAULIC MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

Notification of Cycles (Section – B)

Batches	Laboratory	Cycle	Experiment No.s
B1 & B2	FLUID MECHANICS AND HYDRAULIC MACHINARY LAB	I	FM 1 to FM5
		II	HM 6 to HM10

Total No. of students: 22761A0321 to 22761A0340 & 23765A0339 to 23765A0377

Batch B1 : 22761A0321 to 22761A0340 & 23765A0339 to 23765A0377= 28

Batch B2 : 23765A0311 TO 23765A0338=28

Course Instructor Course Coordinator Module Coordinator HoD

DEPARTMENT OF MECHANICAL ENGINEERING

SCHEDULE OF FLUID MECHANICS AND HYDRAULIC MACHINERYLAB(Section – B)

Course Title :FLUID MECHANICS AND HYDRAULIC MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

Date	Experiment (Batch-1)				
Cycle-I	**Ex - 1**	**Ex – 2**	**Ex – 3**	**Ex – 4**	**Ex – 5**
17/08/2023	**Demonstration of all experiments, CEOs and COs of the Laboratory**				
22/08/2023	B1	B2	B3	B4	B5
29/08/2023	B2	B3	B4	B5	B1
05/09/2023	B3	B4	B5	B1	B2
12/09/2023	B4	B5	B1	B2	B3
19/09/2023	B5	B1	B2	B3	B4
26/09/2023	**I MID EXAMINATIONS**				
Cycle-II	**Ex - 6**	**Ex - 7**	**Ex – 8**	**Ex – 9**	**Ex – 10**
10/10/2023	B1	B2	B3	B4	B5
17/10/2023	B2	B3	B4	B5	B1
24/10/2023	B3	B4	B5	B1	B2
31/10/2023	B4	B5	B1	B2	B3
07/11/2023	B5	B1	B2	B3	B4
14/11/2023	**REPETITION**				
21/11/2023	**REPETITION**				
28/11/2023	**INTERNAL EXAMINATION**				

Sub Batches of B1:

S. No	Batch	Registered Nos	Total
1	**$B1_1$**	**22761A0321, 322, 323, 324, 325, 326.**	6
2	**$B1_2$**	**22761A0327, 328, 329, 332, 333, 334.**	6
3	**$B1_3$**	**22761A0335, 337, 338, 339, 340, 23765A0339.**	6
4	**$B1_4$**	**23765A0340, 341, 342, 343, 344.**	5
5	**$B1_5$**	**23765A0345, 346, 347, 348, 349.**	5
Total			**28**

Course Instructor Course Coordinator Module Coordinator HoD

DEPARTMENT OF MECHANICAL ENGINEERING

SCHEDULE OF FLUID MECHANICS AND HYDRAULIC MACHINERY LAB (Section – B)

Course Title :FLUID MECHANICS AND HYDRAULIC MACHINERY LAB Academic Year: 2023-24

Instructors : Dr. P. RAVINDRA KUMAR/ Mr. D. MALLIKARJUNA RAO Course & SEM: B.Tech & III

Branch: MECH Section : B

Date	Experiment (Batch-2)				
Cycle-I	**Ex - 1**	**Ex – 2**	**Ex – 3**	**Ex – 4**	**Ex – 5**
20/08/2023	**Demonstration of all experiments, CEOs and COs of the Laboratory**				
27/08/2023	B1	B2	B3	B4	B5
0309/2023	B2	B3	B4	B5	B1
17/09/2023	B3	B4	B5	B1	B2
24/09/2023	B4	B5	B1	B2	B3
01/10/2023	B5	B1	B2	B3	B4
15/10/2023	**I MID EXAMINATIONS**				
	Ex - 6	**Ex - 7**	**Ex – 8**	**Ex – 9**	**Ex – 10**
22/10/2023	B1	B2	B3	B4	B5
22/102023	B2	B3	B4	B5	B1
05/11/2023	B3	B4	B5	B1	B2
05/11/2023	B4	B5	B1	B2	B3
19/11/2023	B5	B1	B2	B3	B4
26/11/2023	**REPETITION**				
26/11/2023	**REPETITION**				
03/12/2023	**INTERNAL EXAMINATION**				

Sub Batches of B2:

S. No	Batch	Registered Nos	Total
1	**$B2_1$**	**23765A0350, 351, 352, 353, 354, 355.**	6
2	**$B2_2$**	**23765A0356, 357, 358, 359, 360, 361.**	6
3	**$B2_3$**	**23765A0362, 363, 364, 365, 366, 367.**	6
4	**$B2_4$**	**23765A0368, 369, 370, 371, 372.**	5
5	**$B2_5$**	**23765A0373, 374, 375, 376, 377.**	5
Total			**28**

Course Instructor Course Coordinator Module Coordinator HoD

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(AUTONOMOUS)
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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.S.Pichi Reddy, Mr.K.V.Viswanadh, Mr.K.Venkateswara Reddy

Course Name & Code: Mechanics of Solids and Metallurgy Lab &20ME56

Regulation: R20

L-T-P Structure **: 0-0-3** **Credits:** 1.5

Program/Sem/Sec :**B.Tech/III/B** **A.Y.:** 2023-24

PREREQUISITE: Mechanics of solids, Metallurgy and Material science

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of the course is to determine various mechanical properties of materials by testing under different load conditions and observe the microstructure of various materials and perform heat treatment of materials.

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

CO1	Evaluate the mechanical properties of materials by conducting various tests. **(Applying-L3)**
CO2	Estimate the behavior of various materials under different loading. **(Understanding-L2)**
CO3	Identify the material by observing the microstructure. **(Remembering-L1)**
CO4	Perform the hardness test and heat treatment of steels. **(Applying-L3)**

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

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

References:

Lab Manual

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

LIST OF EXPERIMENTS

At least 12 experiments are to be conducted:

PART-A: MECHANICS OF SOLIDS

Any 6 Experiments are required to be conducted

1. Compression test on helical spring. **(MOS1)**
2. Tension test on mild steel rod. **(MOS2)**
3. Double shear test on metals. **(MOS3)**
4. Torsion test on mild steel rod. **(MOS4)**
5. Impact test on metal specimen. (a) Izod Impact Test (b) Charpy Impact Test **(MOS5)**
6. Hardness test on metals. (a) Rockwell Hardness Test (b) Brinell Hardness Test **(MOS6)**
7. Deflection test on beams. (a) Cantilever Beam (b) Simply Supported beam **(MOS7)**
8. Compression test on brittle materials. **(MOS8)**

PART-B: METALLURGY

Any 6 Experiments are required to be conducted

1. Preparation and study of the microstructure of Cu & Al. **(MET1)**
2. Preparation and study of the microstructure of steels. **(MET2)**
3. Preparation and Study of the microstructures of cast iron. **(MET3)**
4. Preparation and Study of the microstructures of brass. **(MET4)**
5. Hardenability of steels by Jominy end quench test. **(MET5)**
6. Hardness of various treated and untreated steels. **(MET6)**
7. Study of Age hardening of Al-Cu alloy. **(MET7)**
8. Study of Fe-Fe3C equilibrium diagram. **(MET8)**
9. Study of T-T-T diagram for eutectoid steel. **(MET9)**
10. Fabrication of FRP Composite by Hand Lay-up method. **(MET10)**
11. Fabrication of FRP Composite by Vacuum bag moulding. **(MET11)**

REFERENCES

Lab Manual

Batch-I Schedule

S.no	Date	Batches									
		$B1_1$	$B1_2$	$B1_3$	$B1_4$	$B1_5$	$B1_6$	$B1_7$	$B1_8$	$B1_9$	$B1_{10}$
1	19/08/2023	**Demonstration of MOS & MMS Lab**									
2	26/08/2023	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
3	02/09/2023	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
4	16/09/2023	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
5	23/09/2023	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
6	30/09/2023	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
7	14/10/2023	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
02-10-2023 to 07-10-2023		**I Mid Examinations**									
8	28/10/2023	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
9	04/11/2023	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7
10	11/11/2023	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2
11	18/11/2023	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3
12	18/11/2023	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4
13	25/11/2023	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5

14	02/12/2023	**Internal Examination**
04-12-2023 to 09-12-2023		**II Mid Examinations**
No. of classes required to complete:		**No. of classes taken:**

Batches:

S. No	Batch	Registered Nos	Total
1	$B1_1$	22761A0321-323	3
2	$B1_2$	22761A0324-326	3
3	$B1_3$	22761A0327-329	3
4	$B1_4$	22761A0332-333	2
5	$B1_5$	22761A0334-35	2

S. No	Batch	Registered Nos	Total
6	$B1_6$	22761A0337-39	3
7	$B1_7$	22761A0340, Le 3,5	3
8	$B1_8$	Le 6,8,11	3
9	$B1_9$	Le 13, 14, 16	3
10	$B1_{10}$	Le 18, 22	2

Batch-II Schedule

S. no	Date	Batches									
		$B2_1$	$B2_2$	$B2_3$	$B2_4$	$B2_5$	$B2_6$	$B2_7$	$B2_8$	$B2_9$	$B2_{10}$
1	08/08/2023	**Demonstration of MOS & MMS Lab**									
2	22/08/2023	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
3	29/08/2023	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
4	05/09/2023	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
5	12/09/2023	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
6	26/09/2023	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
7	10/10/2023	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
02-10-2023 to 07-10-2023		**I Mid Examinations**									
8	17/10/2023	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
9	31/10/2023	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7
10	07/11/2023	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2
11	07/11/2023	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3
12	14/11/2023	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4
13	21/11/2023	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5
14	28/11/2023	**Internal Examination**									
04-12-2023 to 09-12-2023		**II Mid Examinations**									
No. of classes required to complete:									**No. of classes taken:**		

Batches:

S. No	Batch	Registered Nos	Total
1	$B2_1$	Le 18,22,25	3
2	$B2_2$	Le 27, 36,39	3
3	$B2_3$	Le 40, 42, 43	3
4	$B2_4$	Le 45, 46, 47	3
5	$B2_5$	Le 50, 54	2

S. No	Batch	Registered Nos	Total
6	$B2_6$	Le 55, 56, 57	3
7	$B2_7$	Le 61, 64, 66	3
8	$B2_8$	Le 67, 69, 71	3
9	$B2_9$	Le 72, 74, 75, 78	4
10	$B2_{10}$	Le 83, 85, 86, 87	4

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Expt. no's	Marks

Day to Day work = **A**	1,2,3,4,5,6,7,8…	A=05
Record = **B**	1,2,3,4,5,6,7,8	B=05
Internal Test = **C**	1,2,3,4,5,6,7,8	C = 05
Cumulative Internal Examination: A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

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

PO 9	**Individual and team work**: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with theengineering 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 towardsimprovement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty				
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.P.Somaraju
Course Name & Code : Python Programming Lab(20AD53)
L-T-P Structure : 0-0-3 Credits : 2
Program/Sem/Sec: :B.Tech.,MECH., III Sem-B A.Y: 2023-24

PRE-REQUISITE: Basic Knowledge of Programming.

Course Educational Objective: The Objective of the Python course is to lead the students from the basics of writing and running Python scripts in problem-solving and to design and implement the modules and understands the working of classes and objects in python.

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

CO 1	Identify various programming constructs available in Python and apply them in solving computational problems. (**Apply - L3**)
CO 2	Demonstrate data structures available in Python and apply them in solving computational problems. (**Apply - L3**)
CO 3	Implement modular programming, string manipulations, and Python Libraries **(Apply - L3)**
CO 4	Improve individual/teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX(Correlation betindividual/teamwork:

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

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section B

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:** Language basics and example problems (Two weeks)	3	11-8-2023		**TLM4**	

2.	**Introduction:** Language basics and example problems (Two weeks)	3	18-8-2023		**TLM4**	
3.	**Module 1:** Exercise Programs on Lists.	3	25-9-2023& 1-9-2023		**TLM4**	
4.	**Module 2**: Exercise Programs on Tuples	3	8-9-2023&15-9-2023		**TLM4**	
5.	**Module 3:** Exercise Programs on Sets	3	22-9-2023		**TLM4**	
6.	**Module 4:** Exercise Programs on Dictionaries	3	29-9-2023		**TLM4**	
7.	**Module 5**: Exercise Programs on functions and recursion.	3	13-10-2023		**TLM4**	
8.	**Module 6**: Exercise programs on Strings	3	27-10-2023		**TLM4**	
9.	**Module 7:**Exercise Programs on Regular Expressions	3	3-11-2023		**TLM4**	
10.	**Module 8:**Exercise Programs on Matplot Library	3	10-11-2023&17-11-2023		**TLM4**	
11.	**Lab Internal**	3	24-11-2023		**TLM4**	
No. of classes required to complete		**33**		**No of classes taken**	**33**	

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

PART-C

PROGRAMME OUTCOMES (POs):

PO 1	**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 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-longlearning**: 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.
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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using an open-source programming environment for the success of the organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per society's needs.
PSO 3	To inculcate an ability to analyze, design, and implement database applications.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.P.Somaraju	Dr. Y . Vijay Bhaskar Reddy	Dr. K. Naga Prasnthi	Dr. S. Pichi Reddy

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.A. NAGESWARA RAO/Mrs.B.Kamala Priya

Mr.M.Oliva

Course Name & Code : Technical Drawing using Drafting Package Lab (20MES1)

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

Program/Sem/Sec : B.Tech., Mech., III-Sem., B/S A.Y : 2023-24

PRE-REQUISITE : Engineering Graphics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to improve the skill sets of students in drafting packages (Auto CAD/CATIA) and enable them to draw the diagrams related to mechanical engineering components/applications.

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

CO 1	Understand the Auto-CAD basics for 2D sketches used in industries **(Understanding - L2)**
CO 2	Draw the machine components using 3D modelling commands. **(Applying –L3)**
CO 3	Edit the 3D solid Models using solid editing commands. **(Understanding - L2)**
CO 4	Extract the Orthographic views of the models in Wire Frame, Surface & Solid Modelling. **(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				2					2		1		3	3
CO2	2				3					2		1		3	3
CO3	2				3					2		1		3	3
CO4	2				3					2		1		3	3

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

S.No.	Programs 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 Technical Drawing using Drafting Package-CEO&COs	04	07.08.2023		TLM2	CO-1,2,3,4	
2.	Demonstration to AutoCAD Software	04	14.08.2023		TLM4	CO-1,2,3,4	
3.	Exercise on Basic Drawing Commands **(Exp-1)**	04	21.08.2023		TLM4	CO-1	
4.	Exercise on Modify Commands **(Exp-2)**	04	28.08.2023		TLM4	CO-1	
5.	Exercise on isometric views **(Exp-3)**	04	04.09.2023		TLM4	CO-1	
6.	Exercise on 3D Modelling Commands-I **(Exp-4)**	04	11-09-2023		TLM4	CO-2	
7.	Exercise on 3D Modelling Commands-II **(Exp-5)**	04	25-09-2023		TLM4	CO-2	
MID-I EXAMINATIONS (3-10-23 TO 9-10-23)							
8.	Exercise on 3D Modelling Commands-III **(Exp-6)**	04	16-10-2023		TLM4	CO-2	
9.	Exercise on 3D Solid Editing Commands-I **(Exp-7)**	04	30-10-2023		TLM4	CO-3	
10.	Exercise on 3D Solid Editing Commands-II **(Exp-8)**	04	20-10-2023		TLM4	CO-3	
11.	Extraction of Wire-Frame & Solid Models from 3D Models **(Exp-9)**	04	06-11-2023		TLM4	CO-4	
12.	Extraction of Ortho Graphics Views from 3D model-I **(Exp-10)**	01	13-11-2023		TLM4	CO-4	
13.	Repetition	04	20-11-2023		TLM4	CO-4	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
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TLM3	Tutorial	**TLM6**	Group Discussion/Project

LIST OF EXPERIMENTS:

Exp. No.	Name of the Experiment	Related CO
MES-1	Exercise on Basic Drawing Commands	CO1
MES2	Exercise on Modify Commands	CO1
MES3	Exercise on isometric views	CO1
MES4	Exercise on 3D Modelling Commands-I	CO2
MES5	Exercise on 3D Modelling Commands-II	CO2
MES6	Exercise on 3D Modelling Commands-III	CO2
MES7	Exercise on 3D Solid Editing Commands-I	CO3
MES8	Exercise on 3D Solid Editing Commands-II	CO3
MES9	Extraction of Wire-Frame & Solid Models from 3D Models	CO4
MES10	Extraction of Ortho Graphics Views from 3D model-I	CO4

NOTIFICATION OF CYCLES

Cycle	Exp. No.	Name of the Experiment	Related CO
Cycle-1	MES-1	Exercise on Basic Drawing Commands	CO1
	MES2	Exercise on Modify Commands	CO1
	MES3	Exercise on isometric views	CO1
Cycle-2	MES4	Exercise on 3D Modelling Commands-I	CO2
	MES5	Exercise on 3D Modelling Commands-II	CO2
	MES6	Exercise on 3D Modelling Commands-III	CO2
Cycle-3	MES7	Exercise on 3D Solid Editing Commands-I	CO3
	MES8	Exercise on 3D Solid Editing Commands-II	CO3
Cycle-4	MES9	Extraction of Wire-Frame & Solid Models from 3D Models	CO4
	MES10	Extraction of Ortho Graphics Views from 3D model-I	CO4

PART-C

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. A Nageswara Rao	Mr. K.V.Viswanadh	Dr.B.Sudheer Kumar	M.B.S.SreekarReddy