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. M. Srinivasa Reddy
Course Name & Code : Numerical Methods and Integral Calculus & 20FE10
L-T-P Structure : 3-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ME - A **A.Y.:** 2021 - 22

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.
R3 W.E. Boyce and R. C. Diprima, " Elementary Differential Equations" , 7th 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	25/10/21		TLM1	
2.	Introduction to UNIT I	1	27/10/21		TLM2	
3.	Forward Differences	1	28/10/21		TLM1	
4.	Backward differences	1	29/10/21		TLM1	
5.	Central Differences	1	01/11/21		TLM1	
6.	Symbolic relations and separation of symbols	1	03/11/21		TLM1	
7.	Symbolic relations and separation of symbols	1	05/11/21		TLM1	
8.	Newton's forward formulae for interpolation	1	08/11/21		TLM1	
9.	Newton's backward formulae for interpolation	1	10/11/21		TLM1	
10.	Lagrange's Interpolation	1	11/11/21		TLM1	
11.	Lagrange's Interpolation	1	12/11/21		TLM1	
12.	Tutorial I	1	18/11/21		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	15/11/21		TLM2	
14.	Algebraic and Transcendental Equations	1	17/11/21		TLM1	
15.	False Position method	1	19/11/21		TLM1	
16.	False Position method	1	22/11/21		TLM1	
17.	Newton- Raphson Method in one variable	1	24/11/21		TLM1	
18.	Newton- Raphson Method applications	1	25/11/21		TLM1	
19.	Trapezoidal rule	1	26/11/21		TLM1	
20.	Simpson's 1/3 Rule	1	29/11/21		TLM1	
21.	Simpson's 3/8 Rule	1	01/12/21		TLM1	
22.	Tutorial II	1	02/12/21		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	03/12/21		TLM1	
24.	Double Integrals -Cartesian coordinates	1	06/12/21		TLM1	
25.	Double Integrals- Polar co ordinates	1	08/12/21		TLM1	
26.	Problems	1	09/12/21		TLM1	
27.	Applications to Double integrals (Content Beyond the syllabus)	1	10/12/21		TLM2	
I MID EXAMINATIONS (13-12-2021 TO 18-12-2021)						
28.	Triple Integrals - Cartesian coordinates	1	20/12/21		TLM1	

29.	Triple Integrals - Spherical coordinates	1	22/12/21		TLM1	
30.	Tutorial III	1	23/12/21		TLM 3	
31.	Change of order of Integration	1	24/12/21		TLM1	
32.	Change of order of Integration	1	27/12/21		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
33.	Introduction to UNIT IV	1	29/12/21		TLM1	
34.	Determination of Fourier coefficients, Even and Odd Functions	1	30/12/21		TLM1	
35.	Fourier Series expansion in the interval $[0,2\pi]$	1	31/12/21		TLM1	
36.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	03/01/22		TLM1	
37.	Fourier Series in an arbitrary interval	1	05/01/22		TLM1	
38.	Fourier series in an arbitrary interval odd and even functions	1	06/01/22		TLM1	
39.	Half-range Sine and Cosine series	1	07/01/22		TLM1	
40.	Half-range Sine and Cosine series		10/01/22		TLM1	
41.	Tutorial IV	1	12/01/22		TLM3	
42.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	17/01/22		TLM2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Introduction to UNIT V	1	19/01/22		TLM1	
44.	Vector Differentiation	1	20/01/22		TLM1	
45.	Gradient	1	21/01/22		TLM1	
46.	Directional Derivative	1	24/01/22		TLM1	
47.	Divergence	1	27/01/22		TLM1	
48.	Curl	1	28/01/22		TLM1	
49.	Solenoidal and Irrotational functions, potential surfaces	1	31/01/22		TLM1	
50.	Laplacian and second order operators	1	02/02/22		TLM1	
51.	TUTORIAL - V	1	03/02/22		TLM3	
52.	Properties	1	04/02/22		TLM1	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (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. M. Srinivasa Reddy	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.:** 2021-22
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	25/10/2021		TLM1	
2.	Physical properties of fluids	1	27/10/2021		TLM1	
3.	Specific gravity,viscosity,surface tension,vapour pressure	1	29/10/2021		TLM1	
4.	Problems on physical properties	1	30/10/2021		TLM1	
5.	Manometers, classification	1	1/11/2021		TLM2	
6.	Problems on manometers	1	3/11/2021		TLM1	
7.	Dimensional analysis,rayleigh's method	1	5/11/2021		TLM1	
8.	Buckingham's Pi theorem method	1	6/11/2021		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	8/11/2021		TLM1	
10.	Classification of flows, equation of continuity for 1 dimensional flow	1	10/11/2021		TLM1	
11.	Surface and body forces, Euler's equation, Bernoulli's equation	1	12/11/2021		TLM1	
12.	Momentum equation and its application on pipe bend	1	15/11/2021		TLM1	
13.	Reynold's experiment	1	17/11/2021		TLM2	
14.	Darcy's formula	1	19/11/2021		TLM1	
15.	Minor losses in pipes	1	20/11/2021		TLM1	
16.	Problems on major and minor losses	1	22/11/2021		TLM1	
17.	Pipes in series and parallel	1	24/11/2021		TLM1	
18.	Total energy line and hydraulic gradient line	1	26/11/2021		TLM1	
19.	Venturi meter, orifice meter, pitot tube	1	27/11/2021		TLM2	
20.	Problems on venturi and orifice meter	1	29/11/2021		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	1/12/2021		TLM1	
22.	Boundary layer thickness, momentum thickness	1	3/12/2021		TLM1	
23.	Energy thickness, boundary layer separation	1	4/12/2021		TLM1	
24.	Hydrodynamic forces of jets on stationary and moving flat, inclined, curved vanes	1	6/12/2021		TLM2	
25.	Jet striking centrally and a tip for symmetrically and unsymmetrically vanes, velocity diagrams	1	8/12/2021		TLM2	
26.	Flow over radial vanes	1	10/12/2021		TLM1	

27.	Problems on stationary plates	1	20/12/2021		TLM1	
28.	Problems on moving plates	1	22/12/2021		TLM1	
29.	Problems on moving plates	1	24/12/2021		TLM1	
30.	Problems on radial vanes	1	27/12/2021		TLM1	
No. of classes required to complete UNIT-III: 10				**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
31.	Classification of hydraulic turbines	1	29/12/2021		TLM2	
32.	Pelton wheel, work done, efficiency	1	31/12/2021		TLM2	
33.	Francis turbine, work done, efficiency	1	3/01/2022		TLM1	
34.	Kaplan turbine, work done, efficiency	1	5/01/2022		TLM1	
35.	Specific speed, specific quantities	1	7/01/2022		TLM1	
36.	Unit quantities, Draft tube-classification	1	8/01/2022		TLM1	
37.	Performance characteristic curves, governing of turbines	1	10/01/2022		TLM1	
38.	Problems on hydraulic turbines	1	12/01/2022		TLM1	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

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
39.	Working of centrifugal pump, types	1	17/01/2022		TLM2	
40.	Losses and efficiencies, specific speed	1	19/01/2022		TLM2	
41.	Pumps in series and pumps in parallel	1	21/01/2022		TLM1	
42.	Problems on centrifugal pumps	1	24/01/2022		TLM1	
43.	Problems on centrifugal pumps	1	28/01/2022		TLM1	
44.	Problems on centrifugal pumps	1	29/01/2022		TLM1	
45.	Main components and working of reciprocating pumps, types	1	31/01/2022		TLM1	
46.	Slip, negative slip	1	2/2/2022		TLM1	
47.	Problems on reciprocating pumps	1	4/2/2022		TLM1	
No. of classes required to complete UNIT-V: 9				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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.V.Dhana Raju

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.:** 2021-22

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 examplesand 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 andparameters 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	25-10-21		1	
2.	Basic Concepts, Classification of systems, Macroscopic & Microscopic approaches	1	26-10-21		1,2	
3.	System-Types - examples, Control mass and Control volume Properties of system	1	28-10-21		1,2	
4.	State, Path, Process, Cycle, path and point functions.	1	30-10-21		1,2	
5.	Equilibrium, reversible and irreversible processes, Quasistatic process, Applications of TD, Internal Energy, Specific heat, Enthalpy	1	01-11-21		1,2	
6.	Zeroth law of Thermodynamics Temperature scales – Temperature measurement , Comparison of thermometers	1	02-11-21		1,2	
7.	Constant volume gas thermometer Numerical Problems on Temperature scales.	1	06-11-21		1,2	
8.	Advantages of gas thermometers over liquid thermometers	1	08-11-21		1,2	
9.	Numerical problems on Internal energy, enthalpy, specific heat and latent heat, Assignement-1	1	09-11-21		1	
10.	Tutorial -I	1	11-11-21		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	15-11-21		1,2	
12.	Representation of Thermodynamic processes on P-V planes	1	16-11-21		1,2	
13.	First Law Analysis of Closed System undergoing different process.	1	18-11-21		1,2	
14.	Different forms of stored energy, Forms of energy, Mechanical and Non mechanical forms of Work transfer	2	20-11-21		1,2	
15.	pdV work and other types of work transfer.	1	22-11-21		1,2	
16.	Applications of first law, PMM1 Numerical problems on work and energy.	1	23-11-21		1	

17.	**First Law Analysis of Open Systems** : Thermodynamic analysis of control volume-conservation of mass, energy principle.	1	25-11-21		1,2	
18.	Steady Flow Energy Equation (SFEE), Steady Flow Engineering Devices-Nozzles, Diffusers.	1	27-11-21		1,2	
19.	Turbine, Compressors, Throttling Valves, Heat Exchangers, Limitations on first law of thermodynamics, PMM1.	1	29-11-21		1,2	
20.	Numerical Problems on SFEE	1	30-12-21		1	
21.	Tutorial -2	1	02-12-21		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	04-12-21		1,2	
23.	Kelvin-Planks, Clausius statement of second law of thermodynamics.	1	06-12-21		1,2	
24.	Numerical Problems on Second law of TD.	1	07-12-21		1	
25.	Equivalence of Kelvin -Planck and Clausius statements.	1	09-12-21		1,2	
26.	Perpetual Motion Machine-II, Carnot cycle.	1	20-12-21		1,2	
27.	Carnot Theorem – Numerical problem.	1	21-12-21		1	
28.	**Entropy:** Introduction, Clausius inequality, t-s property diagrams.	1	23-12-21		1	
29.	Entropy change for ideal gases – Derivations.	1	27-12-21		1	
30.	Isentropic relations for ideal gases, Principle of increase of entropy.	1	28-12-21		1,2	
31.	Applications of Entropy- Third law of Thermodynamics Numerical Problems on Entropy.	1	30-12-21		1,2	
32.	Numerical Problems, Assignement-3.	1	01-01-22		1	
33.	Tutorial -3	1	31-12-21		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	03-01-22		1,2	
35.	*p-v, p-T, T-s* and *h-s* diagrams for pure substance, *p-v-T* Surface.	1	04-01-22		1,2	
36.	Properties of steam, quality or dryness fraction.	1	06-01-22		1,2	

37.	Phase change processes, Mollier diagram for a pure substance.	1	10-01-22		1,2,4,6	
38.	Numerical Problems.	1	11-01-22		1	
39.	**Properties of Ideal Gases:** Equation of state of a gas, Avogadro's law, Ideal gas, perfect gas, real gas.	1	17-01-22		1,2	
40.	Properties of mixture of gases – Dalton's law and Amagat's law of partial pressures.	1	18-01-22		1,2	
41.	Internal energy, enthalpy and specific heats of gas mixtures, Entropy of gas mixtures.	1	20-01-22		1,2	
42.	Numerical Problems. Tutorial -4	1	22-01-22		1,2	
No. of classes required to complete UNIT-IV: 09				**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
43.	Introduction**,** working of Carnot vapour cycle, working of simple Rankine cycle	1	24-01-22		1,2	
44.	Problems on Carnot vapour cycle and simple Rankine cycle	1	25-01-22		1,2	
45.	Gas power cycles -Otto, Numerical Problems	1	27-01-22		1,2	
46.	Diesel cycle, Dual cycle - Numerical Problems	1	29-01-22		1,2	
47.	Brayton Cycles and its problems	1	01-02-22		1,2	
48.	Refrigeration Cycles - Reversed Carnot cycle, Numerical Problems	1	03-02-22		1,2	
49.	Bell-Coleman cycle and simple vapour compression refrigeration Cycle (Theory)	1	07-02-22		1,2	
50.	Tutorial -5	1	08-02-22		3	
No. of classes required to complete UNIT-V: 8				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
51	Exergy analysis of thermodynamic systems	**1**	10-02-22		**TLM2**	**CO1,CO4**	**R2**	
52	Fuels and combustion	**1**	12-02-22		**TLM2**			

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

ACADEMIC CALENDER:

Commencement of Class work		25-10-2021	
I Phase of Instructions	25-10-2021	11-12-2021	7 Weeks
I Mid Examinations	13-12-2021	18-12-2021	1 Week
II Phase of Instructions	20-12-2021	05-02-2022	7 Weeks
II Mid Examinations	07-02-2022	12-02-2022	1 Week
Preparation and Practical's	14-02-2022	19-02-2022	1 Week
Semester End Examinations	21-02-2022	05-03-2022	2 Weeks

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+A	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. S. PICHI REDDY **Regulation:** R20
Course Name & Code : METALLURGY AND MATERIAL SCIENCE & 20ME05
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech V Semester A Section **A.Y.:** 2021-2022

PREREQUISITE: Engineering Physics, Engineering Chemistry

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to acquire knowledge on the structure, properties and applications of metals and alloys and understand the effect of mechanical working and heat treatment on materials.

COURSE OUTCOMES (COs): At the end of the course, student 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
1 - Low			2 –Medium								**3** - High				

TEXTBOOKS:

T1 Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw-Hill, 3rdEdition, 2011.

T2 V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 24th Edition, 2008.

REFERENCE BOOKS:

R1	Richard A.Flinn, Paul K.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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): A Section

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	HOD Sign Weekly
53.	Introduction to Outcome Based Education	1	25/10/2021		**TLM1**	
54.	MMS- Course Education Objectives and Course Outcomes	1	26/10/2021		**TLM1**	
55.	Crystal structures-Body centered cubic structure	1	27/10/2021		**TLM2**	
56.	Face cantered cubic structure	1	30/10/2021		**TLM2**	
57.	Closed packed hexagonal, Crystallographic planes.	1	01/11/2021		**TLM2**	
58.	Mechanism of crystallization of metals, grain, and grain boundaries	1	02/11/2021		**TLM1**	
59.	Effect of grain boundaries on the properties of metal / alloys	1	03/11/2021		**TLM1**	
60.	Determination of grain size, Necessity of alloying	1	06/11/2021		**TLM1**	
61.	Solid solutions-Interstitial Solid Solution and Substitution Solid Solution,	1	08/11/2021		**TLM1**	
62.	Hume Rothery's rules.	1	09/11/2021		**TLM1**	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: EQUILIBRIUM DIAGRAMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
63.	Equilibrium Diagrams - Introduction	1	10/11/2021		**TLM1**	
64.	Experimental methods of construction of equilibrium diagrams	1	15/11/2021		**TLM1**	
65.	Classification of equilibrium diagrams- isomorphous	1	16/11/2021		**TLM1**	
66.	Eutectic, partial eutectic equilibrium diagrams.	1	17/11/2021		**TLM1**	
67.	Equilibrium cooling and heating of alloys	1	20/11/2021		**TLM1**	
68.	Lever rule, coring	1	22/11/2021		**TLM1**	
69.	Transformations in the solid state – allotropy	1	23/11/2021		**TLM1**	
70.	Eutectic, eutectoid, peritectoid reactions	1	24/11/2021		**TLM1**	
71.	Study of Cu-Ni equilibrium diagrams.	1	27/11/2021		**TLM1**	
72.	Study of Bi-Cd equilibrium diagrams.	1	29/11/2021		**TLM1**	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: FERROUS METALS AND ALLOYS, STEEL, CAST IRONS, NON-FERROUS METALS AND ALLOYS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
73.	Study of Iron-Iron carbide equilibrium diagram	1	30/11/2021		**TLM1**	
74.	Structural Changes in Iron-Iron carbide equilibrium diagrams	1	01/12/2021		**TLM2**	
75.	Classification of steels, structure, properties, and applications of plain carbon steel-low carbon steel	1	04/12/2021		**TLM1**	
76.	Medium carbon steel and High carbon steel	1	06/12/2021		**TLM1**	
77.	Structure, properties and applications of white cast iron, malleable cast iron	1	07/12/2021		**TLM1**	
78.	Grey cast iron, Spheroidal graphite cast iron	1	08/12/2021		**TLM1**	
79.	Structure, properties and applications of copper and its alloys	1	20/12/2021		**TLM1**	
80.	Structure, properties and applications of Aluminium and its alloys	1	21/12/2021		**TLM1**	
No. of classes required to complete UNIT-III: 08				**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	HOD Sign Weekly
81.	Introduction to metal working	1	22/12/2021		**TLM1**	
82.	Hot working, Cold working	1	27/12/2021		**TLM1**	
83.	Strain hardening, Recovery, Recrystallisation and Grain growth	1	28/12/2021		**TLM1**	
84.	Comparison of properties of cold and hot worked parts	1	29/12/2021		**TLM1**	
85.	Annealing	1	03/01/2022		**TLM1**	
86.	Normalizing and hardening	1	04/01/2022		**TLM1**	
87.	Construction of TTT diagram for eutectoid steel	1	05/01/2022		**TLM1**	
88.	Structural changes in TTT diagram	1	10/01/2022		**TLM1**	
89.	Hardenability- jominy end quench test	1	11/01/2022		**TLM1**	
90.	Surface - hardening methods – Flame hardening and Induction hardening	1	12/01/2022		**TLM1**	
91.	Carburizing, nitriding and carbonitriding	1	18/01/2022		**TLM1**	
92.	Age hardening treatment and application.	1	19/01/2022		**TLM1**	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: COMPOSITE MATERIALS, TYPES OF COMPOSITES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
93.	Classification of composites	1	22/01/2022		**TLM1**	

94.	Various methods of component manufacture of fiber reinforced composites-Hand layup process,	1	24/01/2022		**TLM1**	
95.	Filament winding process, SMC processes	1	25/01/2022		**TLM1**	
96.	Continuous pultrusion processes	1	29/01/2022		**TLM1**	
97.	Resin transfer moulding	1	31/01/2022		**TLM1**	
98.	Introduction to metal ceramic mixtures	1	01/02/2022		**TLM1**	
99.	Metal – Matrix composites , C – C composites and applications	1	02/02/2022		**TLM1**	
No. of classes required to complete UNIT-V: 07				**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.	Advanced Topics	01	05/02/2022		**TLM1**	-		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. P. V. CHNADRA 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.:** 2021-22
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	25/10/2021		TLM1,2	
2.	Concept of Stress & Strain	1	27/10/2021		TLM2	
3.	Mechanical properties of Materials	1	28/10/2021		TLM2	
4.	Stress Strain diagrams for Mild Steel -Hooke's Law Evaluation of Proof stress by Offset method	1	29/10/2021		TLM2,4	
5.	Stresses, Strains & Deformations of a body due to axial force Factor of Safety	1	1/11/2021		TLM1	
6.	Deformation of Stepped bar due to axial loads	1	3/11/2021		TLM1	
7.	Tutorial-I	1	5/11/2021		TLM3	
8.	Stresses in composite bars & Problems	1	8/11/2021		TLM1	
9.	Lateral strain, Poisson's ratio & change in volume; Shear stress & shear strain	1	10/11/2021		TLM1	
10.	Relation between Young's Modulus and shear Modulus	1	11/11/2021		TLM1	
11.	Relation between Elastic modulii & Problems	1	12/11/2021		TLM1	
12.	Tutorial-II	1	15/11/2021		TLM3	
13.	Assignment / Quiz (UNIT-I)	1	17/11/2021		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	18/11/2021		TLM1	
15.	Shear force & Bending moment Diagrams for cantilever beam subjected to Concentrated loads & UDL.	1	19/11/2021		TLM1	
16.	Shear force & Bending moment Diagrams for Simply supported beam subjected to Concentrated loads & UDL.	1	22/11/2021		TLM1	
17.	Estimation of Maximum bending moment for simply supported beam	1	24/11/2021		TLM1	
18.	Shear force & Bending moment Diagrams for Overhanging beam subjected to Concentrated loads & UDL	1	25/11/2021		TLM1	
19.	Estimation of Maximum bending moment & point of contra flexure for Overhanging beams	1	26/11/2021		TLM1	
20.	Tutorial-III	1	29/11/2021		TLM3	
21.	Assignment / Quiz (UNIT-II)	1	1/12/2021		TLM1	

No. of classes required to complete UNIT-II: 08	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
22.	Theory of Simple bending, assumptions	1	2/12/2021		TLM1	
23.	Derivation of flexure equation	1	3/12/2021		TLM1	
24.	Section modulus and problems	1	6/12/2021		TLM1	
25.	Normal stresses due to flexure applications	1	8/12/2021		TLM1	
26.	Problems on bending stresses in beams	1	9/12/2021			
27.	Concept of shear stress variation over cross section due to flexural loads Derivation of lateral shear stress	1	10/12/2021		TLM1	
28.	Shear stress distribution across rectangular & circular sections	1	20/12/2021		TLM1	
29.	Problems on distribution of Shear stress	1	22/12/2021		TLM1	
30.	Tutorial-IV	1	23/12/2021		TLM3	
31.	Assignment / Quiz (UNIT-III)	1	24/12/2021		TLM1	
No. of classes required to complete UNIT-III: 10				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
32.	State of stress at a point, normal and tangential stresses on inclined planes	1	27/12/2021		TLM1	
33.	Problem on normal and tangential stresses on inclined planes	1	29/12/2021		TLM1	
34.	Principle stresses and their planes, maximum shear stress plane	1	30/12/2021		TLM1	
35.	Problems on analysis of stresses1	1	31/12/2021		TLM1	
36.	Tutorial-V	1	3/01/2022		TLM3	
37.	Mohr's circle diagram	1	5/01/2022		TLM1	
38.	Problems on Mohr's circle	1	6/01/2022		TLM1	
39.	Tutorial-VI	1	7/01/2022		TLM3	
40.	Assignment / Quiz (UNIT-IV)	1	10/01/2022		TLM1	
No. of classes required to complete UNIT-IV: 09				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
41.	Derivation of Differential equation for elastic line (Deflection Equation)	1	17/01/2022		TLM1	
42.	Deflection & Slope equations for cantilever beam	1	19/01/2022		TLM1	
43.	Deflection & Slope equations for simply supported beam	1	20/01/2022		TLM1	
44.	Macaulay's method	1	21/01/2022		TLM1	
45.	Introduction to thin & thick shells Hoop stress and longitudinal stresses for thin cylinders	1	24/01/2022		TLM2	
46.	Change in volume of thin cylinder	1	27/01/2022		TLM2	
47.	Derivation of Lame's equations of Thick cylinders; Problems on	1	28/01/2022		TLM1	

	thick cylinders					
48.	Tutorial-VII	1	31/01/2022		TLM3	
49.	Assignment / Quiz (UNIT-V)	1	02/02/2022		TLM1	
50.	Beyond Syllabus	1	03/02/2022		TLM2	
51.	Revision	1	04/02/2022		TLM1	
No. of classes required to complete UNIT-V: 09				**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. CHNADRA SEKHAR RAO**	**K. V. VISWANADH**	**B. SUDHEER KUMAR**	**Dr. S. PICHI REDDY**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. Shaheda Niloufer
Course Name & Code : Environmental Science & 20MC03
L-T-P Structure : 2-0-0 Credits : 0
Program/Sem/Sec : B.Tech., MECH-A., III-Sem., SEC-A A.Y : 2021-22

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	26-10-2021		2	
2.	Population explosion and variations among Nations.	1	27-10-2021		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	02-11-2021		2	
4.	Environmental Hazards	1	03-11-2021		2	
5.	Role of Information Technology in environmental management and human health.	1	09-11-2021		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	10-11-2021		2	
2.	Water Resources	1	16-11-2021		2	
3.	Mineral Resources	1	17-11-2021		2	
4.	Food Resources	1	23-11-2021		2	
5.	Food Resources	1	24-11-2021		2	
6.	Mineral Resources	1	30-11-2021		2	
No. of classes required to complete UNIT-II: 6				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	01-12-2021		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids, Bio-geo-chemical cycles	1	07-12-2021		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	1	08-12-2021		2	

4.	I MID EXAMINATION		14-12-2021			
5.	I MID EXAMINATION		15-12-2021			
6.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	21-12-2021		2	
7.	Man and wild life conflicts. Endangered and endemic species of India	1	22-12-2021		2,3	
8.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	28-12-2021		2	
No. of classes required to complete UNIT-III: 8				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	29-12-2021		2	
2.	Causes, effects and control measures of: Water Pollution Causes, effects and control measures of: Soil Pollution,	1	04-01-2022		2	
3.	Noise Pollution		05-01-2022			
4.	Solid Waste Management		11-01-2022			
5.	Solid Waste Management	1	12-01-2022		2,3	
6.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	18-01-2022		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	19-01-2022		2	
2.	Climate disruption- Greenhouse effect, ozone layer depletion and acid rain. Stockholm conference	1	25-01-2022		2,3	
3.	Environmental Impact Assessment (EIA),	1	01-02-2022		2	
4.	Green building, Environmental Law	1	02-02-2022		2,3	
No. of classes required to complete UNIT-V: 04				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. 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: B.Udaya Lakshmi / A.Pratyush.
Course Name & Code **:** FLUID MECHANICS AND HYDRAULIC MACHINERY LAB (20ME55)
Regulation :R20
L-T-P Structure **:** 0-0-2 **Credits:** 01
Program/Sem/Sec : B. Tech – III - A **A.Y.:**2021-22

PREREQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

COURSE OUTCOMES (COs): At the end of the course, student will be 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 (Correlation between COs, POs & PSOs):

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

TEXTBOOKS:

T1

T2

REFERENCE BOOKS:

R1

R2

R3

R4

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	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)**					
8.	Performance Test on Pelton Wheel **(HM1)**					
9.	Performance Test on Kaplan Turbine **(HM2)**					
10.	Performance Test on Single Stage Centrifugal Pump **(HM3)**					
11.	Performance Test on Reciprocating Pump**(HM4)**					
12.	Turbine flow meter(**HM5**)					
13.	Reynolds experiment.(**HM6**)					
No. of classes required to complete				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	An ability to apply knowledge of Mathematics, Sciences and Engineering fundamentals to find the solution to real time Mechanical Engineering problems.
PO 2	An ability to identify and formulate mathematical models to analyze complex engineering problems.
PO 3	An ability to design a mechanical systems/ processes to meet the desired needs within realistic constraints such as economic, environmental, societal, health & safety .
PO 4	An ability to design and conduct experiments, perform analysis, interpretation of data and synthesis of information to provide valid conclusions
PO 5	An ability to develop the model and analyze the Mechanical systems using modern software tools.
PO 6	An ability to understand societal, health, safety, legal, cultural issues and the consequent responsibilities relevant to engineering practice.
PO 7	An ability to understand the impact of engineering solutions in societal, environmental context and demonstrate the knowledge for sustainable development.
PO 8	An ability to understand the professional ethics to follow the norms of engineering practice
PO 9	An ability to function effectively as an individual and as a member / leader in diverse technical teams.
PO 10	An ability to communicate effectively with the engineering community and society through reports & presentations.
PO 11	An ability to apply management principles to organise the multidisciplinary projects
PO 12	An ability to understand the need of independent and lifelong learning so as to address day to day technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF MECHANICAL ENGINEERING

PART-A

Name of Course Instructor: Dr.S.Pichi Reddy, Mr.K.Venkateswara Reddy, Ms.S.Snigdha

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.: 2021-22

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 pure metals like Iron, Cu and Al.**(MET1)**
2. Preparation and study of the microstructure of low carbon steels, medium carbon steel and highcarbon steels. **(MET2)**
3. Study of the microstructures of gray cast iron, malleable cast iron and nodular cast iron. **(MET3)**
4. Study of the microstructures of brass. **(MET4)**
5. Study of the microstructures of heat treated steels. **(MET5)**
6. Hardenability of steels by Jominy end quench test. **(MET6)**
7. Hardness of various treated and untreated

steels. **(MET7)REFERENCES**
Lab Manual

Batch-I Schedule (20761A0301-330)

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	28/10/21	**Demonstration of MOS & MMS Lab**									
2	11/11/21	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
3	18/11/21	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7
4	25/11/21	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2
5	02/12/21	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3
6	09/12/21	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4
13/12/21 to 18/12/21		**I Mid Examinations**									
7	23/12/21	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5
8	30/12/21	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
9	06/01/22	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
10	20/01/22	MOS - 4	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
11	27/01/22	MOS - 5	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
12	03/02/22	MOS - 6	MOS - 7	MOS - 2	MOS - 3	MOS - 4	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
13		MOS - 7	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
15		**Internal Examination**									
07/02/22 to 12/02/22		**II Mid Examinations**									
No. of classes required to complete:					No. of classes taken:						

Batches:

S. No	Batch	Registered Nos	Total
1	$B1_1$	20761A0301-303	3
2	$B1_2$	20761A0304-306	3
3	$B1_3$	20761A0307-309	3
4	$B1_4$	20761A0310-312	3
5	$B1_5$	20761A0313-315	3

S. No	Batch	Registered Nos	Total
6	$B1_6$	20761A0316-318	3
7	$B1_7$	20761A0319-321	3
8	$B1_8$	20761A0322-324	3
9	$B1_9$	20761A0325-327	3
10	$B1_{10}$	20761A0328-330	3

Batch-II Schedule (20761A0331-347)

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	26/10/21	Demonstration of MOS & MMS Lab									
2	02/11/21	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MOS - 5
3	09/11/21	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
4	16/11/21	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 1
5	23/11/21	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MOS - 2
6	30/11/21	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MOS - 3
7	07/12/21	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MOS - 4
13/12/21 to 18/12/21		I Mid Examinations									
8	21/12/21	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
9	28/12/21	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
10	04/01/22	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
11	11/01/22	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
12	18/01/22	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
13	25/01/22	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
15	01/02/22	Internal Examination									
07/02/22 to 12/02/22		II Mid Examinations									

Batches:

S. No	Batch	Registered Nos	Total
1	$B2_1$	20761A0331-333	3
2	$B2_2$	20761A0334-336	3
3	$B2_3$	20761A0337-339	3
4	$B2_4$	20761A0340-342	3
5	$B2_5$	20761A0343-345	3

S. No	Batch	Registered Nos	Total
6	$B2_6$	20761A0346-347	2
7	$B2_7$		
8	$B2_8$		
9	$B2_9$		
10	$B2_{10}$		

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 complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : A. Sudhakar
Course Name & Code : Programming Using Python Lab (20AD53)
L-T-P Structure : 1-0-2 Credits : 2
Program/Sem/Sec : B.Tech., Mech., III-Sem., A A.Y : 2021-22

PRE-REQUISITE : C Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):
The Objective of 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, the student shall be able to

CO 1	Identify various programming constructs available in Python and apply them in solving computational problems. (Applying - L3)
CO 2	Demonstrate data structures available in Python and apply them in solving computational problems. (Applying - L3)
CO 3	Implement modular programming, string manipulations and Python Libraries (Applying - L3)
CO 4	Improve individual / teamwork skills, communication & report writing skills with ethical values. (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	1	-	-	-	-	-	-	-	3	-	-
CO2	-	3	2	3	2	-	-	-	-	-	-	-	3	-	-
CO3	-	3	2	3	2	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

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

PART-B

Introduction: Language basics and example problems

a) Implement Python Script for checking the given year is leap year or not.
b) Implement Python Script for finding biggest number among 3 numbers.
c) Implement Python Script for displaying reversal of a number.
d) Implement Python Script to check given number is Armstrong or not.
e) Implement Python Script to print sum of N natural numbers.
f) Implement Python Script to check given number is palindrome or not.
g) Implement Python script to print factorial of a number.
h) Implement Python Script to print all prime numbers within the given range.
i) Implement Python Script to calculate the series: S=1+x+x2+x3+.....xn
j) Implement Python Script to print the following pattern:

```
*
* *
* * *
```

Modue 1: Exercise Programs on Lists.

a) Write a Python script to display elements of list in reverse order.
b) Write a Python script to find the minimum and maximum elements without using built-in operations in the lists.
c) Write a Python script to remove duplicates from a list.
d) Write a Python script to append a list to the second list.
e) Write a Python script to count the number of strings in a list where the string length is 2 or more.

Module 2: Exercise Programs on Tuples.

a) Write a Python script to create a tuple with different data types.
b) Write a Python script to find the repeated items of a tuple.
c) Write a Python script to replace last value of tuples in a list.
   Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]
   Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]
d) Write a Python script to sort a tuple by its float element.
   Sample data: [('item1', '12.20'), ('item2', '15.10'), ('item3', '24.5')]
   Expected Output: [('item3', '24.5'), ('item2', '15.10'), ('item1', '12.20')]

Module 3: Exercise Programs on Sets.

a) Write a Python script to add member(s) in a set.

b) Write a Python script to perform Union, Intersection, difference and symmetric difference of given two sets.

c) Write Python script to test whether every element in S is in T and every element in T is in S.

Module 4: Exercise Programs on Dictionaries

a) Write a Python script to sort (ascending and descending) a dictionary by value.

b) Write a Python script to check whether a given key already exists or not in a dictionary.

c) Write a Python script to concatenate following dictionaries to create a new one.
Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60}
Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}

d) Write a Python script to print a dictionary where the keys are numbers between 1 and 15 (both included) and the values are square of keys.

e) Write a Python program to map two lists into a dictionary.

Module 5: Exercise Programs on functions and recursion.

a) Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.

b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between given range X and Y.

c) Define functions to find mean, median, mode for the given numbers in a list.

d) Define a function which generates Fibonacci series up to n numbers.

e) Implement a python script for factorial of number by using recursion.

f) Implement a python script to find GCD of given two numbers using recursion.

Module 6: Exercise programs on Strings

a) Implement Python Script to perform various operations on string using string libraries.

b) Implement Python Script to check given string is palindrome or not.

c) Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.

d) Implement python script that takes a list of words and returns the length of the longest one.

Module 7: Exercise programs on Regular Expressions

a) Write a Python script to check that a string contains only a certain set of characters (in this case a-z, A-Z and 0-9).

b) Write a Python script to check whether password is valid or not.

Conditions for a valid password are:

Should have at least one number.

Should have at least one uppercase and one lowercase character.

Should have at least one special symbol.

Should be between 6 to 20 characters long.

Module 8: Exercise programs on Matplotlib Library

a) Write a Python program to draw a line with suitable label in the x axis, y axis and a title.
b) Write a Python program to plot two or more lines with legends, different widths and colors.
c) Write a Python program to create multiple plots.
d) Write a Python programming to display a bar chart using different color for each bar.
e) Write a Python programming to create a pie chart with a title.
f) Write a Python program to draw a scatter plot with empty circles taking a random distribution in X and Y and plotted against each other.

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
6.	Language Basics and Example Programs	3	30.10.2021		TLM4	CO1,CO4	
7.	Language Basics and Example Programs	3	06.11.2021		TLM4	CO1,CO4	
8.	Language Basics and Example Programs	3	13.11.2021		TLM4	CO1,CO4	
9.	Module-1 Programs on Lists	3	20.11.2021		TLM4	CO2,CO4	
10.	Module-2 Programs on Tuples	3	27.11.2021		TLM4	CO2,CO4	
11.	Module-3 & 4 Programs on Sets Programs on Dictionaries	3	04.12.2021		TLM4	CO2,CO4	
12.	Module-5 Programs on Functions & Recursions	3	11.12.2021		TLM4	CO3,CO4	
13.	Module-6 Programs on Strings	3	08.01.2022		TLM4	CO3,CO4	
14.	Module-7 Programs on Regular Expressions	3	22.01.2022		TLM4	CO3,CO4	
15.	Module-8 Programs on Matplotlib	3	29.01.2022		TLM4	CO3,CO4	
16.	Internal Lab Exam	3	05.02.2022				

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):

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.
PO3	**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.
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.
PO5	**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
PO6	**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
PO7	**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.
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. A. Sudhakar	Mr. A. Sudhakar	Dr. M. Srinivasa Rao	Dr.D.Veeraiah

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : K.V.Viswanadh
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 A.Y : 2021-22

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	03	29-10-2021		TLM2	CO-1,2,3,4	
2.	Demonstration to AutoCAD Software	03	05-11-2021		TLM4	CO-1,2,3,4	
3.	Exercise on Basic Drawing Commands **(Exp-1)**	03	12-11-2021		TLM4	CO-1	
4.	Exercise on Modify Commands **(Exp-2)**	03	19-11-2021		TLM4	CO-1	
5.	Exercise on isometric views **(Exp-3)**	03	26-11-2021		TLM4	CO-1	
6.	Exercise on 3D Modelling Commands-I **(Exp-4)**	03	03-12-2021		TLM4	CO-2	
7.	Exercise on 3D Modelling Commands-II **(Exp-5)**	03	10-12-2021		TLM4	CO-2	
8.	Exercise on 3D Modelling Commands-III **(Exp-6)**	03	24-12-2021		TLM4	CO-2	
9.	Exercise on 3D Solid Editing Commands-I **(Exp-7)**	03	31-12-2021		TLM4	CO-3	
10.	Exercise on 3D Solid Editing Commands-II **(Exp-8)**	03	07-01-2022		TLM4	CO-3	
11.	Extraction of Wire-Frame & Solid Models from 3D Models **(Exp-9)**	03	21-01-2022		TLM4	CO-4	
12.	Extraction of Ortho Graphics Views from 3D model-I **(Exp-10)**	03	28-01-2022		TLM4	CO-4	
13.	Internal Exam	03	04-02-2022		-	-	

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.
PO3	**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.
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.
PO5	**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
PO6	**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
PO7	**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.
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. K.V.Viswanadh	Mr. K.V.Viswanadh	Mr.P.Sudheer Kumar	Dr.S.Pichi Reddy

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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 : 3-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ME B **A.Y.:** 2021 - 22

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.
R3 W.E. Boyce and R. C. Diprima, " Elementary Differential Equations" , 7th 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	25/10/21		TLM1	
2.	Introduction to UNIT I	1	27/10/21		TLM2	
3.	Forward Differences	1	28/10/21		TLM1	
4.	Backward differences	1	29/10/21		TLM1	
5.	Central Differences	1	01/11/21		TLM1	
6.	Symbolic relations and separation of symbols	1	03/11/21		TLM1	
7.	Symbolic relations and separation of symbols	1	05/11/21		TLM1	
8.	Newton's forward formulae for interpolation	1	08/11/21		TLM1	
9.	Newton's backward formulae for interpolation	1	10/11/21		TLM1	
10.	Lagrange's Interpolation	1	11/11/21		TLM1	
11.	Lagrange's Interpolation	1	12/11/21		TLM1	
12.	Tutorial I	1	18/11/21		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	15/11/21		TLM2	
14.	Algebraic and Transcendental Equations	1	17/11/21		TLM1	
15.	False Position method	1	19/11/21		TLM1	
16.	False Position method	1	22/11/21		TLM1	
17.	Newton- Raphson Method in one variable	1	24/11/21		TLM1	
18.	Newton- Raphson Method applications	1	25/11/21		TLM1	
19.	Trapezoidal rule	1	26/11/21		TLM1	
20.	Simpson's 1/3 Rule	1	29/11/21		TLM1	
21.	Simpson's 3/8 Rule	1	01/12/21		TLM1	
22.	Tutorial II	1	02/12/21		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	03/12/21		TLM1	
24.	Double Integrals -Cartesian coordinates	1	06/12/21		TLM1	
25.	Double Integrals- Polar co ordinates	1	08/12/21		TLM1	
26.	Problems	1	09/12/21		TLM1	
27.	Applications to Double integrals (Content Beyond the syllabus)	1	10/12/21		TLM2	
I MID EXAMINATIONS (13-12-2021 TO 18-12-2021)						

28.	Triple Integrals - Cartesian coordinates	1	20/12/21		TLM1	
29.	Triple Integrals - Spherical coordinates	1	22/12/21		TLM1	
30.	Tutorial III	1	23/12/21		TLM 3	
31.	Change of order of Integration	1	24/12/21		TLM1	
32.	Change of order of Integration	1	27/12/21		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
33.	Introduction to UNIT IV	1	29/12/21		TLM1	
34.	Determination of Fourier coefficients, Even and Odd Functions	1	30/12/21		TLM1	
35.	Fourier Series expansion in the interval $[0,2\pi]$	1	31/12/21		TLM1	
36.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	03/01/22		TLM1	
37.	Fourier Series in an arbitrary interval	1	05/01/22		TLM1	
38.	Fourier series in an arbitrary interval odd and even functions	1	06/01/22		TLM1	
39.	Half-range Sine and Cosine series	1	07/01/22		TLM1	
40.	Half-range Sine and Cosine series		10/01/22		TLM1	
41.	Tutorial IV	1	12/01/22		TLM3	
42.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	17/01/22		TLM2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Introduction to UNIT V	1	19/01/22		TLM1	
44.	Vector Differentiation	1	20/01/22		TLM1	
45.	Gradient	1	21/01/22		TLM1	
46.	Directional Derivative	1	24/01/22		TLM1	
47.	Divergence	1	27/01/22		TLM1	
48.	Curl	1	28/01/22		TLM1	
49.	Solenoidal and Irrotational functions, potential surfaces	1	31/01/22		TLM1	
50.	Laplacian and second order operators	1	02/02/22		TLM1	
51.	TUTORIAL - V	1	03/02/22		TLM3	
52.	Properties	1	04/02/22		TLM1	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (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. 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: A.NARESH KUMAR
Course Name & Code : FLUID MECHANICS & HYDRAULIC MACHINERY&20ME03
L-T-P Structure : 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech/III/B **A.Y.:** 2021-22
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	25/10/2021		TLM1	
2.	Physical properties of fluids	1	26/10/2021		TLM1	
3.	Specific gravity, viscosity, surface tension, vapour pressure	1	27/10/2021		TLM1	
4.	Problems on physical properties	1	29/10/2021		TLM1	
5.	Manometers, classification	1	01/11/2021		TLM2	
6.	Problems on manometers	1	02/11/2021		TLM1	
7.	Dimensional analysis, rayleigh's method	1	03/11/2021		TLM1	
8.	Buckingham's Pi theorem method	1	05/11/2021		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	08/11/2021		TLM1	
10.	Classification of flows, equation of continuity for 1 dimensional flow	1	09/11/2021		TLM1	
11.	Surface and body forces, Euler's equation, Bernoulli's equation	1	10/11/2021		TLM1	
12.	Momentum equation and its application on pipe bend	1	12/11/2021		TLM1	
13.	Reynold's experiment	1	15/11/2021		TLM2	
14.	Darcy's formula	1	16/11/2021		TLM1	
15.	Minor losses in pipes	1	17/11/2021		TLM1	
16.	Problems on major and minor losses	1	19/11/2021		TLM1	
17.	Pipes in series and parallel	1	22/11/2021		TLM1	
18.	Total energy line and hydraulic gradient line	1	23/11/2021		TLM1	
19.	Venturi meter, orifice meter, pitot tube	1	24/11/2021		TLM2	
20.	Problems on venturi and orifice meter	1	26/11/2021		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	29/11/2021		TLM1	
22.	Boundary layer thickness, momentum thickness	1	30/11/2021		TLM1	
23.	Energy thickness, boundary layer separation	1	01/12/2021		TLM1	
24.	Hydrodynamic forces of jets on stationary and moving flat, inclined, curved vanes	1	03/12/2021		TLM2	
25.	Jet striking centrally and a tip for symmetrically and unsymmetrically	1	06/12/2021		TLM2	

	vanes, velocity diagrams					
26.	Flow over radial vanes	1	07/12/2021		TLM1	
27.	Problems on stationary plates	1	08/12/2021		TLM1	
28.	Problems on moving plates	1	10/12/2021		TLM1	
29.	Problems on moving plates	1	20/12/2021		TLM1	
30.	Problems on radial vanes	1	21/12/2021		TLM1	
No. of classes required to complete UNIT-III: 10				**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
31.	Classification of hydraulic turbines	1	22/12/2021		TLM2	
32.	Pelton wheel, work done, efficiency	1	24/12/2021		TLM2	
33.	Francis turbine, work done, efficiency	1	27/12/2021		TLM1	
34.	Kaplan turbine, work done, efficiency	1	28/12/2021		TLM1	
35.	Specific speed, specific quantities	1	29/12/2021		TLM1	
36.	Unit quantities, Draft tube-classification	1	31/12/2021		TLM1	
37.	Performance characteristic curves, governing of turbines	1	03/01/2022		TLM1	
38.	Problems on hydraulic turbines	1	04/01/2022		TLM1	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

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
39.	Working of centrifugal pump, types	1	05/01/2022		TLM2	
40.	Losses and efficiencies, specific speed	1	07/01/2022		TLM2	
41.	Pumps in series and pumps in parallel	1	17/01/2022		TLM1	
42.	Problems on centrifugal pumps	1	18/01/2022		TLM1	
43.	Problems on centrifugal pumps	1	19/01/2022		TLM1	
44.	Problems on centrifugal pumps	1	21/01/2022		TLM1	
45.	Main components and working of reciprocating pumps, types	1	24/01/2022		TLM1	
46.	Slip, negative slip	1	25/01/2022		TLM1	
47.	Problems on reciprocating pumps	1	28/01/2022		TLM1	
No. of classes required to complete UNIT-V: 9				**No. of classes taken:**		

CONTENTS BEYOND SYLLABUS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Hydrostatic forces on surfaces	1	31/01/2022		TLM2	
2.	Buoyancy and Floatation	1	01/02/2022		TLM2	
3.	Notches and Weirs	1	02/02/2022		TLM1	
4.	Viscous Flow and Turbulent Flow	1	04/02/2022		TLM1	
				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	**A.NARESH KUMAR**	**S.RAMI REDDY**	**Dr.P.VIJAY KUMAR**	**Dr.S.PICHI REDDY**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.P.Ravindra Kumar
Course Name & Code **:** Thermodynamics &
L-T-P Structure **:** 3-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech III Sem B/S **A.Y.:** 2021-22

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	27-10-21	27-10-21	1	
2.	Basic Concepts, Classification of systems, Macroscopic & Microscopic approaches	1	28-10-21	28-10-21	1,2	
3.	System-Types - examples, Control mass and Control volume Properties of system	1	29-10-21	29-10-21	1,2	
4.	State, Path, Process, Cycle, path and point functions.	1	30-10-21	30-10-21	1,2	
5.	Equilibrium, reversible and irreversible processes, Quasistatic process, Applications of TD, Internal Energy, Specific heat, Enthalpy	1	03-11-21	03-11-21	1,2	
6.	Zeroth law of Thermodynamics Temperature scales – Temperature measurement , Comparison of thermometers	1	05-11-21	05-11-21	1,2	
7.	Constant volume gas thermometer Numerical Problems on Temperature scales.	1	06-11-21	06-11-21	1,2	
8.	Advantages of gas thermometers over liquid thermometers	1	10-11-21	10-11-21	1,2	
9.	Numerical problems on Internal energy, enthalpy, specific heat and latent heat, Assignement-1	1	11-11-21	11-11-21	1	
10.	Tutorial -I	1	12-11-21	12-11-21	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	13-11-21	13-11-21	1,2	
12.	Representation of Thermodynamic processes on P-V planes	1	17-11-21	17-11-21	1,2	
13.	First Law Analysis of Closed System undergoing different process.	1	18-11-21	18-11-21	1,2	
14.	Different forms of stored energy, Forms of energy, Mechanical and Non mechanical forms of Work transfer	2	19-11-21	19-11-21	1,2	
15.	pdV work and other types of work transfer.	1	20-11-21	20-11-21	1,2	
16.	Applications of first law, PMM1 Numerical problems on work and energy.	1	24-11-21	24-11-21	1	

17.	**First Law Analysis of Open Systems** : Thermodynamic analysis of control volume-conservation of mass, energy principle.	1	25-11-21	25-11-21	1,2	
18.	Steady Flow Energy Equation (SFEE), Steady Flow Engineering Devices-Nozzles, Diffusers.	1	26-11-21	26-11-21	1,2	
19.	Turbine, Compressors, Throttling Valves, Heat Exchangers, Limitations on first law of thermodynamics, PMM1.	1	27-11-21	27-11-21	1,2	
20.	Numerical Problems on SFEE	1	01-12-21	01-12-21	1	
21.	Tutorial -2	1	02-12-21	02-12-21	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	03-12-21		1,2	
23.	Kelvin-Planks, Clausius statement of second law of thermodynamics.	1	04-12-21		1,2	
24.	Numerical Problems on Second law of TD.	1	08-12-21		1	
25.	Equivalence of Kelvin -Planck and Clausius statements.	1	09-12-21		1,2	
26.	Perpetual Motion Machine-II, Carnot cycle.	1	10-12-21		1,2	
27.	Carnot Theorem – Numerical problem.	1	11-12-21		1	
28.	**Entropy:** Introduction, Clausius inequality, t-s property diagrams.	1	22-12-21		1,2	
29.	Entropy change for ideal gases – Derivations.	1	23-12-21		1,2	
30.	Isentropic relations for ideal gases, Principle of increase of entropy.	1	24-12-21		1,2	
31.	Applications of Entropy- Third law of Thermodynamics Numerical Problems on Entropy.	1	29-12-21		1,2	
32.	Numerical Problems, Assignement-3.	1	30-12-21		1	
33.	Tutorial -3	1	31-12-21		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	05-01-22		1,2	
35.	*p-v, p-T, T-s* and *h-s* diagrams for pure substance, *p-v-T* Surface.	1	06-01-22		1,2	
36.	Properties of steam, quality or dryness fraction.	1	07-01-22		1,2	
37.	Phase change processes, Mollier diagram for a pure substance.	1	08-01-22		1,2,4,6	

38.	Numerical Problems.	1	12-01-22		1	
39.	**Properties of Ideal Gases:** Equation of state of a gas, Avogadro's law, Ideal gas, perfect gas, real gas.	1	13-01-22		1,2	
40.	Properties of mixture of gases – Dalton's law and Amagat's law of partial pressures.	1	19-01-22		1,2	
41.	Internal energy, enthalpy and specific heats of gas mixtures, Entropy of gas mixtures.	1	20-01-22		1,2	
42.	Numerical Problems.	1	21-01-22		1,2	
43.	Tutorial -4	1	22-01-22		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	27-01-22		1,2	
45.	Problems on Carnot vapour cycle and simple Rankine cycle	1	28-01-22		1,2	
46.	Gas power cycles -Otto, Numerical Problems	1	29-01-22		1,2	
47.	Diesel cycle, Dual cycle - Numerical Problems	1	02-02-22		1,2	
48.	Brayton Cycles and its problems	1	03-02-22		1,2	
49.	Refrigeration Cycles - Reversed Carnot cycle, Numerical Problems	1	04-02-22		1,2	
50.	Bell-Coleman cycle and simple vapour compression refrigeration Cycle (Theory)	1	05-02-22		1,2	
51.	Tutorial -5	1	09-02-22		3	
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+A	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department

Name of the Faculty	Dr.P.Ravindra Kumar	Dr.P.Ravindra Kumar	Dr.P.Vijay Kumar	Dr.S.Pichi Reddy
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. B. DYVA ISAC PREMKUMAR **Regulation:** R20
Course Name & Code **:** METALLURGY AND MATERIAL SCIENCE & 20ME05
L-T-P Structure **:** 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech V Semester B Section **A.Y.:** 2021-2022

PREREQUISITE: Engineering Physics, Engineering Chemistry

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to acquire knowledge on the structure, properties and applications of metals and alloys and understand the effect of mechanical working and heat treatment on materials.

COURSE OUTCOMES (COs): At the end of the course, student 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
1 - Low			2 –Medium									**3** - High			

TEXTBOOKS:

T1 Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw-Hill, 3rdEdition, 2011.

T2 V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 24th Edition, 2008.

REFERENCE BOOKS:

R1	Richard A.Flinn, Paul K.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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): B Section

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	HOD Sign Weekly
1.	Crystal structures-Body cantered cubic	1	26/10/2021		**TLM1**	
2.	Face cantered cubic	1	28/10/2021		**TLM1**	
3.	Closed packed hexagonal, Crystallographic planes.	1	29/10/2021		**TLM1**	
4.	Mechanism of crystallization of metals, grain, and grain boundaries	1	30/10/2021		**TLM1**	
5.	Effect of grain boundaries on the properties of metal / alloys	1	02/11/2021		**TLM1**	
6.	Determination of grain size, Necessity of alloying	1	05/11/2021		**TLM1**	
7.	Solid solutions-Interstitial Solid Solution and Substitution Solid Solution,	1	06/11/2021		**TLM1**	
8.	Hume Rothery's rules.	1	09/11/2021		**TLM1**	
No. of classes required to complete UNIT-I: 08				**No. of classes taken:**		

UNIT-II: EQUILIBRIUM DIAGRAMS

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.	Experimental methods of construction of equilibrium diagrams	1	11/11/2021		**TLM1**	
10.	Classification of equilibrium diagrams- isomorphous	1	12/11/2021		**TLM1**	
11.	Eutectic, partial eutectic equilibrium diagrams.	2	18/11/2021		**TLM1**	
12.	Equilibrium cooling and heating of alloys	1	19/11/2021		**TLM1**	
13.	Lever rule, coring	1	20/11/2021		**TLM1**	
14.	Transformations in the solid state – allotropy	1	23/11/2021		**TLM1**	
15.	Eutectic, eutectoid, peritectoid reactions	1	25/11/2021		**TLM1**	
16.	Study of Cu-Ni equilibrium diagrams.	1	26/11/2021		**TLM1**	
17.	Study of Bi-Cd equilibrium diagrams.	1	27/11/2021		**TLM1**	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: FERROUS METALS AND ALLOYS, STEEL, CAST IRONS, NON-FERROUS METALS AND ALLOYS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Study of Iron-Iron carbide equilibrium diagram	2	02/12/2021		**TLM1**	
19.	Classification of steels, structure,	1	03/12/2021		**TLM1**	

	properties, and applications of plain carbon steel-low carbon steel					
20.	Medium carbon steel and High carbon steel	1	04/12/2021		**TLM1**	
21.	Structure, properties and applications of white cast iron, malleable cast iron	1	07/12/2021		**TLM1**	
22.	Grey cast iron, Spheroidal graphite cast iron	1	09/12/2021		**TLM1**	
23.	Structure, properties and applications of copper and its alloys, Aluminium and its alloys	1	10/12/2021		**TLM1**	
No. of classes required to complete UNIT-III: 07				**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	HOD Sign Weekly
24.	Hot working, Cold working	1	21/12/2021		**TLM1**	
25.	Strain hardening, Recovery, Recrystallisation and Grain growth	1	23/12/2021		**TLM1**	
26.	Comparison of properties of cold and hot worked parts	1	24/12/2021		**TLM1**	
27.	Annealing	1	28/12/2021		**TLM1**	
28.	Normalizing and hardening	1	30/12/2021		**TLM1**	
29.	Construction of TTT diagram for eutectoid steel	2	04/01/2022		**TLM1**	
30.	Hardenability- jominy end quench test	1	06/01/2022		**TLM1**	
31.	Surface - hardening methods	2	11/01/2022		**TLM1**	
32.	Age hardening treatment and application.	1	18/01/2022		**TLM1**	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: COMPOSITE MATERIALS, TYPES OF COMPOSITES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Classification of composites	1	20/01/2022		**TLM1**	
34.	Various methods of component manufacture of fiber reinforced composites-Hand layup process,	1	21/01/2022		**TLM1**	
35.	Filament winding process	1	22/01/2022		**TLM1**	
36.	SMC processes	1	25/01/2022		**TLM1**	
37.	Continuous pultrusion processes	1	27/01/2022		**TLM1**	
38.	Resin transfer moulding	1	28/01/2022		**TLM1**	
39.	Introduction to metal ceramic mixtures	1	29/01/2022		**TLM1**	
40.	Metal – Matrix composites	1	01/02/2022		**TLM1**	
41.	C – C composites and applications	1	03/02/2022		**TLM1**	
No. of classes required to complete UNIT-V: 09				**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.	Advanced Topics	02	05/02/2022		**TLM1**	-		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty				
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.:** 2021-22
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	25/10/2021		TLM1,2	
2.	Concept of Stress & Strain	1	26/10/2021		TLM2	
3.	Mechanical properties of Materials	1	28/10/2021		TLM2	
4.	Stress Strain diagrams for Mild Steel -Hooke's Law Evaluation of Proof stress by Offset method	1	30/10/2021		TLM2,4	
5.	Stresses, Strains & Deformations of a body due to axial force Factor of Safety	1	1/11/2021		TLM1	
6.	Deformation of Stepped bar due to axial loads	1	2/11/2021		TLM1	
7.	Tutorial-I	1	6/11/2021		TLM3	
8.	Stresses in composite bars & Problems	1	8/11/2021		TLM1	
9.	Lateral strain, Poisson's ratio & change in volume; Shear stress & shear strain	1	9/11/2021		TLM1	
10.	Relation between Young's Modulus and shear Modulus	1	11/11/2021		TLM1	
11.	Relation between Elastic modulii & Problems	1	15/11/2021		TLM1	
12.	Tutorial-II	1	16/11/2021		TLM3	
13.	Assignment / Quiz (UNIT-I)	1	18/11/2021		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	20/11/2021		TLM1	
15.	Shear force & Bending moment Diagrams for cantilever beam subjected to Concentrated loads & UDL.	1	22/11/2021		TLM1	
16.	Shear force & Bending moment Diagrams for Simply supported beam subjected to Concentrated loads & UDL.	1	23/11/2021		TLM1	
17.	Estimation of Maximum bending moment for simply supported beam	1	25/11/2021		TLM1	
18.	Shear force & Bending moment Diagrams for Overhanging beam subjected to Concentrated loads & UDL	1	27/11/2021		TLM1	
19.	Estimation of Maximum bending moment & point of contra flexure for Overhanging beams	1	29/11/2021		TLM1	
20.	Tutorial-III	1	30/11/2021		TLM3	

21.	Assignment / Quiz (UNIT-II)	1	2/12/2021		TLM1	
No. of classes required to complete UNIT-II: 08				**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
22.	Theory of Simple bending, assumptions	1	4/12/2021		TLM1	
23.	Derivation of flexure equation	1	6/12/2021		TLM1	
24.	Section modulus and problems	1	7/12/2021		TLM1	
25.	Normal stresses due to flexure applications	1	9/12/2021		TLM1	
26.	Concept of shear stress variation over cross section due to flexural loads Derivation of lateral shear stress	1	20/12/2021		TLM1	
27.	Shear stress distribution across rectangular & circular sections	1	21/12/2021		TLM1	
28.	Problems on distribution of Shear stress	1	23/12/2021		TLM1	
29.	Tutorial-IV	1	27/12/2021		TLM3	
30.	Assignment / Quiz (UNIT-III)	1	28/12/2021		TLM1	
No. of classes required to complete UNIT-III: 09				**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
31.	State of stress at a point, normal and tangential stresses on inclined planes	1	30/12/2021		TLM1	
32.	Problem on normal and tangential stresses on inclined planes	1	3/01/2022		TLM1	
33.	Principle stresses and their planes, maximum shear stress plane	1	4/01/2022		TLM1	
34.	Tutorial-V	1	6/01/2022		TLM3	
35.	Mohr's circle diagram	1	10/01/2022		TLM1	
36.	Problems on Mohr's circle	1	11/01/2022		TLM1	
37.	Tutorial-VI	1	13/01/2022		TLM3	
38.	Assignment / Quiz (UNIT-IV)	1	15/01/2022		TLM1	
No. of classes required to complete UNIT-IV: 08				**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
39.	Derivation of Differential equation for elastic line (Deflection Equation)	1	17/01/2022		TLM1	
40.	Deflection & Slope equations for cantilever beam	1	18/01/2022		TLM1	
41.	Deflection & Slope equations for simply supported beam	1	20/01/2022		TLM1	
42.	Macaulay's method	1	22/01/2022		TLM1	
43.	Introduction to thin & thick shells Hoop stress and longitudinal stresses for thin cylinders	1	24/01/2022		TLM2	
44.	Change in volume of thin cylinder	1	25/01/2022		TLM2	
45.	Derivation of Lame's equations of Thick cylinders; Problems on	1	27/01/2022		TLM1	

	thick cylinders					
46.	Tutorial-VII	1	29/01/2022		TLM3	
47.	Assignment / Quiz (UNIT-V)	1	31/01/2022		TLM1	
48.	Beyond Syllabus	1	1/02/2022		TLM2	
49.	Revision		4/02/2022		TLM1	
50.	Revision		5/02/2022		TLM1	
No. of classes required to complete UNIT-V: 09				**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	**K. V. VISWANADH**	**K. V. VISWANADH**	**B. SUDHEER KUMAR**	**Dr. S. PICHI REDDY**
Signature				

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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., MECH-A., III-Sem., SEC-B A.Y : 2021-22

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	28-10-2021		2	
2.	Population explosion and variations among Nations.	1	29-10-2021		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	04-11-2021		2	
4.	Environmental Hazards	1	05-11-2021		2	
5.	Role of Information Technology in environmental management and human health.	1	11-11-2021		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	12-11-2021		2	
2.	Water Resources	1	18-11-2021		2	
3.	Mineral Resources	1	19-11-2021		2	

4.	Food Resources	1	25-11-2021		2	
5.	Food Resources	1	26-11-2021		2	
6.	Mineral Resources	1	02-12-2021		2	
No. of classes required to complete UNIT-II: 6				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	03-12-2021		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids, Bio-geo-chemical cycles	1	09-12-2021		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	1	10-12-2021		2	
4.	I MID EXAMINATION		16-12-2021			
5.	I MID EXAMINATION		17-12-2021			
6.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	23-12-2021		2	
7.	Man and wild life conflicts. Endangered and endemic species of India	1	24-12-2021		2,3	
8.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	30-12-2021		2	
No. of classes required to complete UNIT-III: 8				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	31-12-2021		2	
2.	Causes, effects and control measures of: Water Pollution Causes, effects and control measures of: Soil Pollution,	1	06-01-2022		2	
3.	Noise Pollution		07-01-2022			
4.	Solid Waste Management		13-01-2022			
5.	Solid Waste Management	1	14-01-2022		2,3	

6.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	20-01-2022		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	21-01-2022		2	
2.	Climate disruption- Greenhouse effect, ozone layer depletion and acid rain. Stockholm conference	1	27-01-2022		2,3	
3.	Environmental Impact Assessment (EIA),	1	28-01-2022		2	
4.	Green building,	1	03-02-2022		2,3	
5.	Environmental Law	1	04-02-2022		2,3	
No. of classes required to complete UNIT-V: 05				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				

LIST OF EXPERIMENTS- B.Tech-III SEM -ME-B/S **A.Y:2021-22**

1. Verification of Bernoulli's Theorem
2. Calibration of Venturimeter
3. Calibration of Orificemeter
4. Determination of friction factor for a given pipe line
5. Impact of jets on Vanes
6. Performance Test on Pelton Wheel
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. Calibration of V Notch
12. Calibration of Mouthpiece apparatus

Lab in charge **Head of the Department**

D. Mallikarjun Rao Dr.S.PICHI REDDY

Faculty

1) A.NARESH KUMAR

2) M.Oliva

B.Tech-III SEM -ME-B/S **A.Y:2021-22**

Course Objective:

In this course students will learn about the insights of calculating the discharge in various flow measuring devices, performance parameters of hydraulic machines.

Course Outcomes:

After completion of this lab, student will be able to

1. Tuning flow discharge measuring devices used in pipes channels and tanks.
2. Compute flow equations to solve control volume analysis problems in fluid mechanics.
3. Determine the laminar and turbulent boundary layer fundamentals in fluid flow problems.
4. Develop capability to apply conservation principles to hydraulic machines.

Lab in charge **Head of the Department**

D. Mallikarjun Rao Dr.S.PICHI REDDY

Faculty

1) A.NARESH KUMAR

2) M.OLIVA

Laboratory Code : 20ME55
Lab: FLUID MECHANICS &HYDRAULIC MACHINERY LAB **A.Y.: 2021-22**
Class: B. Tech – III Semester (Section – B) **Lab/Practical's: 3 hrs/ week**
Credits: 01
Continuous Internal Assessment : 15
Semester End Examination : 35
Name of the Faculty: A.NARESH KUMAR/M.OLIVA

Batches (Section – B)

Total No. of students : 20761A0348-20761A0380
20761A0381-20761A03A0 = 52

Batch	**A1**	**: 20761A0348-20761A0352**	**= 05**
Batch	**A2**	**: 20761A0353-20761A0357**	**= 05**
Batch	**A3**	**: 20761A0358-20761A0362**	**= 05**
Batch	**A4**	**: 20761A0363-20761A0367**	**= 05**
Batch	**A5**	**: 20761A0368-20761A0372**	**= 05**
Batch	**A6**	**: 20761A0373-20761A0380**	**= 07**
Batch	**B1**	**: 20761A0381-20761A0383**	**= 03**
Batch	**B2**	**: 20761A0384-20761A0386**	**= 03**
Batch	**B3**	**: 20761A0387-20761A0389**	**= 03**
Batch	**B4**	**: 20761A0390-20761A0392**	**= 03**
Batch	**B5**	**: 20761A0393-20761A0396**	**= 04**
Batch	**B6**	**: 20761A0397-20761A03A0**	**= 04**

Schedule of Experiments (Section –B)

BATCH-A

Date	Experiment (Batch)					
	Ex - 1	Ex – 2	Ex – 3	Ex – 4	Ex – 5	Ex – 6
25-10-21	**Demonstration of all experiments, CEOs and COs of the Laboratory**					
CYCLE-I						
01-11-21	A1	A2	A3	A4	A5	A6
08-11-21	A2	A3	A4	A5	A6	A1
15-11-21	A3	A4	A5	A6	A1	A2
22-11-21	A4	A5	A6	A1	A2	A3
29-11-21	A5	A6	A1	A2	A3	A4
06-12-21	A6	A1	A2	A3	A4	A5
CYCLE-II						
20-12-21	A1	A2	A3	A4	A5	A6
27-12-21	A2	A3	A4	A5	A6	A1
03-01-22	A3	A4	A5	A6	A1	A2
10-01-22	A4	A5	A6	A1	A2	A3
17-01-22	A5	A6	A1	A2	A3	A4
24-01-22	A6	A1	A2	A3	A4	A5
31-01-22	**Repetition**					

BATCH-B

Date	Experiment (Batch)					
	Ex - 1	**Ex – 2**	**Ex – 3**	**Ex – 4**	**Ex – 5**	**Ex – 6**
27-10-21	**Demonstration of all experiments, CEOs and COs of the Laboratory**					
CYCLE-I						
03-11-21	B1	B2	B3	B4	B5	B6
10-11-21	B2	B3	B4	B5	B6	B1
17-11-21	B3	B4	B5	B6	B1	B2
24-11-21	B4	B5	B6	B1	B2	B3
01-12-21	B5	B6	B1	B2	B3	B4
08-12-21	B6	B1	B2	B3	B4	B5
CYCLE-II						
22-12-21	B1	B2	B3	B4	B5	B6
29-12-21	B2	B3	B4	B5	B6	B1
05-01-22	B3	B4	B5	B6	B1	B2
19-01-22	B4	B5	B6	B1	B2	B3
02-02-22	B5	B6	B1	B2	B3	B4
	B6	B1	B2	B3	B4	B5

Lab in charge **Head of the Department**

D. Mallikarjun Rao Dr.S.PICHI REDDY

Faculty

1) A.NARESH KUMAR

2) M.OLIVA

A.Y:2021-22

VIVA QUESTIONS B.Tech-III SEM-ME-B/S

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.

Lab in charge **Head of the Department**

D. Mallikarjun Rao Dr.S.PICHI REDDY

Faculty

1) A.NARESH KUMAR

2) M.OLIVA

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC and NBA (CSE, IT, ECE, EEE & ME) under Tier - I

NOTIFICATION OF CYCLES -ME-B/S **A.Y:2021-22**

CYCLE-I

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

Lab in charge **Head of the Department**

D. Mallikarjuna Rao Dr.S.PICHI REDDY

Faculty

1) A.NARESH KUMAR

2) M.OLIVA

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 25-10-2021			
I Phase of Instructions	25/10/21	11/12/21	7
I Mid Examinations	13/12/21	18/12/21	1
II Phase of Instructions	20/12/21	05/02/22	7
II Mid Examinations	07/02/22	12/02/22	1
Preparation and Practical's	14/02/22	19/02/22	1
Semester End Examinations	21/02/22	05/03/22	2

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(Autonomous)

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Accredited by NBA (Tier – I), New Delhi & certified by ISO 9001:2015

DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	**: 20ME56**	**Lab: MECHANICS OF SOLIDS AND METALLURGY LAB**	
Lab/Practicals	**: 3hrs/ Week**	**Continuous Internal Assessment**	**: 15**
A.Y.	**: 2021-22**	**Semester End Examination**	**: 35**
Class & Semester	**: B. Tech – III Semester**	**Section**	**: B**
Instructors	**: Mr.B.Sudheer Kumar, Sr.Assistant Professor**		
	Mr.B.Dyva Isac Premkumar, Assistant Professor		

COURSE EDUCATIONAL OBJECTIVE:

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:

After completion of the course students are able to:

CO1: Evaluate the mechanical properties of materials by conducting various tests. (Applying-L3)

CO2: Estimate the behaviour 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:

20ME56	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
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	-

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

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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	**: 20ME56**	**Lab: MECHANICS OF SOLIDS AND METALLURGY LAB**	
Lab/Practicals	**: 3hrs/ Week**	**Continuous Internal Assessment**	**: 15**
A.Y.	**: 2021-22**	**Semester End Examination**	**: 35**
Class & Semester	**: B. Tech – III Semester**	**Section**	**: B**
Instructors	**: Mr.B.Sudheer Kumar, Sr.Assistant Professor**		
	Mr.B.Dyva Isac Premkumar, Assistant Professor		

At least 12 experiments are to be conducted:

LIST OF EXPERIMENTS:

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 pure metals like Iron, Cu and Al.**(MET1)**
2. Preparation and study of the microstructure of low carbon steels, medium carbon steel and high carbon steels. **(MET2)**
3. Study of the microstructures of gray cast iron, malleable cast iron and nodular cast iron. (**MET3)**
4. Study of the microstructures of brass. **(MET4)**
5. Study of the microstructures of heat treated steels. **(MET5)**
6. Hardenability of steels by Jominy end quench test. **(MET6)**
7. Hardness of various treated and untreated steels. **(MET7)**

REFERENCES

Lab Manual

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

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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code : 20ME56 Lab: MECHANICS OF SOLIDS AND METALLURGY LAB
Lab/Practicals : 3hrs/ Week Continuous Internal Assessment : 15
A.Y. : 2021-22 Semester End Examination : 35
Class & Semester : B. Tech – III Semester Section : B
Instructors : Mr.B.Sudheer Kumar, Sr.Assistant Professor
Mr.B.Dyva Isac Premkumar, Assistant Professor

Batches (Section – A)

Total No. of students : 20761A0348-20761A0375,20761A0377-20761A03A0 = 52

Batch B1 :20761A0348-20761A0375,20761A0377-20761A0380 = 32

Batch B2 : 20761A0381 - 19761A03A0= 20

Sub Batches of B1:

S. No	Batch	Registered Nos	Total
1	$B1_1$	20761A0348-20761A0350	3
2	$B1_2$	20761A0351-20761A0353	3
3	$B1_3$	20761A0354-20761A0356	3
4	$B1_4$	20761A0357-20761A0359	3
5	$B1_5$	20761A0360-20761A0362	3
6	$B1_6$	20761A0363-20761A0365	3
7	$B1_7$	20761A0366-20761A0368	3
8	$B1_8$	20761A0369-20761A0371	3
9	$B1_9$	20761A0372-20761A0375	4
10	$B1_{10}$	20761A0377-20761A0380	4
Total			32

Sub Batches of B2:

S. No	Batch	Registered Nos	Total
1	$B2_1$	20761A0381-20761A0383	3
2	$B2_2$	20761A0384-20761A0386	3
3	$B2_3$	20761A0387-20761A0389	3
4	$B2_4$	20761A0390-20761A0392	3
5	$B2_5$	20761A0393-20761A0396	4
6	$B2_6$	20761A0397-20761A03A0	4
Total			20

Course Instructor Course Coordinator Module Coordinator HoD

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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code : 20ME56 Lab: MECHANICS OF SOLIDS AND METALLURGY LAB
Lab/Practicals : 3hrs/ Week Continuous Internal Assessment : 15
A.Y. : 2021-22 Semester End Examination : 35
Class & Semester : B. Tech – III Semester Section : B
Instructors : Mr.B.Sudheer Kumar, Sr.Assistant Professor
Mr.B.Dyva Isac Premkumar, Assistant Professor

Notification of Cycles (Section – A)

Batches	Laboratory	Cycle	Experiment No.s
B1 & B2	MECHANICS OF SOLIDS AND METALLURGY LAB	I	MET 1 to MET 6
		II	M0S 1 to M0S 6

Total No. of students : 20761A0348-20761A0375, 20761A0377-20761A03A0 = 52

Batch B1 : 20761A0348-20761A0375, 20761A0377-20761A0380 = 32

Batch B2 : 20761A0381 - 19761A03A0 = 20

Course Instructor Course Coordinator Module Coordinator HoD

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DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of MECHANICS OF SOLIDS AND METALLURGY LAB (Section – A)

Laboratory Code : 20ME56 **Lab: MECHANICS OF SOLIDS AND METALLURGY LAB**

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

A.Y. : 2021-22 **Semester End Examination : 35**

Class & Semester : B. Tech – III Semester **Section : B**

Instructors : Mr.B.Sudheer Kumar, Sr.Assistant Professor

Mr.B.Dyva Isac Premkumar, Assistant Professor

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	27/10/21	Demonstration of MOS & MMS Lab									
2	03/11/21	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MOS - 5
3	10/11/21	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
4	17/11/21	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 1
5	24/11/21	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MOS - 2
6	01/12/21	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MOS - 3
13/12/21 to 18/12/21		I Mid Examinations									
7	08/12/21	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MOS - 4
8	22/12/21	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
9	29/12/21	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
10	05/01/22	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
11	12/01/22	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
12	19/02/22	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
13	02/02/22	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
07/02/22 to 12/02/22		II Mid Examinations									
14	14/02/22	Internal Examination									

Batches:

S. No	Batch	Registered Nos	Total	S. No	Batch	Registered Nos	Total	S. No	Batch	Registered Nos	Total	S. No	Batch	Registered Nos	Total
1	$B1_1$	20761A0348-350	3	4	$B1_4$	20761A0357-359	3	7	$B1_7$	20761A0366-368	3	10	$B1_{10}$	20761A0377-380	4
2	$B1_2$	20761A0351-353	3	5	$B1_5$	20761A0360-362	3	8	$B1_8$	20761A0369-371	3				
3	$B1_3$	20761A0354-356	3	6	$B1_6$	20761A0363-365	3	9	$B1_9$	20761A0372-375	4				

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

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DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of MECHANICS OF SOLIDS AND METALLURGY LAB (Section – A)

Laboratory Code : 20ME56 **Lab: MECHANICS OF SOLIDS AND METALLURGY LAB**

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

A.Y. : 2021-22 **Semester End Examination : 35**

Class & Semester : B. Tech – III Semester **Section : B**

Instructors : Mr.B.Sudheer Kumar, Sr.Assistant Professor

Mr.B.Dyva Isac Premkumar, Assistant Professor

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	25/10/21	Demonstration of MOS & MMS Lab									
2	01/11/21	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MOS - 5
3	08/11/21	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6
4	15/11/21	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 1
5	22/11/21	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MOS - 2
6	29/11/21	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MOS - 3
7	06/12/21	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MOS - 4
13/12/21 to 18/12/21		I Mid Examinations									
8	20/12/21	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MET – 1	MET – 2	MET – 3	MET – 4	MET – 5
9	27/12/21	MOS - 2	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MET – 2	MET – 3	MET – 4	MET – 5	MET – 6
10	03/01/22	MOS - 3	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MET – 3	MET – 4	MET – 5	MET – 6	MET – 1
11	10/01/22	MOS - 4	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MET – 4	MET – 5	MET – 6	MET – 1	MET – 2
12	17/01/22	MOS - 5	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MET – 5	MET – 6	MET – 1	MET – 2	MET – 3
13	24/01/22	MOS - 6	MOS - 1	MOS - 2	MOS - 3	MOS - 4	MET – 6	MET – 1	MET – 2	MET – 3	MET – 4
15	31/01/22	Internal Examination									
07/02/22 to 12/02/22		II Mid Examinations									

Batches:

S. No	Batch	Registered Nos	Total	S. No	Batch	Registered Nos	Total	S. No	Batch	Registered Nos	Total	S. No	Batch	Registered Nos	Total
1	$B2_1$	20761A0381-383	3	4	$B2_4$	20761A0390-392	3	7	$B2_7$			10	$B2_{10}$		
2	$B2_2$	20761A0384-386	3	5	$B2_5$	20761A0393-396	4	8	$B2_8$						
3	$B2_3$	20761A0387-389	3	6	$B2_6$	20761A0397-3A0	4	9	$B2_9$						

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

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : A. Sudhakar
Course Name & Code : Programming Using Python Lab (20AD53)
L-T-P Structure : 1-0-2 Credits : 2
Program/Sem/Sec : B.Tech., Mechanical., III-Sem., B A.Y : 2021-22

PRE-REQUISITE : C Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):
The Objective of 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, the student shall be able to

CO 1	Identify various programming constructs available in Python and apply them in solving computational problems. (Applying - L3)
CO 2	Demonstrate data structures available in Python and apply them in solving computational problems. (Applying - L3)
CO 3	Implement modular programming, string manipulations and Python Libraries (Applying - L3)
CO 4	Improve individual / teamwork skills, communication & report writing skills with ethical values. (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	1	-	-	-	-	-	-	-	3	-	-
CO2	-	3	2	3	2	-	-	-	-	-	-	-	3	-	-
CO3	-	3	2	3	2	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

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

PART-B

Introduction: Language basics and example problems

a) Implement Python Script for checking the given year is leap year or not.
b) Implement Python Script for finding biggest number among 3 numbers.
c) Implement Python Script for displaying reversal of a number.
d) Implement Python Script to check given number is Armstrong or not.
e) Implement Python Script to print sum of N natural numbers.
f) Implement Python Script to check given number is palindrome or not.
g) Implement Python script to print factorial of a number.
h) Implement Python Script to print all prime numbers within the given range.
i) Implement Python Script to calculate the series: S=1+x+x2+x3+.....xn
j) Implement Python Script to print the following pattern:

```
*
* *
* * *
```

Modue 1: Exercise Programs on Lists.

a) Write a Python script to display elements of list in reverse order.
b) Write a Python script to find the minimum and maximum elements without using built-in operations in the lists.
c) Write a Python script to remove duplicates from a list.
d) Write a Python script to append a list to the second list.
e) Write a Python script to count the number of strings in a list where the string length is 2 or more.

Module 2: Exercise Programs on Tuples.

a) Write a Python script to create a tuple with different data types.
b) Write a Python script to find the repeated items of a tuple.
c) Write a Python script to replace last value of tuples in a list.
   Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]
   Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]
d) Write a Python script to sort a tuple by its float element.
   Sample data: [('item1', '12.20'), ('item2', '15.10'), ('item3', '24.5')]
   Expected Output: [('item3', '24.5'), ('item2', '15.10'), ('item1', '12.20')]

Module 3: Exercise Programs on Sets.

a) Write a Python script to add member(s) in a set.
b) Write a Python script to perform Union, Intersection, difference and symmetric difference of given two sets.
c) Write Python script to test whether every element in S is in T and every element in T is in S.

Module 4: Exercise Programs on Dictionaries

a) Write a Python script to sort (ascending and descending) a dictionary by value.
b) Write a Python script to check whether a given key already exists or not in a dictionary.
c) Write a Python script to concatenate following dictionaries to create a new one.
   Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60}
   Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
d) Write a Python script to print a dictionary where the keys are numbers between 1 and 15 (both included) and the values are square of keys.
e) Write a Python program to map two lists into a dictionary.

Module 5: Exercise Programs on functions and recursion.

a) Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.
b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between given range X and Y.
c) Define functions to find mean, median, mode for the given numbers in a list.
d) Define a function which generates Fibonacci series up to n numbers.
e) Implement a python script for factorial of number by using recursion.
f) Implement a python script to find GCD of given two numbers using recursion.

Module 6: Exercise programs on Strings

a) Implement Python Script to perform various operations on string using string libraries.
b) Implement Python Script to check given string is palindrome or not.
c) Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.
d) Implement python script that takes a list of words and returns the length of the longest one.

Module 7: Exercise programs on Regular Expressions

a) Write a Python script to check that a string contains only a certain set of characters (in this case a-z, A-Z and 0-9).
b) Write a Python script to check whether password is valid or not.
   Conditions for a valid password are:
   Should have at least one number.

Should have at least one uppercase and one lowercase character.

Should have at least one special symbol.

Should be between 6 to 20 characters long.

Module 8: Exercise programs on Matplotlib Library

a) Write a Python program to draw a line with suitable label in the x axis, y axis and a title.
b) Write a Python program to plot two or more lines with legends, different widths and colors.
c) Write a Python program to create multiple plots.
d) Write a Python programming to display a bar chart using different color for each bar.
e) Write a Python programming to create a pie chart with a title.
f) Write a Python program to draw a scatter plot with empty circles taking a random distribution in X and Y and plotted against each other.

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

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.	Language Basics and Example Programs	3	26.10.2021		TLM4	CO1,CO4	
2.	Language Basics and Example Programs	3	02.11.2021		TLM4	CO1,CO4	
3.	Language Basics and Example Programs	3	09.11.2021		TLM4	CO1,CO4	
4.	Module-1 Programs on Lists	3	16.11.2021		TLM4	CO2,CO4	
5.	Module-2 Programs on Tuples	3	23.11.2021		TLM4	CO2,CO4	
6.	Module-3 & 4 Programs on Sets Programs on Dictionaries	3	30.11.2021		TLM4	CO2,CO4	
7.	Module-4 Programs on Dictionaries	3	07.12.2021		TLM4	CO2,CO4	
8.	Module-5 Programs on Functions & Recursions	3	21.12.2021		TLM4	CO3,CO4	
9.	Module-6 Programs on Strings	3	28.12.2021		TLM4	CO3,CO4	
10.	Module-7 Programs on Regular Expressions	3	04.01.2022		TLM4	CO3,CO4	
11.	Module-8 Programs on Matplotlib	3	18.01.2022		TLM4	CO3,CO4	
12.	Revision	3	25.01.2022		TLM4	All CO's	
13.	Internal Lab Exam	3	01.02.2022				

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):

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.
PO3	**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.
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.
PO5	**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
PO6	**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
PO7	**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.
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. A. Sudhakar	Mr. A. Sudhakar	Dr. M. Srinivasa Rao	Dr.D.Veeraiah

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : K.V.Viswanadh
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 A.Y : 2021-22

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-B

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 lab Demonstration to AutoCAD Software	03	30-10-2021		TLM2,4	CO-1,2,3,4	
2.	Exercise on Basic Drawing Commands **(Exp-1)**	03	06-11-2021		TLM4	CO-1	
3.	Exercise on Modify Commands **(Exp-2)**	03	13-11-2021		TLM4	CO-1	
4.	Exercise on isometric views **(Exp-3)**	03	20-11-2021		TLM4	CO-1	
5.	Exercise on 3D Modelling Commands-I **(Exp-4)**	03	27-11-2021		TLM4	CO-2	
6.	Exercise on 3D Modelling Commands-II **(Exp-5)**	03	04-12-2021		TLM4	CO-2	
7.	Exercise on 3D Modelling Commands-III **(Exp-6)**	03	11-12-2021		TLM4	CO-2	
8.	Exercise on 3D Solid Editing Commands-I **(Exp-7)**	03	01-01-2022		TLM4	CO-3	
9.	Exercise on 3D Solid Editing Commands-II **(Exp-8)**	03	08-01-2022		TLM4	CO-3	
10.	Extraction of Wire-Frame & Solid Models from 3D Models **(Exp-9)**	03	22-01-2022		TLM4	CO-4	
11.	Extraction of Ortho Graphics Views from 3D model-I **(Exp-10)**	03	29-01-2022		TLM4	CO-4	
12.	Internal Exam	03	05-02-2022		-	-	

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.
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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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PO7	**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.
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PSO 3	**Software Engineering:** The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. K.V.Viswanadh	Mr. K.V.Viswanadh	Mr.P.Sudheer Kumar	Dr.S.Pichi Reddy

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CENTRE FOR CAREER GUIDANCE & TRAINING

Name of the Faculty : **T. Radha Rani** Date : **25-10-2021**
Subject : CGT(Quantitative Aptitude) Branch : **MECH B**
A.Y : **2021-2022** SEM : **III**

S.No	No. of Lecture Hours	Tentative Date	Planned Topics	Actual Date	Remarks
1	1	29-10-2021	Introduction to CGT		
2	1	05-11-2021	Introduction- Numbers		
3	1	12-11-2021	Test of Divisibility, Units Digit		
4	1	19-11-2021	Problems on Numbers		
5	1	26-11-2021	Introduction-LCM & HCF		
6	1	03-12-2021	Problems on LCM & HCF		
7	1	10-12-2021	Introduction-Simplification		
8	1	17-12-2021	Problems on Simplification		
9	1	24-12-2021	Problems on Decimal Fractions		
10	1	31-12-2021	Problems on Square Root		
11	1	08-01-2022	Introduction- Averages		
12	1	22-01-2022	Problems on Averages		
13	1	29-01-2022	Introduction-Problems on Ages		
14	1	05-02-2022	Problems on Ages		

(T.Radha Rani)
Signature of the Faculty

(Dr. Sujit Kumar Rath)
Signature of the HOD