LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, (AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
ISO 21001 : 2018, 50001 : 2018, 14001: 2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM	**:** B. Tech., III-Sem., MECHANICAL
ACADEMIC YEAR	**:** 2024-25
COURSE NAME & CODE	**:** Numerical Methods and Transform Techniques & 23FE09
L-T-P STRUCTURE	**:** 3-0-0
COURSE CREDITS	3
COURSE INSTRUCTOR	**:** SK . HASEENA
COURSE COORDINATOR	**:** SK . HASEENA
PRE-REQUISITES	**:** Basics of Differentiation, Integration.

Course Objectives:

- To elucidate the different numerical methods to solve nonlinear algebraic equations.
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling variousreal world applications.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)

CO2: Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

CO3: Apply the Laplace transform for solving differential equations (L3)

CO4: Find or compute the Fourier series of periodic signals (L3)

CO5: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)

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

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	-	-	-	-	-	-	-	1
CO2	3	2	-	2	-	-	-	-	-	-	-	1
CO3	3	2	-	2	-	-	-	-	-	-	-	1
CO4	3	2	-	2	-	-	-	-	-	-	-	1
CO5	3	2	-	2	-	-	-	-	-	-	-	1

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**

1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Dr. B.S. Grewal, "Higher Engineering Mathematics", 44nd Edition, Khanna Publishers, New Delhi, 2017.

T2 B. V. Ramana, "*Higher Engineering Mathematics*", 2007 Edition , Tata McGraw Hill Education.

BOS APPROVED REFERENCE BOOKS:

R1 Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 10th Edition, John Wiley – India.

R2 Steven c.chopra, "*Applied numerical methods with MAT lab for engineering and science*", Tata McGraw Hill Education.

R3 R.K. Jain and S.R.K. Iyengar, "*Numerical methods for Scientificand engineering computation",* New age international publications.

R4 Lawrence Turyn, "*Advanced engineering mathematics",* CRC press.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	30- 06 - 25		TLM2			
2.	Course Outcomes, Program Outcomes	1	02 – 07 - 25		TLM2			

UNIT-I: Iterative Methods

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Introduction to Unit I	1	03- 07 - 25		TLM1	CO1	T1,T2	
4.	Bisection method	1	04- 07 - 25		TLM1	CO1	T1,T2	
5	Bisection method	1	07- 07 - 25		TLM1	CO1	T1,T2	
6	Secant method	1	09- 07 - 25		TLM1	CO1	T1,T2	
7	False – position method	1	10- 07 - 25		TLM1	CO1	T1,T2	
8	Iteration method	1	11- 07 - 25		TLM1	CO1	T1,T2	
9.	Newton – Raphson method	1	14- 07 - 25		TLM1	CO1	T1,T2	
10.	Simultaneous equations	1	16- 07 - 25		TLM1	CO1	T1,T2	
11.	Newton's forward interpolation	1	17- 07 - 25		TLM1	CO1	T1,T2	
12.	Newton's backward interpolation	1	18- 07 - 25		TLM1	CO1	T1,T2	
13.	Lagrange's interpolation for unequal parts	1	21- 07 - 25		TLM1	CO1	T1,T2	
14	Lagrange's interpolation for unequal parts	1	23 - 07 -25		TLM1	CO1	T1,T2	
15.	Tutorial – I	1	24 - 07 - 25		TLM3	CO1	T1,T2	
No. of classes required to complete UNIT-I		15			No. of classes taken:			

UNIT-II: Linear Differential equations of higher order (Constant Coefficients)

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
16.	Introduction to Unit - 2	1	25 - 07-25		TLM1	CO2	T1,T2	
17.	Trapezoidal rule	1	28-07-25		TLM1	CO2	T1,T2	
18 .	Trapezoidal rule	1	30-07-25		TLM1	CO2	T1,T2	
19 .	Simpson's 3/8 rule	1	31-07-25		TLM1	CO2	T1,T2	
20 .	Simpson's 3/8 rule	1	01-08-25		TLM1	CO2	T1,T2	

21	Taylor's series method	1	04-08-25		TLM1	CO2	T1,T2	
22.	Taylor's series method	1	06-08-25		TLM1	CO2	T1,T2	
23	Picard's method		07-08-25		TLM1	CO2	T1,T2	
24.	Picard's method	1	08-08-25		TLM1	CO2	T1,T2	
25	Euler's method		11-08-25		TLM1	CO2	T1,T2	
26.	Euler's method	1	13-08-25		TLM1	CO2	T1,T2	
27.	Runge – Kutta method of 2^{nd} order	1	14-08-25		TLM1	CO2	T1,T2	
28.	Runge – Kutta method of 4^{th} order	1	18-08-25		TLM1	CO2	T1,T2	
29.	Runge – Kutta method of 4^{th} order	1	20-08-25		TLM1	CO2	T1,T2	
30.	Milne's predictor and corrector method	1	21-08-25		TLM1	CO2	T1,T2	
31.	Revision / Tutorial – II	1	22-08-25		TLM1	CO2	T1,T2	
No. of classes required to complete UNIT-II		16			No. of classes taken:			

I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)

UNIT-III: LAPLACE TRANSFORMS

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
32	Introduction to Unit - III	1	01-09-25		TLM1	CO3	T1,T2	
33	Laplace transform of standard functions	1	03-09-25		TLM1	CO3	T1,T2	
34	Properties	1	04-09-25		TLM1	CO3	T1,T2	
35	Shifting theorems	1	05-09-25		TLM1	CO3	T1,T2	
36	Transforms of derivatives& integrals	1	08-09-25		TLM1	CO3	T1,T2	
37	Unit step function & Dirac's delta function	1	10-09-25		TLM1	CO3	T1,T2	
38	Inverse Laplace by partial fractions	1	11-09-25		TLM1	CO3	T1,T2	
39	Inverse Laplace by Convolution theorem	1	12-09-25		TLM1	CO3	T1,T2	
40	Applications to ODE	1	15-09-25		TLM1	CO3	T1,T2	
41	Applications to ODE	1	17-09-25		TLM1	CO3	T1,T2	
42	Integral equations	1	18-09-25		TLM1	CO3	T1,T2	
43	Tutorial - III	1	19-09-25		TLM3	CO3	T1,T2	

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
44	Introduction to Unit - IV	1	22-09-25		TLM1	CO4	T1,T2	
45	Fourier series of periodic functions	1	24-09-25		TLM1	CO4	T1,T2	
46	Dirichlet's conditions	1	25-09-25		TLM1	CO4	T1,T2	
47	Problems on Fourier series	1	26-09-25		TLM1	CO4	T1,T2	
48	Even and odd functions	1	03-10-25		TLM1	CO4	T1,T2	
49	Even and odd functions	1	06-10-25		TLM1	CO4	T1,T2	
50	Change of intervals	1	08-10-25		TLM1	CO4	T1,T2	
51	Change of intervals	1	09-10-25		TLM1	CO4	T1,T2	
52	Half range sine & cosine series	1	10-10-25		TLM1	CO4	T1,T2	
53	Half range sine & cosine series	1	13-10-25		TLM1	CO4	T1,T2	
54	Tutorial - IV	1	15-10-25		TLM3	CO4	T1,T2	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: Fourier transforms

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
55	Introduction to Unit -V	1	16-10-25		TLM1	CO5	T1,T2	
56	Fourier integrals	1	17-10-25		TLM1	CO5	T1,T2	
57	Fourier sine & cosine integrals	1	20-10-25		TLM1	CO5	T1,T2	
58	Infinite Fourier transforms	1	22-10-25		TLM1	CO5	T1,T2	
59	Infinite Fourier transforms	1	23-10-25		TLM1	CO5	T1,T2	
60	Infinite Fourier cosine & sine transforms	1	24-10-25		TLM1	CO5	T1,T2	
61	Infinite Fourier cosine & sine transforms	1	27-10-25		TLM1	CO5	T1,T2	
62	Convolution theorem	1	29-10-25		TLM1	CO5	T1,T2	
63	Finite Fourier transforms / Tutorial - V	1	30-10-25		TLM1	CO5	T1,T2	
No. of classes required to complete UNIT-V		09			No. of classes taken:			

Content 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
64	To find current using Laplace in simple electrical circuits	1	31-10-25		TLM2	CO3	T1,T2	
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

Course Instructor	Course Coordinator	Module Coordinator	HoD

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. P. Ravindra Kumar
Course Name & Code : Thermodynamics & 23ME03 Regulation: R23
L-T-P Structure : **2**-1-0 **Credits:** 2
Program/Sem/Sec : B.Tech III Sem **A.Y.:** 2025-26

PREREQUISITE: Engineering Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- Familiarize concepts of heat, work, energy and governing rules for conversion of one form to other.
- State and illustrate the basic laws of thermodynamics. Also, to learn the concept of entropy, enthalpy, reversibility and irreversibility.
- To get conversant with properties of steam and gas mixtures.
- Provide fundamental concepts of Thermodynamic cycles.

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

CO1	**Understand the basic concepts of thermodynamics and can distinguish the forms of heat and work. (Understanding - L2)**
CO2	**Apply first of law of thermodynamics to flow and non-flow processes of thermodynamic systems. (Applying – L3)**
CO3	**Apply the second law of thermodynamics to solve second law parameters of thermal systems .(Applying – L3)**
CO4	**Analyze the non-reactive mixture of gases, t-s and h-s diagrams, Mollier charts, and Phase Transformations using steam tables data hand book. (Analyzing – L4)**
CO5	**Compute the performance parameters of various thermodynamic cycles. (Applying – L3)**

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

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

TEXTBOOKS:

T1	P.K.Nag, "Engineering Thermodynamics"- McGraw-Hill. 5th Edition, 2013
T2	Claus Borgnakke Richard E. Sonntag, Fundamentals of Thermodynamics, 7th Edition, Wiley, 2009.

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.
R3	Y.A. Cengel, and M.A.Boles, "Thermodynamics: An Engineering Approach", McGraw-Hill, 7th Edition, 2011.

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, CEOs, COs, POs, PSOs	1	01-07-25		1	
2	System, boundary, Surrounding, Universe, Types of Systems -examples	1	01-07-25		1,2	
3	Macroscopic and Microscopic viewpoints, Control mass, Control volume, Concept of Continuum.	1	03-07-25		1,2	
4	Properties of system, State, Change of state, Path, Process.	1	04-07-25		1,2	
5	Reversible and irreversible processes, Cycle, Quasi static Process.	1	08-07-25		1,2	
6	Thermodynamic equilibrium, Path and Point functions, Specific heat, Internal Energy, Enthalpy.	1	08-07-25			
7	Zeroth law of Thermodynamics Introduction, Zeroth law of thermodynamics, Measurement of temperature.	1	10-07-25		1,2	
8	Constant volume gas thermometer Numerical Problems on Temperature scales.	1	11-07-25		1,2	
9	Advantages of gas thermometers over liquid thermometers, Numerical Problems	1	15-07-25		1,2	
10	**Tutorial-I** on Numerical problems on Internal energy, enthalpy, specific heat and latent heat, Assignement-1.	1	15-07-25		3	
11	Recapitulation, Concluding Points Assignement-1.	1	17-07-25		1,2	
12	Short answer questions	1	18-07-25		1,2	
	No. of classes taken: 12					

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
13	**First Law Analysis of Closed Systems** : Introduction, First law for a closed system undergoing change of state and cycle	1	22-07-25		1,2	
14	Representation of Thermodynamic processes on P-V planes	1	22-07-25		1,2	
15	First Law Analysis of Closed System undergoing different process.	1	24-07-25		1,2	
16	Work done in different process - closed systems	1	25-07-25		1,2	
17	**Tutorial –II :** Different forms of stored energy, Forms of energy, Mechanical and Non mechanical forms of Work transfer	1	29-07-25		3	
18	pdV work and other types of work transfer.	1	29-07-25		1,2	
19	Applications of first law, PMM1 Numerical problems on work and energy.	1	31-07-25		1,2	
20	**First Law Analysis of Open Systems**: Thermodynamic analysis of control	1	01-08-25		1,2	

	volume-conservation of mass, energy principle.					
21	Steady Flow Energy Equation (SFEE), Steady Flow Engineering Devices-Nozzles, Diffusers.	1	05-08-25		1,2	
22	**Tutorial –III** on Work done in different processes –Open systems	1	05-08-25		3	
23	SFEE - Turbine, Compressors, Throttling Valves	1	07-08-25		1,2	
24	Heat Exchangers, Limitations on first law of thermodynamics, PMM1.	1	08-08-25		1	
25	Numerical Problems on SFEE	1	12-08-25		1,2	
26	**Tutorial –IV,** Problems on SFEE-Compressors, Turbines	1	12-08-25		3	
27	Numerical Problems on SFEE – Nozzles, Diffusers	1	14-08-25		1,2	
28	Short answer questions	1	19-08-25		1,2	
29	**Tutorial V** -Numerical Problems on SFEE	1	19-08-25		3	
30	Revision – I Unit	1	21-08-25		1,2	
31	Revision –II Unit	1	22-08-25		1,2	
	No. of classes taken: 19					

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
32	**Second Law Analysis of Thermodynamics:** Introduction, Energy Reservoirs, Heat Engines, Refrigerators, Heat Pumps.	1	02-09-25		1,2	
33	Kelvin-Planks, Clausius statement of second law of thermodynamics.	1	02-09-25		1,2	
34	Numerical Problems on Second law of TD.	1	04-09-25		1	
35	Equivalence of Kelvin -Planck and Clausius statements.	1	05-09-25		1,2	
36	Perpetual Motion Machine-II, Carnot cycle, Carnot Theorem	1	09-09-25		1,2	
37	**Tutorial VI** – Tutorial problems on HE, Refrigerators and Heat Pumps	1	09-09-25		3	
38	**Entropy:** Introduction, Clausius inequality, t-s property diagrams.	1	11-09-25		1,2	
39	Entropy change for ideal gases – Derivations.	1	12-09-25		1,2	
40	Isentropic relations for ideal gases, Principle of increase of entropy, Applications of Entropy - Third law of Thermodynamics	1	16-09-25		1,2	
41	**Tutorial VII -** Numerical Problems on Entropy.	1	16-09-25		3	
42	Short answer questions, Assignement-3.	1	18-09-25		1	
43	Revision , Concluding Points	1	19-09-25		1,2	
	No. of classes taken:12					

UNIT-IV: Properties of Pure Substances and Ideal Gas Mixtures

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	**Properties of Pure Substance:** Introduction, Phases of pure substance.	1	23-09-25		1,2,4	
45	*p-v, p-T, T-s* and *h-s* diagrams for pure substance, *p-v-T* Surface.	1	23-09-25		1,2,4	
46	Properties of steam, quality or dryness fraction, Phase change processes,	1	25-09-25		1,2,4	
47	Mollier diagram for a pure substance, Numerical problems.	1	26-09-25		1,2,5,6	
48	**Tutorial VIII-** Numerical Problems.	1	07-10-25		3	
49	**Properties of Ideal Gases:** Equation of state of a gas, Avogadro's law, Ideal gas, perfect gas, real gas.	1	07-10-25		1,2	
50	Properties of mixture of gases – Dalton's law and Amagat's law of partial pressures.	1	09-10-25		1,2	
51	Internal energy, enthalpy and specific heats of gas mixtures, Entropy of gas mixtures.	1	10-10-25		1,2	
52	Numerical Problems - **Tutorial IX**	1	14-10-25		3	
53	Short answer questions, Revision, Concluding points, Assignment -4	1	06-10-25		1,2	
	No. of classes taken: 10					

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
54	Introduction**,** working of Carnot vapour cycle, working of simple Rankine cycle	1	14-10-25		1,2	
55	Problems on Carnot vapour cycle and simple Rankine cycle	1	16-10-25		1,2	
56	Gas power cycles - Otto, Numerical Problems	1	17-10-25		1,2	
57	Diesel cycle, Dual cycle - Numerical Problems – **Tutorial X**	1	23-10-25		3	
58	Brayton Cycles and its problems	1	24-10-25		1,2	
59	Refrigeration Cycles - Reversed Carnot cycle, Numerical Problems	1	28-10-25		1,2	
60	Bell-Coleman cycle and simple vapour compression refrigeration Cycle (Theory)	1	25-10-25		1,2	
61	Short answer questions, Revision, Concluding Points, Assignment -5	1	30-10-25		1,2	
62	Content beyond the syllabus Stirling cycle, Ericsson cycle	1	31-10-25		1,2	
	No. of classes taken: 9					

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

ACADEMIC CALENDER:

Commencement of Class work		30-06-2025	
I Phase of Instructions	30-06-2025	23-08-2025	8 Weeks
I Mid Examinations	25-08-2025	30-08-2025	1 Week
II Phase of Instructions	01-09-2025	01-11-2025	9 Weeks
II Mid Examinations	03-11-2025	08-11-2025	1 Week
Preparation and Practical's	10-11-2025	15-11-2025	1 Week
Semester End Examinations	17-11-2025	29-11-2025	2 Weeks

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, Computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature and analyze Complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO 5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments
PO 11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr M B S Sreekara Reddy

Course Name & Code	**:** Mechanics of Solids & 23ME04	**Regulation**: R23
L-T-P Structure	**: 3-0-0**	**Credits:** 3
Program/Sem	: B.Tech III Sem	**A.Y.:** 2025-2026

PREREQUISITE: Engineering Mechanics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objectives of the course are to

- Understand the behavior of basic structural members subjected to uni- axial and bi-axial loads.
- Apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment.
- Learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyze beams and draw correct and complete shear and bending moment diagrams for beams.
- Attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior
- Design and analysis of Industrial components like pressure vessels.

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

CO1	Understand the concepts of basic structural members subjected to uni-axial and bi-axial loads. **(Understanding-L2)**
CO2	Construct the shear force and bending moment diagrams along the length of beam. **(Applying-L3)**
CO3	Compute the stresses of a member subjected to flexural and torsional loads. **(Applying-L3)**
CO4	Determine the transverse shear stresses and deflections of beams due to bending loads**. (Applying– L3)**
CO5	Estimate the stresses in pressure vessels and analyze the columns for buckling **(Analyzing-L4)**

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

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

CO4	3	2	1	--	--	--	--	--	--	--	--	2	--	--	3
CO5	3	1	2	--	--	--	--	--	--	--	--	2	--	--	3
1 - Low					2 –Medium						3 - High				

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

TEXTBOOKS:

1. GH Ryder, Strength of materials, Palgrave Macmillan publishers India Ltd, 1961.
2. B.C. Punmia, Strength of materials,10/e, Lakshmi publications Pvt. Ltd, New Delhi, 2018.
3. Sadhu Singh, Strength of Materials, Khanna Publishers, 2013.
4. S.Ramamrutham, Strength of Materials, Dhanpat Rai& Sons, 2011.

REFERENCE BOOKS:

1. Gere & Timoshenko, Mechanics of materials, 2/e, CBS publications, 2004.
2. U.C.Jindal, Strength of Materials, 2/e, Pearson Education, 2017.
3. Timoshenko, Strength of Materials Part – I& II, 3/e, CBS Publishers, 2004.
4. Andrew Pytel and Ferdinand L. Singer, Strength of Materials,4/e, Longman Publications, 1990.
5. Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc19_ce18/preview
- https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6
- https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
- https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
- https://www.coursera.org/learn/mechanics-1
- https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-1-linear-elastic-behavior
- https://archive.nptel.ac.in/courses/112/107/112107146/

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: SIMPLE STRESSES & 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, Types of stresses & strains	1	30-06-2025		TLM 1	
2.	Hooke's law ,stress – strain diagram for mild steel	1	01-07-2025		TLM 1	
3.	Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric Strain	1	03-07-2025		TLM 1	

4.	Relation between elastic constants	1	05-07-2025		TLM 1	
5.	Bars of varying section, Problems	1	07-07-2025		TLM 3	
6.	composite bars, Problems	1	08-07-2025		TLM 3	
7.	Problems on simples stresses & strains		10-07-2025		TLM3	
8.	Thermal stresses, Problems	1	14-07-2025		TLM 1	
9.	Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions	1	15-07-2025		TLM 1	
10.	Principal planes and principal Stresses	1	17-07-2025		TLM 1	
11.	Mohr's circle	1	19-07-2025		TLM 1	
12.	Strain energy – Resilience – Gradual, sudden, impact and shock loadings.	1	21-07-2025		TLM 1	
13.	Problems on strain energy	1	22-07-2025		TLM 3	
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.	Definition of beam – Types of beams – Concept of shear force and bending moment	1	24-07-2025		TLM 1	
15.	S.F and B.M diagrams for Cantilever	1	28-07-2025		TLM 1	
16.	Problems on combination of loads : S.F and B.M diagrams for cantilever	1	29-07-2025		TLM 3	
17.	S.F and B.M diagrams for simply supported beams	1	31-07-2025		TLM 1	
18.	Problems on S.F and B.M diagrams for simply supported	1	02-08-2025		TLM 3	
19.	Problems on combination of loads : S.F and B.M diagrams for simply supported	1	04-08-2025		TLM 3	
20.	S.F and B.M diagrams for over hanging	1	05-08-2025		TLM 1	
21.	Problems on S.F and B.M diagrams for over hanging	1	07-08-2025		TLM 3	
22.	Problems on combination of loads : S.F and B.M diagrams for overhanging	1	11-08-2025		TLM 3	
23.	Point of contra flexure.	1	12-08-2025		TLM 1	
24.	Relation between S.F., B.M and rate of loading at a section of a beam.	1			TLM 1	

		1	14-08-2025		TLM 1	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: FLEXURAL STRESSES, TORSION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	**FLEXURAL STRESSES** : Theory of simple bending, Derivation of bending equation	1	18-08-2025		TLM 1	
26.	Determination of bending stresses	1	19-08-2025		TLM 1	
27.	section modulus of rectangular, circular, I and T sections	1	21-08-2025		TLM 1	
28.	Design of simple beam sections	1	23-08-2025		TLM 1	
29.	Problems on Design of simple beam sections.	1	01-09-2025		TLM 3	
30.	Problems on Design of simple beam sections.	1	02-09-2025		TLM 3	
31.	**TORSION:** Introduction-Derivation	1	04-09-2025		TLM 1	
32.	Torsion of Circular shafts- Pure Shear	1	06-09-2025		TLM 1	
33.	Transmission of power by circular shafts	1	08-09-2025		TLM 1	
34.	Shafts in series, Shafts in parallel.	1	09-09-2025		TLM 3	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: SHEAR STRESSES IN BEAMS & DEFLECTION OF BEAMS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	**SHEAR STRESSES IN BEAMS:** Derivation of formula	1	11-09-2025		TLM 1	
36.	Shear stress distribution across rectangular and triangular Sections	1	15-09-2025		TLM 1	
37.	Shear stress distribution across I and T section	1	16-09-2025		TLM 3	
38.	**DEFLECTION OF BEAMS:** Bending into a circular arc – slope, deflection and radius of Curvature	1	18-09-2025		TLM 1	
39.	Differential equation for the elastic line of a beam, Double integration method	1	20-09-2025		TLM 1	
40.	Macaulay's method	1	22-09-2025		TLM 1	
41.	Determination of slope and deflection for cantilever	1	23-09-2025		TLM 1	
42.	Determination of slope and deflection for simply supported	1	25-09-2025		TLM 1	

43.	Mohr's theorem and Moment area method	1	27-09-2025		TLM 1	
44.	Application to simple cases.	1	06-10-2025		TLM 3	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: THIN AND THICK CYLINDERS, COLUMNS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses	1	07-10-2025		TLM 1	
46.	Hoop, longitudinal and volumetric strains	1	09-10-2025		TLM 1	
47.	Changes in dia, and volume of thin cylinders	1	13-10-2025		TLM 1	
48.	Problems on thick Cylinders	1	14-10-2025		TLM 3	
49.	Problems on thin Cylinders	1	16-10-2025		TLM 3	
50.	Thin spherical shells	1	18-10-2025		TLM 1	
51.	Wire wound thin cylinders, Lame's Equation	1	20-10-2025		TLM 1	
52.	cylinders subjected to inside & outside pressures –compound cylinders.	1	23-10-2025		TLM 1	
53.	Columns : Buckling and Stability, Columns with Pinned ends	1	25-10-2025		TLM 1	
54.	Columns with other support Conditions	1	27-10-2025		TLM 1	
55.	Limitations of Euler's Formula, Rankine's Formula.	1	28-10-2025		TLM 1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

CONTENT 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.	Shell Theory-Introduction	1	30-10-2025		TLM2	
2	Shell Theory-Concept, Application	1	01-11-2025		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 Calander: 2025-25

Description	From	To	Weeks
B. Tech III semester			
Commencement of class work	30-06-2025		
I phase of Instructions	30-06-2025	23-08-2025	8 weeks
I Mid examinations	25-08-2025	30-08-2025	1 week
II phase of Instructions	01-09-2025	01-11-2025	9 weeks
II Mid examinations	03-11-2025	08-11-2025	1 week
Preparation and practical's	10-11-2025	15-11-2025	1 week
Semester end examinations	17-11-2025	29-11-2025	2 weeks

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME 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 MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Seelam Pichi Reddy
Course Name & Code : Material Science and Metallurgy
L-T-P Structure : **3**-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech III Sem **A.Y.:** 2025-26

PREREQUISITE: Engineering Physics and Engineering Chemistry

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- Understand the crystalline structure of different metals.
- Explain the stability of phases in different alloy systems.
- Study the behaviour of ferrous and non- ferrous metals and alloys and their application in different domains.
- Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.
- Comprehend the properties and applications of ceramic, composites and other advanced methods.

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

CO1	Understand the crystalline structure of different metals **(Understanding-L2)**
CO2	Recognize the stability of phases in different alloy systems **(Remembering-L1)**
CO3	Explain the behavior of ferrous and non-ferrous metals and alloys and their application in different domains. **(Understanding-L2)**
CO4	Study the heat treatment and age hardening process. **(Remembering-L1)**
CO5	Identify the properties and applications of ceramic, composites and other advanced methods. **(Understanding-L2)**

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

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

TEXTBOOKS:

T1	S.H.Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 1997.
T2	Donald R.Askeland, Essentials of Materials science and Engineering, 4/e, CL Engineering publications, 2018.

REFERENCE BOOKS:

R1	Dr. V.D.kodgire, Material Science and Metallurgy, 39/e, Everest Publishing House, 2017.
R2	V.Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2004.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Structure of Metals and 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.	Introduction – CEOs, Cos and POs	1	30-06-2025		TLM1, TLM2	
2.	Crystallization of metals	1	01-07-2025		TLM1, TLM2	
3.	Packing Factor	1	02-07-2025		TLM1, TLM2	
4.	Simple Cubic,	1	04-07-2025		TLM1, TLM2	
5.	Body Centered Cubic	1	07-07-2025		TLM1, TLM2	
6.	Face Centered Cubic	1	08-07-2025		TLM1, TLM2	
7.	Hexagonal Closed Packed	1	09-07-2025		TLM1, TLM2	
8.	Grain and grain boundaries,	1	11-07-2025		TLM1, TLM2	
9.	Effect of grain boundaries on Properties of metals	1	14-07-2025		TLM1, TLM2	
10.	Determination of grain size.	1	15-07-2025		TLM1, TLM2	
11.	Necessity of alloying,	1	16-07-2025		TLM1, TLM2	
12.	Types of solid solutions	1	18-07-2025		TLM1, TLM2	
13.	Hume Rothery's rules, Intermediate alloy phases	1	21-07-2025		TLM1, TLM2	
14.	Electron compounds	1	22-07-2025		TLM1, TLM2	
No. of classes required to complete UNIT-I: 14				**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
15.	Importance of Equilibrium Diagrams	1	23-07-2025		TLM1, TLM2	
16.	Experimental methods of construction of equilibrium diagrams	1	25-07-2025		TLM1, TLM2	
17.	Isomorphous alloy systems	1	28-07-2025		TLM1, TLM2	
18.	Equilibrium cooling and heating of alloys	1	29-07-2025		TLM1, TLM2	
19.	Lever rule,	1	30-07-2025		TLM1, TLM2	
20.	Coring miscibility gaps, Eutectic systems,	1	01-08-2025		TLM1, TLM2	
21.	Peritectic reaction.	1	04-08-2025		TLM1, TLM2	
22.	Transformations in the solid state	1	05-08-2025		TLM1, TLM2	
23.	Allotropy, Eutectoid, Peritectoid reactions	1	06-08-2025		TLM1, TLM2	
24.	Phase rule	1	08-08-2025		TLM1, TLM2	
25.	Relationship between equilibrium diagrams and properties of alloys	1	11-08-2025		TLM1, TLM2	
26.	Study of binary phase diagrams such as Cu-Ni	1	12-08-2025		TLM1, TLM2	
27.	Bi-Cd	1	13-08-2025		TLM1, TLM2	
28.	Fe-Fe_3C Equilibrium Diagram	1	18-08-2025		TLM1, TLM2	
29.	Fe-Fe_3C Phase changes with temperature	1	19-08-2025		TLM1, TLM2	
30.	Revision Unit-1	1	20-08-2025		TLM1, TLM2	
31.	Revision Unit-2	1	22-08-2025		TLM1, TLM2	
I Mid Examination -25-08-20254 to 30-08-2025						
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		

UNIT-III: 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
32.	Structure and properties of White Cast iron, Malleable Cast iron	1	01-09-2025		TLM1, TLM2	
33.	Grey cast iron, Spheriodal graphite cast iron	1	02-09-2025		TLM1, TLM2	
34.	Alloy cast iron	1	03-09-2025		TLM1, TLM2	
35.	Classification of steels	1	05-09-2025		TLM1, TLM2	
36.	Structure and properties of plain carbon steels	1	08-09-2025		TLM1, TLM2	
37.	LCS, MCS and HCS	1	09-09-2025		TLM1, TLM2	
38.	Low alloy steels, Hadfield manganese	1	10-09-2025		TLM1, TLM2	
39.	Tool and die steels	1	12-09-2025		TLM1, TLM2	
40.	Structure and properties of Copper.	1	15-09-2025		TLM1, TLM2	
41.	Copper Alloys	1	16-09-2025		TLM1, TLM2	
42.	Structure and properties of Aluminum	1	17-09-2025		TLM1, TLM2	
43.	Aluminum Alloys	1	18-09-2025		TLM1, TLM2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Heat treatment of Steels

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.	Heat Treatment Introduction	1	22-09-2025		TLM1, TLM2	
45.	Annealing,	1	23-09-2025		TLM1, TLM2	
46.	Normalizing, Hardening	1	24-09-2025			
47.	TTT diagrams	1	26-09-2025		TLM1, TLM2	
48.	CCC Diagrams	1	29-09-2025			
49.	Critical Cooling Rate	1	01-10-2025			
50.	Tempering and harden ability	1	03-10-2025		TLM1, TLM2	
51.	Jominy End Quench Test	1	06-10-2025		TLM1, TLM2	
52.	Surface - hardening methods – Flame and Induction Hardening	1	07-10-2025		TLM1, TLM2	
53.	Carburizing, Nitriding and Carbo-nitriding	1	08-10-2025		TLM1, TLM2	
54.	Age hardening treatment	1	10-10-2025		TLM1, TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Ceramic and Advanced materials

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
55.	Crystalline ceramics,	1	13-10-2025		TLM1, TLM2	
56.	Glasses, cermets,	1	14-10-2025		TLM1, TLM2	
57.	Abrasive materials	1	15-10-2025		TLM1, TLM2	
58.	Classification of composites,	1	17-10-2025		TLM1, TLM2	
59.	Manufacturing methods	1	20-10-2025		TLM1, TLM2	
60.	Particle reinforced composites,	1	22-10-2025		TLM1, TLM2	

61.	fiber reinforced composites	1	24-10-2025		TLM1, TLM2	
62.	PMC, MMC,	1	27-10-2025		TLM1, TLM2	
63.	CMC and CCCs	1	28-10-2025		TLM1, TLM2	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
64.	Smart Materials	1	29-10-2025		TLM1, TLM2	
65.	Revision	1	31-10-2025		TLM1, TLM2	

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

ACADEMIC CALENDER:

Commencement of Class work		**15-07-2024**	
I Phase of Instructions	30-06-2025	23-08-2025	8 W
I Mid Examinations	**25-08-2025**	**30-08-2025**	**1 W**
II Phase of Instructions	01-09-2025	01-11-2025	9 W
II Mid Examinations	**03-11-2025**	**08-11-2025**	**1 W**
Preparation and Practical's	10-11-2025	15-11-2025	1 W
Semester End Examinations	**17-11-2025**	**29-11-2025**	**2 W**

PART-C

EVALUATION PROCESS (R 23 Regulation):

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

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, Computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature and analyze Complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO 5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments
PO 11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor/ Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. S.Pichi Reddy**	**Mr.J.Subba Reddy**	**Dr. M.B.S.S Reddy**
Signature			

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Venkateswara Reddy
Course Name & Code : UHV2–Understanding harmony and Ethical human conduct (23HS01)
L-T-P Structure : 2-1-0 **Credits** : 3
Program/Sem/Sec : B.Tech III Semester – ME **A.Y.** : 2025-26

PREREQUISITE: Nil
COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards valuebased living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity. **(Understanding-L2)**
CO2	Identify one's self, and one's surroundings (family, society nature). **(Understanding-L2)**
CO3	Relate human values with human relationship and human society. **(Understanding-L2)**
CO4	Illustrate the need for universal human values and harmonious existence. **(Understanding-L2)**
CO5	Develop as socially and ecologically responsible engineers. **(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	3	1	-	-	3	-	-	-
CO2	-	-	-	-	-	1	2	3	3	1	-	2	-	-	-
CO3	-	-	-	-	-	3	2	1	1	1	-	2	-	-	-
CO4	-	-	-	-	-	3	3	2	2	-	-	2	-	-	-
CO5	-	-	-	-	-	2	2	3	1	-	-	3	-	-	-

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999

R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004

R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Value Education

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, COs, POs and articulation matrix	1	01-07-2025		TLM1,2	
2.	Right Understanding, Relationship and Physical Facility	1	02-07-2025		TLM1,2	
3.	Right Understanding, Relationship and Physical Facility	1	05-07-2025		TLM1,2	
4.	Understanding Value Education	1	08-07-2025		TLM1,2	
5.	Sharing about Oneself	1	09-07-2025		TLM3	
6.	Self-exploration as the Process for Value Education	1	12-07-2025		TLM1,2	
7.	Continuous Happiness and Prosperity – the Basic HumanAspirations	1	15-07-2025		TLM1,2	
8.	Exploring Human Consciousness	1	16-07-2025		TLM3	
9.	Happiness and Prosperity – Current Scenario	1	19-07-2025		TLM1,2	
10.	Method to Fulfill the Basic Human Aspirations	1	22-07-2025		TLM1,2	
11.	Exploring Natural Acceptance	1	23-07-2025		TLM3	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: Harmony in the Human Being

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Understanding Human being as the Co-existence of the self and the body.	1	26-07-2025		TLM1,2	
13.	Distinguishing between the Needs of the self and the body	1	29-07-2025		TLM1,2	
14.	Exploring the difference of Needs of self and body.	1	30-07-2025		TLM3	
15.	The body as an Instrument of the self	1	02-08-2025		TLM1,2	
16.	Understanding Harmony	1	05-08-2025		TLM1,2	

	in the self					
17.	Exploring Sources of Imagination in the self	1	06-08-2025		TLM3	
18.	Harmony of the self with the body	1	09-08-2025		TLM1,2	
19.	Programme to ensure self-regulation and Health	1	12-08-2025		TLM1,2	
20.	Exploring Harmony of self with the body	1	13-08-2025		TLM3	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Harmony in the Family and Society

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.	Harmony in the Family – the Basic Unit of Human Interaction	1	19-08-2025		TLM1,2	
22.	'Trust' – the Foundational Value in Relationship	1	20-08-2025		TLM1,2	
23.	Exploring the Feeling of Trust	1	23-08-2025		TLM3	
24.	'Respect' – as the Right Evaluation	1	02-09-2025		TLM1,2	
25.	Exploring the Feeling of Respect	1	03-09-2025		TLM3	
26.	Other Feelings, Justice in Human-to-Human Relationship	1	06-09-2025		TLM1,2	
27.	Understanding Harmony in the Society	1	09-09-2025		TLM1,2	
28.	Vision for the Universal Human Order	1	10-09-2025		TLM1,2	
29.	Exploring Systems to fulfil Human Goal	1	13-09-2025		TLM3	
No. of classes required to complete UNIT-III: 9				**No. of classes taken:**		

UNIT-IV: Harmony in the Nature/Existence

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Understanding Harmony in the Nature	1	16-09-2025		TLM1,2	
31.	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	1	17-09-2025		TLM1,2	
32.	Exploring the Four Orders of Nature	1	20-09-2025		TLM3	
33.	Realizing Existence as Co-existence at All Levels	1	23-09-2025		TLM1,2	
34.	The Holistic Perception of Harmony in Existence	1	24-09-2025		TLM1,2	
35.	Exploring Co-existence in Existence.	1	27-09-2025		TLM3	
No. of classes required to complete UNIT-IV: 6				**No. of classes taken:**		

UNIT-V: Implications of the Holistic Understanding – a Look at Professional Ethics

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Natural Acceptance of Human Values	1	04-10-2025		TLM1,2	
37.	Definitiveness of (Ethical) Human Conduct	1	07-10-2025		TLM1,2	
38.	Exploring Ethical Human Conduct	1	08-10-2025		TLM3	
39.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	1	11-10-2025		TLM1,2	
40.	Competence in Professional Ethics	1	14-10-2025		TLM1,2	
41.	Exploring Humanistic Models in Education	1	15-10-2025		TLM3	
42.	Holistic Technologies, Production Systems and Management Models Typical Case Studies	1	18-10-2025		TLM1,2	
43.	Strategies for Transition towards Value-based Life and Profession	1	21-10-2025		TLM1,2	
44.	Exploring Steps of Transition towards Universal Human Order	1	22-10-2025		TLM3	
45.	Revision	3	28-10-2025 29-10-2025 01-11-2025		TLM1,2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**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):

PSO1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and

	power, conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Signature				
Name of the Faculty	**Mr.K.Venkateswara Reddy**	**Dr.P.Ravindra Kumar**	**Dr. B. Srinivasa Rao**	**Dr. M.B.S.Sreekara Reddy**

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FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., III-Sem., ME
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : **Environmental Science**
L-T-P STRUCTURE : 2-0-0
COURSE CREDITS : 0
COURSE INSTRUCTOR : Dr. Shaheda Niloufer
COURSE COORDINATOR : Dr. Shaheda Niloufer
PRE-REQUISITES : Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

Course Outcomes (COs): At the end of the course, students will be able to

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	L2

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	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).

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.

T2. Palaniswamy,EnvironmentalStudies,2/e,Pearsoneducation,2014.

T3.S.AzeemUnnisa,EnvironmentalStudies,AcademicPublishingCompany,2021.

T4.K.RaghavanNambiar,"TextbookofEnvironmentalStudiesforUndergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

ReferenceBooks:

R1.KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
R2. DeekshaDaveandE.SaiBabaReddy,TextbookofEnvironmentalScience,2/e, Cengage Publications, 2012.
R3.M.AnjiReddy,"TextbookofEnvironmentalSciencesandTechnology",BSPublication, 2014.
R4.J.P.Sharma,ComprehensiveEnvironmentalstudies,Laxmipublications,2006.
R5.J.GlynnHenryandGaryW.Heinke,EnvironmentalSciencesandEngineering, Prentice Hall of India Private limited, 1988.
R6.G.R.Chatwal,ATextBookofEnvironmentalStudies,HimalayaPublishingHouse, 2018.
R7. GilbertM.MastersandWendellP.Ela,IntroductiontoEnvironmentalEngineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	01-07-2025		TLM2			
2.	Multidisciplinary Nature ofEnvironmental Studies	1	03-07-2025		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Natural Resources – Forest resources	1	08-07-2025		TLM1	CO1	T1,T2	
4.	Water resources	1	10-07-2025		TLM1	CO1	T1,T2	
5.	Mineral resources	1	15-07-2025		TLM1	CO1	T1,T2	
6.	Food resources	1	17-07-2025		TLM1	CO1	T1,T2	
7.	Energy resources	1	22-07-2025		TLM1	CO1	T1,T2	
No. of classes required to complete UNIT-I		07			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

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
8.	Ecosystems – Structure & Functions Ecosystems – Structure & Functions	1	24-07-2025		TLM1	CO2	T1,T2	
9.	Ecological succession &	1	29-07-2025		TLM1	CO2	T1,T2	
10.	Food chains, Food webs & Ecological Pyramids	1	31-08-2025		TLM1	CO2	T1,T2	
11.	Types of ecosystems	1	05-08-2025		TLM1	CO2	T1,T2	
12.	Biodiversity – introduction, levels, bio geographic classification	1	07-08-2025		TLM1	CO2	T1,T2	

13.	Values of Biodiversity, India as mega diversity nation	1	12-08-2025		TLM1	CO2	T1,T2	
14.	Threats to biodiversity and Conservation of biodiversity	1	14-08-2025		TLM1	CO2	T1,T2	
15.	Revision	1	19-08-2025		TLM3	CO2	T1,T2	
16.	Revision	1	21-08-2025		TLM3	CO2	T1,T2	
No. of classes required to complete UNIT-II		09			No. of classes taken:			

I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)

UNIT-III: Environmental Pollution

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
17.	Environmental pollution -Air pollution	1	02-09-2025		TLM1	CO3	T1,T2	
18.	Water pollution, Marine pollution, Thermal pollution	1	04-09-2025		TLM1	CO3	T1,T2	
19.	Soil pollution	1	09-09-2025		TLM1	CO3	T1,T2	
20.	Noise pollution & Nuclear Hazards	1	11-09-2025		TLM1	CO3	T1,T2	
21.	Solid waste management	1	16-09-2025		TLM1	CO3	T1,T2	
22.	Disaster management	1	18-09-2025		TLM1	CO3	T1,T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

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
23.	From Unsustainable to Sustainable development	1	23-09-2025		TLM1	CO4	T1,T2	
24.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	25-09-2025		TLM1	CO4	T1,T2	
25.	Environmental ethics, Climate change	1	07-10-2025		TLM1	CO4	T1,T2	
26.	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	09-10-2025		TLM1	CO4	T1,T2	
27.	Environmental Acts	1	14-10-2025		TLM1	CO4	T1,T2	
28.	Environmental Acts	1	16-10-2025		TLM1	CO4	T1,T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
29.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	16-10-2025		TLM1	CO5	T1,T2	
30.	Environment and human health –Human Rights – Value Education	1	23-10-2025		TLM1	CO5	T1,T2	
31.	HIV/AIDS – Women and Child Welfare	1	28-10-2025		TLM1	CO5	T1,T2	
32.	Role of information Technology in Environment and human health	1	30-10-2025		TLM1	CO5	T1,T2	
33.	Revision	1	30-10-2025		TLM3	CO5	T1,T2	
No. of classes required to complete UNIT-V		06			No. of classes taken:			

Content 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
34.	Case studies	2	19-08-2025 23-10-2025		TLM2	CO2	T1,T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C EVALUATION PROCESS (R23 Regulation):

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

Dr. Shaheda Niloufer	**Dr. Shaheda Niloufer**	**Dr. Shaheda Niloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. J. Subba Reddy (T668), Mr.K.V.Viswanath (T572),
\ Dr.A.Dhanunjay Kumar (T811), Mr.S.Uma Maheswara Reddy (T840)

Course Name & Code	**: Mechanics of Solids & Materials Science Lab (23ME53)**	**Regulation**	**: R23**
L-T-P Structure	**: 0-0-3**	**Credits**	**: 1.5**
Program/Sem/Sec	**: B.Tech/A/III Semester**	**A.Y.**	**: 2025-26**

PREREQUISITE: Mechanics of Solids, Material Science and Metallurgy

COURSE EDUCATIONAL OBJECTIVES (CEOs):
The main objective of the course is to determine various mechanical properties of materials by testing under different load conditions, 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

CO	Statements
CO1	Estimate the behaviour of various materials under different loading. **(Understanding L2)**
CO2	Calculate the hardness of different materials. **(Applying – L3)**
CO3	Evaluate the mechanical properties of materials by conducting various tests. **(Applying-L3)**
CO4	Identify the material by observing the microstructure. **(Applying-L3)**
CO5	Evaluate the hardness of treated and untreated steels. **(Applying-L3)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	--	--	--	--	--	--	--	--	--	2	--	2	3
CO2	3	--	1	--	--	--	--	--	--	--	--	2	--	3	2
CO3	3	1	2	--	--	--	--	--	--	--	--	2	--	2	3
CO4	3	2	--	--	--	--	--	--	--	--	--	2	--	3	--
CO5	2	3	--	--	--	--	--	--	--	--	--	2	--	3	2

REFERENCE: Lab Manual

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

LIST OF EXPERIMENTS

NOTE: Any 6 experiments from each section A and B.

A) MECHANICS OF SOLIDS LAB:

1. Tensile test. **(MOS1)**
2. Bending test on a) Simply supported beam b) Cantilever beam. **(MOS2)**
3. Torsion test. **(MOS3)**
4. Hardness test **(MOS4)**

   (a) Brinell's hardness test (b) Rockwell hardness test (c) Vickers hardness test.
5. Test on springs. **(MOS5)**
6. Impact test a) Charpy test b) Izod test. **(MOS6)**
7. Shear test. **(MOS7)**

B) MATERIAL SCIENCE LAB:

1. Preparation and study of the Microstructure of pure metals. **(MSC1)**
2. Preparation and study of the Microstructure of Mild steel, medium carbon steels, andHigh carbon steels. **(MSC2)**
3. Study of the Microstructures of Cast Irons. **(MSC3)**
4. Study of the Microstructures of Non-Ferrous alloys. **(MSC4)**
5. Study of the Microstructures of Heat-treated steels. **(MSC5)**
6. Hardenability of steels by Jominy End Quench Test. **(MSC6)**

(C) VIRTUAL LAB:

1. To investigate the principal stresses σa and σb at any given point of a structural element or machine component when it is in a state of plane stress. (https://virtual- labs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html)
2. To find the impact resistance of mild steel and cast iron.(https://sm- nitk.vlabs.ac.in/exp/izod-impact-test).
3. To find the impact resistance of mild steel.(https://sm-nitk.vlabs.ac.in/exp/charpy- impact-test/index.html)
4. To find the Rockwell hardness number of mild steel, cast iron, brass, aluminum and spring steel etc. (https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test)
5. To determine the indentation hardness of mild steel, brass, aluminum etc. using Vickers hardness testing machine. (https://sm-nitk.vlabs.ac.in/exp/vickers-hardness- test).

REFERENCE: Lab Manual

BATCH- SCHEDULE

S.no	Date	BATCHES											
		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
1	30-06-2025	Demonstration of Mechanics of Solids & Materials Science Lab											
2	07-07-2025	MOS-1	MOS-2	MOS-3	MOS-4	MOS-5	MOS-6	MSC-1	MSC-2	MSC-3	MSC-4	MSC-5	MSC-6
3	14-07-2025	MOS-2	MOS-3	MOS-4	MOS-5	MOS-6	MOS-1	MSC-2	MSC-3	MSC-4	MSC-5	MSC-6	MSC-1
4	21-07-2025	MOS-3	MOS-4	MOS-5	MOS-6	MOS-1	MOS-2	MSC-3	MSC-4	MSC-5	MSC-6	MSC-1	MSC-2
5	28-07-2025	MOS-4	MOS-5	MOS-6	MOS-1	MOS-2	MOS-3	MSC-4	MSC-5	MSC-6	MSC-1	MSC-2	MSC-3
6	04-08-2025	MOS-5	MOS-6	MOS-1	MOS-2	MOS-3	MOS-4	MSC-5	MSC-6	MSC-1	MSC-2	MSC-3	MSC-4
7	11-08-2025	MOS-6	MOS-1	MOS-4	MOS-3	MOS-4	MOS-5	MSC-6	MSC-1	MSC-2	MSC-3	MSC-4	MSC-5
8	18-08-2025	Virtual Lab											
25-08-2025 to 30-08-2025: I Mid Examinations													
8	01-09-2025	MSC-1	MSC-2	MSC-3	MSC-4	MSC-5	MSC-6	MOS-1	MOS-2	MOS-3	MOS-4	MOS-5	MOS-6
9	08-09-2025	MSC-2	MSC-3	MSC-4	MSC-5	MSC-6	MSC-1	MOS-2	MOS-3	MOS-4	MOS-5	MOS-6	MOS-1
10	15-09-2025	MSC-3	MSC-4	MSC-5	MSC-6	MSC-1	MSC-2	MOS-3	MOS-4	MOS-5	MOS-6	MOS-1	MOS-2
11	22-09-2025	MSC-4	MSC-5	MSC-6	MSC-1	MSC-2	MSC-3	MOS-4	MOS-5	MOS-6	MOS-1	MOS-2	MOS-3
12	29-09-2025	MSC-5	MSC-6	MSC-1	MSC-2	MSC-3	MSC-4	MOS-5	MOS-6	MOS-1	MOS-2	MOS-3	MOS-4
13	06-10-2025	MSC-6	MSC-1	MSC-2	MSC-3	MSC-4	MSC-5	MOS-6	MOS-1	MOS-4	MOS-3	MOS-4	MOS-5
14	13-10-2025	Virtual Lab											
15	20-10-2025	Repetition											
16	27-10-2025	Internal Examination											
03-11-2025 to 08-11-2025: II Mid Examinations													
		No. of classes required to complete:								No. of classes taken:			

Batches:

S. No	Batch	Registered Nos	Total
1	B1	24761A0301-306	6
2	B2	24761A0307-312	6
3	B3	24761A0313-318	6
4	B4	24761A0319- 320, 322 - 325	6
5	B5	24761A0326-331	6
6	B6	24761A0332-336	5

S. No	Batch	Registered Nos	Total
7	B7	24761A0337-342	6
8	B8	24761A0343-344, 346-349	6
9	B9	24761A0350-355	6
10	B10	24761A0356-360	5
11	B11	24761A0361-365	5
12	B12	25765A0301 - 306	6

TEACHING LEARNING METHODS			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/SwayamPrabha/MOOCS)
TLM3	Tutorial	TLM6	Group Discussion/Project

PART-C

EVALUATION PROCESS (R20 Regulation):

EVALUATION TASK	EXPT. NOs	MAXIMUM MARKS
Day to Day work = **A**	1,2,3,4,5,6,7,8…	**A = 15 M**
Record = **B**	1,2,3,4,5,6,7,8	**B = 05 M**
Internal Test = **C**	1,2,3,4,5,6,7,8	**C = 15 M**
Cumulative Internal Examination: A + B + C = 30 M	1,2,3,4,5,6,7,8	**30 M**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 70 M**
Total Marks: A + B + C + D = 100 M	1,2,3,4,5,6,7,8	**100 M**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management 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 ofperformance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. J. Subba Reddy (T668) Mr. K.V.Viswanath (T572) Dr. A. Dhanujaya Kumar (T811) Mr. S. U. Maheswar Reddy (T840)	Mr. K. V. Viswanath (T572)	Dr. B. Sudheer Kumar (T542)	Dr. M. B. S. Sreekara Reddy (T875)
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.V.Sankararao / Dr.A.Dhanunjay Kumar / Mr.D.Mallikharuna Rao
Course Name & Code : Computer Aided Machine Drawing - 23ME54
L-T-P Structure : 0-0-3
Program/Sem/Sec : B.Tech., ME., III-Sem., A/S Credits : 1.5
PRE-REQUISITE : Engineering Graphics A.Y: 2025-26

COURSE OBJECTIVES:

- Introduce conventional representations of material and machine components.
- Train to use software for 2D and 3D modeling.
- Familiarize with thread profiles, riveted, welded and key joints.
- Teach solid modeling of machine parts and their sections.
- Explain creation of 2D and 3D assembly drawings and familiarize with limits, fits, and tolerances in mating components.

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

CO1	Demonstrate the conventional representations of materials and machine components. (Understanding-L2)
CO2	Model riveted, welded and key joints using CAD system. (Applying-L3)
CO3	Create solid models and sectional views of machine components. (Applying-L3)
CO4	Assemble the solid models of machine parts. (Evaluating-L5)
CO5	Generate part drawings from assembly. (Evaluating-L5)

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

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

MATERIAL: Lab Manual

Textbooks:

1. Machine Drawing by K.L.Narayana, P.Kannaiah and K.Venkat Reddy, New Age International Publishers, 3/e, 2014
2. Machine drawing by N.Sideshwar, P. Kannaiah, V.V.S.Sastry, TMH Publishers. 2014.

Reference Books:

1. Cecil Jensen, Jay Helsel and Donald D.Voisinet, Computer Aided Engineering Drawing, Tata McGraw-Hill, NY, 2000.
2. James Barclay, Brain Griffiths, Engineering Drawing for Manufacture, KoganPage Science, 2003.
3. N.D.Bhatt, Machine Drawing, Charotar Publishers, 50/e, 2014.

Online Learning Resources:

• https://eeedocs.wordpress.com/wp-content/uploads/2014/02/machinedrawing.pdf
• https://archive.nptel.ac.in/courses/112/105/112105294/
•https://www.edx.org/learn/engineering/dassault-systemes-solidworks-solidworks cadfundamentals?index=product&queryID=c90b35a82a6ef58b0d6f89679c63f6a1&position=2&linked_from=autocomplete&c=autocomplete
• https://www.youtube.com/watch?v=0bQkS3_3Fq4

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.	Demonstration	03	04-07-2025		TLM2	CO 1,2,3,4	
2.	Conventional representation of materials and components	03	11-07-2025		TLM4	CO 1,2,3,4	
3.	Detachable joints	03	18-07-2025		TLM4	CO1	
4.	Riveted joints	03	25-07-2025		TLM4	CO1	
5.	Welded joints	03	01-08-2025		TLM4	CO2	
6.	Keys and types of keys	03	08-08-2025		TLM4	CO3	
7.	Sectional views	03	22-08-2025		TLM4	CO3	
8.	Shaft couplings	03	05-09-2025		TLM4	CO4	
9.	Engine parts – Stuffing box	03	12-09-2025		TLM4	CO4	
10.	Connecting rod	03	19-09-2025		TLM4	CO5	
11.	Piston assembly	03	26-09-2025		TLM4	CO5	

12.	Screw jack	03	03-10-2025		TLM4	CO5	
13.	Production drawing: Representation of limits, fits and tolerances for mating parts.	03	10-10-2025		TLM4	CO5	
14.	Preparation of manufacturing drawing with dimensional and geometric tolerances	03	17-10-2025		TLM4	CO5	
15.	Repetition	03	24-10-2025		TLM4	-	
16.	Internal Exam	03	31-10-2025		-	-	

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

ACADEMIC CALENDAR:

Description	**From**	**To**	**Weeks**
I Phase of Instructions	30/06/2025	23/08/2025	8
I Mid Examinations	25/08/2025	30/08/2025	1
II Phase of Instructions	01/09/2025	01/11/2025	9
II Mid Examinations	03/11/2025	08/11/2025	1
Preparation and Practicals	10/11/2025	15/11/2025	1
Semester End Examinations	17/11/2025	29/11/2025	2

EVALUATION PROCESS:

Evaluation Task	**Marks**
Day to Day Evaluation: A	A=10
Internal Lab Exams: B	B=15
Record: C	C=5
Cumulative Internal Examination : CIE = A+B+C	**CIE=30**
Procedure: A	A=20
Execution & Results: B	B=30
Viva-Voce: C	C=20
Semester End Examinations: SEE = A+B+C	**SEE=70**
Total Marks: CIE+SEE	**100**

LIST OF EXPERIMENTS:

Expt. No.	Type of Drawings	Name of the Experiment
1.	Conventional Drawing	Conventional representations of various materials
2.		Conventional representations of various machine parts
3.		Sectional Views
4.	Drawing of Machine elements for simple parts	Thread Profiles
5.		Bolt with Nut and Washer
6.		Flanged Coupling
7.		Riveted Joint
8.	Assembly Drawing	Stuffing box
9.		Piston Assembly
10.		Plummer block
11.		Universal Joint
12.		Screw Jack
13.	Production Drawing	Part of Drawing of Simple Parts

NOTIFICATION OF CYCLES:

Exp. No.	Type of Drawings	Name of the Experiment
1.	Cycle-I	Conventional representations of various materials
2.		Conventional representations of various machine parts
3.		Sectional Views
4.	Cycle-II	Thread Profiles
5.		Bolt with Nut and Washer
6.		Keys
7.		Flanged Coupling
8.		Riveted Joint
9.	Cycle-III	Plummer block
10.		Screw Jack
11.		Eccentric
12.		Lathe Tail Stock
13.	Cycle-IV	Part of Drawing of Simple Parts

PART-C

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Mr.V.Sankararao/ Dr.A.Dhanunjay Kumar/ D.Mallikharuna Rao	Mr.K.V.Viswanadh	Dr.B.Sudheer Kumar	Dr.M.B.S.Sreekara Reddy
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B.SWANTH
Course Name & Code : PYTHON PROGRAMMING & 23CS57
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III **A.Y.:** 2025-26

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

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	-	
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

Note: 1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High)

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**Exp-1:** Introduction,Course Outcomes, Introduction to Python, Installation,Variables,Data types.Reading Input, Print output, Comments	3	02-07-2025		
2.	**Exp-2:**Control statements – if, else, nestedif, elif, Loop statements, Programs on Loop statements	3	09-07-2025		
3.	Programs on raek,continue, Pass statements	3	16-07-2025		
4.	Practical Programs on Loops	3	23-07-2025		
5.	**Exp-3:** Function Definition and Calling the function, return Statement and void Function	3	29-07-2025		
6.	Scope and Lifetime of Variables, Function Definition and Calling the function, return Statement and void Function	3	30-07-2025		
7.	Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.Strings Introduction, Basic String Operations	3	06-08-2025		
8.	**EXP-4:** creating lists,tuples,Indexing and Slicing in Lists, tuples,Built-In Functions Used on Lists, List Methods, del Statement, tuple methods **EXP-5:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	13-08-2025		
9.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries, set operations	3	20-08-2025		
10.	**EXP-6:** Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting	3	27-08-2025		

	Strings., Sample Programs on strings				
11.	Introduction to files ,Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	03-09-2025		
12.	Work with different File formats.	3	10-09-2025		
13.	**Unit-7**: Write programs using try, except, else, and finally blocks	3	17-09-2025		
14.	Handle specific exceptions, create and raise specific exceptions	3	24-09-2025		
15.	**EXP-8:Object-Oriented Programming**: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Encapsulation, Inheritance, Polymorphism,	3	24-09-2025		
16.	**EXP-9:**Install and use librariesnumpy,pandas	3	01-10-2025		
17.	**EXP-10:**Data Manipulation and Visuvalization	3	08-10-2025		
18.	**EXP-11:**JSON and XML in Python, NumPy with Python, Pandas.	3	15-10-2025		
19.	**EXP-12:**Programs on Database queries	3	22-10-2024		
20.	**Internal Exam**	3	29-10-2024		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30

Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**B.SWANTH**	**Dr. Y.V.B Reddy**	**Dr. Y.V.B Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.

DEPARTMENT OF MECHANICAL ENGINEERING

Course Name & Code	:	EMBEDDED SYSTEMS & IoT – 23ECS1
L-T-P Structure	:	0-1-3
Credits	:	3
Program	:	II-Year B.Tech., Mech
A.Y	:	2025 - 26

Pre requisite: BEE, C Programming.

Course Objectives:

- To comprehend Microcontroller-Transducers Interface techniques
- To establish Serial Communication techniques with Arduino
- To analyze the basics of SPI communication, and interfacing techniques of Stepper Motor, Accelerometer with Arduino
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of distance sensor on IoT devices.

Course Outcomes:

After competition of this course, the student will be able to:

CO1 : Comprehend Microcontroller-Transducers Interface techniques. **(Understand)**
CO2 : Identify the programming concepts of IOT. **(Design)**
CO3: Develop real time applications using Internet of Things. **(Apply)**
CO4 : Demonstrate the integration of sensors with IOT.. **(Apply)**
CO5 : Adapt effective Communication, presentation and report writing skills. **(Apply)**

HANDS–ON Laboratory Sessions:

PART-A: Embedded Systems Experiments- (Any 5 from the following)

List of experiments:

1. Measure Analog signal from Temperature Sensor.
2. Generate PWM output.
3. Drive single character generation on Hyper Terminal.
4. Drive a given string on Hyper Terminal.
5. Full duplex Link establishment using Hyper terminal.
6. Drive a given value on a 8 bit DAC consisting of SPI.
7. Drive Stepper motor using Analog GPIOs.
8. Drive Accelerometer and Display the readings on Hyper Terminal.

Components / Boards: 1. Arduino Duemilanove Board 2. Arduino Software IDE.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.
3. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
4. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

PART-B: Internet of Things Experiments-(Any 5 from the following)

1. Getting started with Raspberry Pi, Install Raspian on your SD card.
1. Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.
2. Using Raspberry pi a. Calculate the distance using distance sensor. b. Basic LED functionality.
3. Raspberry Pi interact with online services through the use of public APIs and SDKs.
4. Study and Install IDE of Arduino and different types of Arduino.
5. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
6. Calculate the distance using distance sensor Using Arduino.
7. Basic LED functionality Using Arduino.
8. Calculate temperature using temperature sensor Using Arduino.
9. Calculate the distance using distance sensor Using Node MCU.
10. Basic LED functionality Using Node MCU.

Text Books:

1. Arsheep Bahga &Vijay Madisetti, Internet of Things - A Hands-on Approach, 1/e, Orient Blackswan Private Limited - New Delhi, 2015.
2. Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,

Online Learning Sources

1. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
2. https://onlinecourses.nptel.ac.in/noc20_ee98/preview
3. https://archive.nptel.ac.in/courses/108/105/108105057/

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

PART-A: Embedded Systems Experiments						
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 Arduino Duemilanove Board and installation of Arduino Software IDE.	1	05-07-2024		TLM5	
2.	Demonstration on Temperature Sensor and to measure Analog signal from Temperature Sensor.	1	12-07-2024		TLM5	
3.	Demonstration on generation of PWM wave	1	19-07-2024		TLM5	
4.	Demonstration on driving single character generation and drive a given string on Hyper Terminal.	1	02-08-2024		TLM5	
5.	Demonstration on full duplex Link establishment using Hyper terminal.	1	09-08-2024		TLM5	
6.	Demonstration on driving a given value on a 8 bit DAC consisting of SPI.	1	23-08-2024		TLM5	
7.	Demonstration on driving Stepper motor using Analog GPIOs.	1	06-09-2024		TLM5	

PART-B: Internet of Things Experiments						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
8.	Getting started with Raspberry Pi, Install Raspian on your SD card .	1	13-09-2024		TLM5	
9.	Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.	1	20-09-2024		TLM5	
10.	Using Raspberry pi a. Calculate the distance using distance sensor. b. Basic LED functionality.	1	27-09-2024		TLM5	
11.	Raspberry Pi interact with online services through the use of public APIs and SDKs.	1	04-10-2024		TLM5	
12.	Study and Install IDE of Arduino and different types of Arduino and Implement Zigbee Protocol using Arduino / Raspberry Pi.	1	11-10-2024		TLM5	
13.	Calculate the distance using distance sensor Using Arduino.	1	18-10-2024		TLM5	
14.	Basic LED functionality Using Arduino and to calculate temperature using temperature sensor Using Arduino.	1	25-10-2024		TLM5	
15.	Basic LED functionality and calculate the distance using distance sensor Using Node MCU.	1	01-11-2024		TLM5	

Hands – on Laboratory Session						
S.No.	**Experiments to be conducted**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
	PART-A: Embedded Systems Experiments					
1.	Measuring Analog signal from Temperature Sensor.	3	05-07-2024		TLM8	
2.	Generation of PWM output.	3	12-07-2024		TLM8	
3.	Drive single character generation and a given string on Hyper Terminal.	3	19-07-2024		TLM8	
4.	Full duplex Link establishment using Hyper terminal.	3	02-08-2024		TLM8	
5.	Drive a given value on a 8 bit DAC consisting of SPI.	3	09-08-2024		TLM8	
6.	Drive Stepper motor using Analog GPIOs.	3	23-08-2024		TLM8	
7.	Drive Accelerometer and Display the readings on Hyper Terminal	3	06-09-2024		TLM8	
	PART-B: Internet of Things Experiments					
8.	Getting started with Raspberry Pi, Install Raspian on your SD card.	3	13-09-2024		TLM8	
9.	Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.	3	20-09-2024		TLM8	
10.	Using Raspberry pi a. Calculate the distance using distance sensor. b. Basic LED functionality.	3	27-09-2024		TLM8	
11.	Raspberry Pi interact with online services through the use of public APIs and SDKs.	3	04-10-2024		TLM8	
12.	Study and Install IDE of Arduino, different types of Arduino and Implement Zigbee Protocol using Arduino / Raspberry Pi.	3	11-10-2024		TLM8	
13.	Calculate the distance using distance sensor Using Arduino.	3	18-10-2024		TLM8	
14.	Basic LED functionality and calculate temperature using temperature sensor Using Arduino.	3	25-10-2024		TLM8	
15.	Basic LED functionality and calculate the distance using distance sensor Using Node MCU	3	01-11-2024		TLM8	
No.of classes required to complete:		**45**	**No.of classes conducted:**			

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

PART-C: EVALUATION PROCESS:

Evaluation Task	**Marks**
Semester End Examination (SEE)	**100**
Total Marks = 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.
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PO 11:	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12:	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2:	**VLSI and Embedded Systems:** Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mr. T. Anil Raju]	[Mr. K. Sasi Bhushan]	[Dr. P. Lachi Reddy]	[Dr. G. Srinivasulu]