MANAKULA VINAYAGAR
INSTITUTE OF TECHNOLOGY

Approved by the AICTE, New Delhi - Affiliated to Pondicherry University
Accredited by NAAC WITH 'A' Grade and NBA (National Board of Accreditation)
Kalitheerthalkuppam, Puducherry - 605 107
Ph: 0413 2643007 / Website: www.mvit.edu.in

Curriculum & Syllabus

for

UG Degree course

in

B.Tech.

DEPARTMENT OF MECHANICAL ENGINEERING

REGULATION- 2025

2025-26

2026-27

MANAKULA VINAYAGAR
INSTITUTE OF TECHNOLOGY
An Autonomous Institution
Affiliated to Pondicherry University, Approved by AICTE, New Delhi,
Accredited by NAAC with 'A' Grade
Kalitheerthalkuppam, Puducherry- 605 107.

Department of Mechanical Engineering

B.Tech- MECH
2025-2026
(FIRST YEAR CURRICULUM)

SEMESTER I							
Sl.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
Induction program							
Theory							
1	25UMAT11	Matrices & Calculus	BSC	3	1	0	4
2	25UPHT13	Physical science for Mechanical Engineering	BSC	3	0	0	3
3	25UHST13	Universal Human Values-II	HSC	2	0	0	2
4	25UMET14	Concepts of Engineering in Biology	BSC	3	0	0	3
Integrated Course							
5	25UMEI15	Manufacturing Processes & practice	PC	3	0	2	4
6	25UHSI16	Professional Communications for Engineers	HSC	1	0	4	3
Practical							
7	25UPHP13	Physical science lab for Mechanical Engineering	BSC	0	0	2	1
8	25UGEP18	Design Thinking &Idea Lab	ESC	0	0	2	1
9	25UGEP19	Engineering Graphics and Auto CAD	ESC	0	0	2	1
Employability Enhancement Course							
10	25UPCE11	Career Development Skills	EEC	0	0	2	0
Mandatory Course							
11	25UMCC11	IKS- Concept & application in Engineering and Science	MCC	0	0	2	0
12	25UMCC12	Environmental Science & Sustainability	MCC	2	0	0	0
		Total Credits		**19**	**1**	**14**	**22**

SEMESTER II							
Sl.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
Theory							
1	25UMAT21	Differential Equations And Transforms	BSC	3	1	0	4
2	25UMET22	Engineering Mechanics	ESC	3	1	0	4
3	25UMET23	Applied Electrical, Electronics and Instrumentation Engineering	ESC	3	0	0	3
4	25UMET24	Machining Processes	PC	3	0	0	3
Integrated Course							
5	25UCSI25	Problem solving using Programming Language	ESC	1	0	2	2
Practical							
6	25UEEP26	Electrical & Electronics Engineering Lab	ESC	0	0	2	1
7	25UMEP27	Machining Processes Lab	PC	0	0	2	1
8	25UGEP28	Fabrication Lab	ESC	0	0	2	1
Employability Enhancement Course							
9	25UPCE21	Communication Skills	EEC	0	0	2	0
10	25UCCC21	Certificate course -I	CCC	0	0	4	0
Mandatory Course							
11	25UMCC21	IKS in humanities & Social Science	MCC	0	0	2	0
12	25UMCC22	Holistic wellness	MCC	0	0	1	0
			Total Credits	**13**	**2**	**17**	**19**

MANAKULA VINAYAGAR
INSTITUTE OF TECHNOLOGY

Approved by the AICTE, New Delhi - Affiliated to Pondicherry University
Accredited by NAAC WITH 'A' Grade and NBA (National Board of Accreditation)
Kalitheerthalkuppam, Puducherry - 605 107
Ph: 0413 2643007 / Website: www.mvit.edu.in

Ph: 0413 2643007 / Website: www.mvit.edu.in

Department of Mechanical Engineering

B.Tech. MECH

REGULATION- 2025

(Curriculum-Autonomous)

III Semester							
Sl.No	Subject Code	Course Title	Category	Periods			Credits
				L	T	P	
Theory							
01	25UMAT35	Applications of Fourier series and Z-Transforms	BS	3	1	0	04
02	25UMET31	Mechanics of Solids	PC	3	1	0	04
03	25UMET32	Fluid Mechanics and Machinery	PC	3	1	0	04
04	25UMET33	Applied Thermodynamics	PC	3	1	0	04
Integrated Course (Type- 6)							
05	25UMEI31	Metallurgy, Material Science & Lab	PC	3	0	2	04
Practical							
06	25UMEP31	Advanced Manufacturing Process Lab	PC	0	0	2	01
07	25UMEP32	Fluid Mechanics and Machinery Lab	PC	0	0	2	01
Employability Enhancement Course							
08	25UPCE31	Personality development	EEC	0	0	2	0
09	25UCCC03	Certificate course II Web Application Development (HTML)	CCC				0
Mandatory Course							
10	25UMCC31	Indian constitution & Human Rights	MCC	0	0	2	0
Total				**15**	**4**	**10**	**22**

IV Semester							
S. No.	Subject Code	Course Title	Category	Periods			Credits
				L	T	P	
Theory							
01	25UMAT41	Statistical And Numerical Methods	BS	3	1	0	04
02	25UMET41	Kinematics and Dynamics of Machinery	PC	3	1	0	04
03	25UMET42	Thermal Engineering	PC	3	1	0	04
04	25UMET43	Mechatronics, Robotics & Control	PC	3	0	0	03
Integrated Course (Type- 4)							
05	25UMEI41	Computer aided machine drawing theory & Lab	PC	2	0	2	03
Practical							
06	25UMEP41	Thermal Engineering Lab	PC	0	0	2	01
07	25UMEP42	Dynamics of Machinery Lab	PC	0	0	2	01
08	25URAP43	Robotics Lab	PC	0	0	2	01
Core Enrichment Course							
09	25UMEW49	Mini-Project-1	CEC	0	0	2	01
Employability Enhancement Course							
10	25UPCE41	Professionalism and Basic Aptitude	EEC	3	0	0	0
11	25UCCC05	Certificate course III Autodesk Auto CAD- ACU	CCC				0
Mandatory Course							
12	25UMCC41	Entrepreneurial skills and concepts	MCC	2	0	0	0
Total				**19**	**3**	**10**	**22**

SYLLABUS

SEMESTER-I

25UMAT11	MATRICES & CALCULUS	Category	L	T	P	Credit
		BSC	3	1	0	4

Course Prerequisite

- Nil

Course Objective

- To understand and gain the knowledge of matrix algebra, partial differentiation, double integration, triple integration and their application, curl, divergence. To familiar with vector differential operators, integral theorems (Green's, Stoke's, Gauss divergence).

Course Outcome

On the successful completion of the course, students will be able to

CO1	Find eigenvalues and eigenvectors, verify the Cayley-Hamilton theorem, and perform orthogonal diagonalization.	K3
CO2	Compute partial derivatives, determine total derivatives, Jacobians, employ Taylor's series, and find extremes of functions of two variables.	K3
CO3	Demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.	K3
CO4	Compute gradients, divergence, curl, directional derivatives, and apply vector identities to solve vector field problems.	K3
CO5	Apply Green's theorem, Stoke's theorem and Gauss divergence theorem.	K3

Syllabus

UNIT I MATRICES 12

Eigenvalues and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigenvaluesand Eigenvectors- Cayley-Hamilton Theorem, Diagonalization of matrices.Reduction of a quadraticform to canonical form by orthogonal transformation -Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives-Total derivative- Differentiation of implicit functions, Change of variables-Jacobians and their properties-Taylor's series for functions of two variables- Maxima and minima,Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Multiple Integral – Change of order of integration (Cartesian form). Applications: Areas as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).

UNIT IV VECTOR DIFFERENTIATION 12

Scalar and vector valued functions-gradient, tangent plane – directional derivative-divergence and curl- scalar and vector potentials. Statement of vector identities-simple problems.

UNIT V VECTOR INTEGRATION 12

Line, surface and volume integrals- statements of Green's, Stoke's and Gauss Divergence theorems – verification and evaluation of vector integrals using them.

TOTAL PERIODS: 60

Text Book

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.

2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.

Reference Book & Web Resources

1. Bali. N., Goyal. M and Watkins. C, "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain. R.K and Iyengar. S.R.K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
3. Narayanan. S and Manicavachagom Pillai. T. K, "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
4. Ramana. B.V, "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
5. Sivaramakrishna Das. P, Vijayakumari. C, "Engineering Mathematics", Pearson

Online Courses/NPTEL/SWAYAM:

https://nptel.ac.in/courses/111106100

https://nptel.ac.in/courses/111104125

https://nptel.ac.in/courses/111105121

https://nptel.ac.in/courses/111107112

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem Based Assignment / Mind Mapping / Quiz	Google Classroom / MS/Kahoot	5
Visualization Projects(Wolfram Alpha, GeoGebra&Kahoot,)	Demo and Viva	5
Attendance		5
Total		40

25UPHT13	PHYSICAL SCIENCE FOR MECHANICAL ENGINEERING	Category	L	T	P	Credit
		BSC	3	0	0	3

Preamble/ Course Objective

- To understand basics of crystal physics.
- To enhance the fundamental knowledge of elasticity and its applications relevant to engineering streams.
- To familiarize students with thermal properties and applications
- To identify the various types, preparation and applications of polymer used in the industrial processes
- To understand the chemical and electrochemical corrosion nature of metals and the protective methods
- To bring adaptability to the concepts of Nanochemistry and to acquire the required skills to become a perfect engineer

Prerequisite

NIL

Course Outcome

On the successful completion of the course, students will be able to

CO1	Apply the basic knowledge of crystal structure in solids.	K3
CO2	Understand the elastic nature of materials and determine the elastic moduli of different materials.	K2
CO3	Understand the concept of thermal expansion in solids and liquids and apply heat transfer principles to real-world applications such as heat exchangers, refrigerators, ovens, and solar water heaters.	K3
CO4	Understand types, synthesis, and applications of polymers and moulding techniques.	K2
CO5	Identify types and causes of corrosion and apply methods for its control.	K4
CO6	Analyze nanoscale materials, their synthesis, properties, and uses.	K4

Syllabus

Unit-I

Crystal physics

Single crystalline, polycrystalline and amorphous materials–single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices–inter-planar distances coordination number and packing factor for SC, BCC, FCC and HCP -crystal imperfections: point defects, line defects–Burger vectors, stacking faults–role of imperfections in plastic deformation-growth of single crystals: solution and melt growth techniques**.**

Unit -II

Mechanical Properties of Solids and Fluids (9)

Elasticity–Hooke‟s law-stress–strain-modulus of elasticity-stress-strain diagram-Poisson‟s ratio-rigidity modulus- twisting couple on a cylinder-moment of inertia - torsional pendulum method. Bendingofbeams-bendingmoment-cantileverdepression-theoryandexperiment-

oungsmodulusdetermination–uniformandnon-uniformbending-I-shapegirders.Viscosity-flowofmotion-Reynoldsnumber.Properties of fluids

Unit -III

Heat Transfer and Thermal Applications (9)

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints – bimetallic strips-thermalconduction,convectionandradiation—heatconductionsinsolids—thermal conductivity - Forbe's and Lee's disc method: theory and experiment – conductionthroughcompoundmedia(seriesandparallel)—thermalinsulation—applications:heatexchangers, refrigerators, ovens and solar water heaters.

Unit- IV

Polymer Chemistry (9)

Classification-Natural and synthetic; Thermoplastic and Thermosetting, Functionality – Degree of polymerization. polymerization mechanism of radical. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, and epoxy resin, buna S, buna N. Rubbers – vulcanization Moulding Techniques, Compression, injection and Extrusion Moulding, Conducting polymers - classification and applications. Polymer composites – FRP, Bullet Proof Plastics

Unit-V

Corrosion (9)

Corrosion –Introduction - factors – types – chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – sacrificial anode method and impressed current cathodic method. Uses of inhibitors, metallic coating – anodic coating, cathodic coating. Metal cladding, Electroplating of Copper and Anodizing.

Unit VI

Nanochemistry (9)

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvo

thermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications. Introduction to electrochemistry-Battery and Fuel cell -Introduction to battery and fuel cells

Text Book:

1. Engineering Physics Vol I & II (4th Edition) Author: P.K. Palanisamy Publisher: ScitechPublications, 2022

2. Engineering Physics (3rd Edition) Authors: Bhattacharya, D.K. & Poonam Tandon Publisher: Oxford University Press , 2023

3. Engineering Physics (Updated Edition) Authors: Gaur, R.K. & Gupta, S.L. Publisher: Dhanpat Rai Publishers , 2024

4. Physical Metallurgy: Principles and Practice (4th Edition) Author: Raghavan, V. Publisher: PHI Learning , 2023

5. Principles of Physics (12th Edition) Authors: Resnick, Halliday & Walker Publisher: Wiley , 2022

6. **Engineering Physics Vol I & II (4th Edition)** Author: P.K. Palanisamy Publisher: ScitechPublications, 2022

7. **Engineering Chemistry (18th Edition)** Authors: Jain, P.C. & Jain, Monica Publisher: Dhanpat Rai & Sons Year: 2023

8. **A Textbook of Engineering Chemistry (16th Edition)** Authors: Dara, S.S. &Umare, S.S. Publisher: S. Chand &Co. , 2022

9. **Engineering Chemistry (5th Edition)** Author: Sharma, B.K. Publisher: Krishna Prakashan, 2024
10. **Engineering Chemistry (2nd Edition)** Authors: Gopalan, R., Venkappayya, D. & Nagarajan, S. Publisher: Vikas Publishing Year: 2023
11. **Engineering Chemistry (Updated)** Author: Chawla, Shashi Publisher: Dhanpat Rai Year: 2022

Reference Book & Web Resources

1. Balasubramaniam,R.*"Callister'sMaterialsScienceandEngineering".*WileyIndiaPvt. Ltd., 2017
2. Resnick,R.,Halliday,D.,&Walker,J.*"PrinciplesofPhysics*",WileyIndiaPvt.,2018.
3. R.S. Khurmi, J.K. Gupta ,**Thermal Engineering,** S. Chand Publishing, **ISBN**: 978-8121926774
4. S. S. Dara, "A Textbook of Engineering Chemistry", S. Chand & Co., Ltd. New Delhi.,2021
5. B. K. Sharma, "Engineering Chemistry", 3rd edition Krishna Prakashan Media (P) Ltd., Meerut, 2021

Weblink

1. **https://archive.nptel.ac.in/courses/115/105/115105129/**
2. **https://onlinecourses.nptel.ac.in/noc20_ph16/preview**
3. **https://nptel.ac.in/courses/113105081**
4. **https://archive.nptel.ac.in/courses/104/105/104105124/**
5. **https://archive.nptel.ac.in/courses/113/104/113104082**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	0	0	1	0	0	1	0	2	0	0
CO2	3	2	0	1	0	1	0	0	1	0	2	2	0
CO3	3	2	1	1	0	2	1	0	1	0	2	2	0
CO4	3	1	1	1	2	2	2	2	1	1	2	3	3
CO5	3	3	3	3	3	1	2	1	2	2	2	3	2
CO6	3	3	3	3	3	1	2	1	2	2	2	3	2

Assessment Methodology	Assessment Tools	Marks
Test		25
MCQ unit wise 10 questions	Moodle / Google form	5
Virtual lab based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UHST13	UNIVERSAL HUMAN VALUES-II	Category	L	T	P	Credit
		HSC	2	0	0	2

Preamble/ Course Objective

- To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour, and mutually enriching interaction with Nature

Prerequisite

NIL

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand holistic vision of life.	K2
CO2	Enhance socially responsible behavior.	K2
CO3	Understand the responsibility of environmental work.	K2
CO4	Understand the Competence and Capabilities for Maintaining Health and Hygiene.	K2
CO5	Appreciate the aspiration for excellence (merit) and gratitude for all.	K2

Syllabus

UNIT I INTRODUCTION TO VALUE EDUCATION (9)

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity the Basic Human Aspirations, Happiness and Prosperity Current Scenario, Method to Fulfil the Basic Human Aspirations.

UNIT II HARMONY IN THE HUMAN BEING (9)

Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

UNIT III HARMONY IN THE FAMILY AND SOCIETY (9)

Harmony in the Family, the Basic Unit of Human Interaction, Trust, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

UNIT IV HARMONY IN THE NATURE/EXISTENCE (9)

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, providingexamples or evidence, writing introduction and conclusion.

UNIT V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING (9)

Natural Acceptance of Human Values, Definitive- ness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Hu- man Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models- Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

TEXT BOOKS:

1. Premvir Kapoor, "Professional Ethics and Human Values", Khanna Book Publishing Company, New Delhi, 2022.
2. R RGaur,R Asthana, G P Bagaria, "The Textbook - A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.
.

REFERENCES:

1. Annie Leonard, "The Story of Stuff", 2011.
2. A.N. Tripathi,"Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", FP classic, 2009.
4. A Nagaraj, JeevanVidyaPrakashan, Amarkantak, "VanVidya: EkParichaya", 1999.
5. RR Gaur, R Asthana, G P Bagaria, "The Teacher's Manual- Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, 2019

CO-PO Mapping

COs	PO1	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	–	–	–	2	2	3	2	–	–	2
CO2	–	–	–	3	2	3	3	2	–	2
CO3	–	–	–	2	3	3	2	–	–	2
CO4	1	–	–	2	–	2	2	2	–	–
CO5	1	–	–	–	2	2	3	2	–	2

Assessment Methodology	Assessment Tools	Marks
Test		25
Case study analysis	Group discussion and report	5
Value-based project proposal	Presentation and peer evaluation	5
Attendance		5
Total		**40**

25UMET14	CONCEPTS OF ENGINEERING IN BIOLOGY	Category	L	T	P	Credit
		BSC	3	0	0	3

Preamble/ Course Objective

1. Understand fundamental concepts where engineering intersects with biological sciences.
2. Analyze biological processes and energy dynamics from an engineering perspective.
3. Explain transport phenomena in living systems and their applications in medicine.
4. Explore current advancements in molecular biology, nanobiotechnology, and biomimetics.
5. Apply ergonomic principles and biomechanics in engineering design related to biological systems.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Describe the fundamental principles of biology as applied to engineering including biopolymers and macromolecules.	K2
CO2	Analyze the mechanisms of photosynthesis, respiration, and energy assimilation in biological systems.	K4
CO3	Interpret transport mechanisms and fluid flow in biological systems using mathematical and biophysical models.	K2,K3
CO4	Examine the applications of nanobiotechnology and biomimetics in engineering fields such as healthcare, agriculture, and prosthetics.	K4,K5
CO5	Apply ergonomics, biomechanics, and rehabilitation engineering concepts in bioengineering system design.	K3,K6

SYLLABUS

Unit 1: Understanding Basics (9L)

Engineering perspectives of biological sciences: Where engineering meets biology and where biology meets engineering. Biology as an integrated Science. **Biopolymers and macromolecules** – Structure and Function: Organic and inorganic molecules; Unique Properties of Carbon; Carbohydrates, Amino Acids and proteins, Lipids, Nucleic Acids, Vitamins and Minerals; The Rise of Living Systems.

Unit 2: Biological Processes and Bioenergetics (9L)

EnergyDynamics in Biology – Introduction to Energy in Biological Systems,Photosynthesis: Mechanism and Significance,Energy Assimilation in Living Organisms,Aerobic Respiration,Anaerobic Respiration and Fermentation,Comparative Study: Aerobic vs Anaerobic Systems,Applications of Energy Systems in Biology,Recent Advances and Case Studies.

Unit 3: Living Systems (9L)

Transport Phenomena in Biological Systems: Introduction to Transport Phenomena in Biology,Membrane Structure and Transport Mechanisms,Membrane Channels and Ion Channels,Fluid Flow in Biological Systems,Mass Transfer in Biological Systems,Mathematical Models and Biophysical Principles,Applications of Transport Phenomena in Biology and Medicine.

Unit 4: Molecular Biology (9L)

Current trends and advances in cell and molecular biology; **Landmark Discoveries**: Landmark discoveries in the field of Molecular Biology. **Nanobiotechnology:** Micro-/Nanotechnologies for Interfacing Live Cells; Nanotechnology in Medicine - Diagnostics and Therapy, Biosensors& Nanotechnology in Agriculture.**Biomimetics:** Introduction about Biomimetics Nature inspired processes applicable to the field of Engineering. **Biomechanics:** Human body motion and Prosthetics.

Unit 5: Ergonomics(9L)

Introduction to Ergonomics; Elements of Anthropometry; Physiology, Anatomy; Mechanical Properties of Bone and Soft Tissues Rehabilitation engineering, Biomimetics; Bio Material Handling; Hand Tool Design; Human Information Processing; Applications of Principles of Biomechanics in two and three dimensional kinematics; Properties of Fluid Mechanics; Introduction to Bio sensors and 3D Printing and Biomaterials.

Text Book

1. "Biology for Engineers" by Arthur T. Johnson, Publisher: CRC Press, ISBN: 9780367201842.
2. Transport Phenomena in Biological Systems – *by George A. Truskey, Fan Yuan, David F. Katz,* Publisher: Pearson. (2009)
3. Ergonomics for Beginners: A Quick Reference Guide – *by Jan Dul and Bernard Weerdmeester,* Publisher: CRC Press, ISBN : 9780429145353 (2008)

Reference Book & Web Resources

1. "Molecular Biology of the Cell" by Alberts et al., Publisher: Garland Science, ISBN: 9780815344643, relevance unit 1,3,4
2. "Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and LubertStryer, Publisher: W.H. Freeman, ISBN: 9781464126109, relevance unit 2,4
3. "Nanobiotechnology: Concepts, Applications and Perspectives" by Christ of M. Niemeyer and Chad A. Mirkin, Publisher: Wiley-VCH, ISBN: 9783527313820, relevance unit 5
4. Biomimetics: Nature-Based Innovation – *by Yoseph Bar-Cohen,* Publisher: CRC Press, ISBN : 9780429093708, relevance unit 4 & 5 (2012)
5. Principles of Anatomy and Physiology – *by Gerard J. Tortora and Bryan H. Derrickson,* Publisher: Wiley, ISBN, 0470084715, 9780470084717,April 2008

Web Resources

1. **https://www.youtube.com/watch?v=1T-2Sgb4d7k&list=PLM2QtThIQ70Na3hTrcaaOXoXCp5tBCjHB**
2. **https://www.youtube.com/watch?v=hTF4NZC29mU**
3. **https://www.youtube.com/watch?v=ZN1bZ6Q_mG4**

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Cognitive domain (Knowledge & Understanding)	CAT - I CAT - 2 Model Examinations	25
Affective domain (Reflection)	Online Quiz, Group discussion, Assignments, Mind Mapping	05
Behavioral domain (Application & Practice)	Role plays Community engagement Presentations.	05
Attendance		05
Total		40

25UMEI15	MANUFACTURING PROCESSES & PRACTICE	Category	L	T	P	Credit
		PC	3	0	2	4

Prerequisite
Nil.

Preamble/ Course Objective

- To understand the fundamentals of casting processes, including pattern making, moulding, and identification of casting defects and their remedies.
- To gain knowledge of various welding techniques, equipment, applications, and the analysis of
- To study the principles for non-traditional machining techniques such as EDM, ECM, ECG, AJM, and USM.
- To understand the structure, types, and processing methods of polymers and plastics for industrial manufacturing applications.

Course Outcome		
CO1	Understand the various casting methods, pattern and core making, moulding techniques, and identify casting defects and their remedies.	K2
CO2	Explain different welding processes, equipment, standards, and analyze common welding defects and applications.	K3
CO3	Demonstrate knowledge of metal forming processes like rolling, forging, and extrusion, including terminology, equipment, and defect analysis.	K3
CO4	Introduction to non-traditional machining techniques such as EDM, ECM, ECG, AJM, and USM.	K3
CO5	Understand the structure, classification, and processing methods of plastics and polymers for industrial product manufacturing.	K2

Syllabus

UNIT-I (09)
Introduction to manufacturing processes – classification – steps involved in casting process – different types of casting – pattern and core making – materials, types and allowances – mouldingtoolsandequipment-propertiesofmouldingsand-castingdefectsandremedies.
UNIT-II (09)
Types of welding processes–weldability-gas welding–oxyacetylene welding-Introduction to arc welding – types and equipment – resistance welding – types and applications - welding defects– Introduction to welding standards – welding of dissimilar metals and non-metals.
UNIT-III (09)
Classification of metal forming processes – Rolling, Forging, Extrusion, Drawing and other Sheet metal operations: terminology used, processes, machines and defects.
UNIT-IV (09)
Unconventional Machining-Introduction to unconventional machining – Electrical Discharge Machining (EDM), Electrochemical machining (ECM), Electrochemical grinding (ECG), Abrasive jet machining (AJM) and Ultrasonic machining (USM).
UNIT-V (09)
Plastics and polymers–structure of polymers–additives in plastics–thermoplastics and thermo setting plastics – manufacturing of plastic products – different moulding methods– forming or shaping methods – laminating methods – machining of plastics – joining plastics–

industrial applications of plastics.

Laborator Practice Syllabus (15)

- Fitting shop- Symmetric Fitting, Acute angle Fitting.
- Carpentry- Half Lap Joint, Corner Mortise Joint.
- Casting- Demo.
- Smithy-Demo.
- Plastic moulding & glass cutting- Demo.
- Sheet metal- Rectangular Tray, Funnel
- Grinding – surface finish – lapping, honing, buffing, broaching- Demo

Text Book

1. B.S.NagendraParashar&R.K.Mittal – Elements of Manufacturing Processes, Prentice Hall India Pvt. Ltd.,latest edition.
2. S.K.HajraChoudry-working shop technology, Vol-I, media promoters and publishers pvt.Ltd, latest edition.

Reference Book

1. Roy A lindberg-Processes and Materials of manufacturing, Prentice Hall India pvt.Ltd, latest edition.
2. Welding and Welding Technology, by Richard L. Little latest edition.
3. A Textbook of Manufacturing Technology by R.K. Rajput.Latest edition.
4. Manufacturing Processes for Engineering Materials by SeropeKalpakjian and Steven R. Schmid, latest edition.
5. Fundamentals of Modern Manufacturing by Mikell P. Groover, latest edition.

Web Resources

1. www.Myebookslibrary.com/workshoptechnology-by-hajrachoudry-vol.1-pdf-download.pdf**.**

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Theory Test	Evaluation	15
Internal Assessment (Assignments/Quiz/Seminar)		10
Laboratory Work (Fitting, Carpentry, Sheet Metal, etc.)	Performance evaluation	10
Viva-Voce		5
Model Practical		5
Attendance		5
Total	—	**50**

25UHSI16	PROFESSIONAL COMMUNICATION FOR ENGINEERS	Category	L	T	P	Credit
		HSC	1	0	4	3

Course Prerequisite:

- Nil

Course Objective:

- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

Course Outcome

On the successful completion of the course, students will be able to

CO1	Use appropriate words in a professional context.	K2
CO2	Gain understanding of basic grammatic structures and use them in right context.	K2
CO3	Speak fluently and accurately in formal and informal communicative contexts	K2
CO4	Write definitions, descriptions, narrations and essays on various topics	K2
CO5	Express their opinions effectively in both oral and written medium of communication	K4

SYLLABUS

UNIT I INTRODUCTION TO COMMUNICATION (9)

EFFECTIVE COMMUNICATION:(1)

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

FUNDAMENTALS OF COMMUNICATION: (9**)**

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

LAB ACTIVITY: Extempore (Oral), Conversation on asking directions, Listening – Telephone conversation; Speaking Self-introduction; Telephone conversation – Video conferencing etiquette.

UNIT II NARRATION AND SUMMATION (9)

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

LAB ACTIVITY: Listening – Travel podcast; Speaking – Narrating and sharing personal experiences through a podcast, Autobiography of a famous Personality

UNIT III DESCRIPTION OF A PROCESS / PRODUCT (9)

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

LAB ACTIVITY: Listening – Railway / Airport Announcements, Travel Vlogs; Speaking – Describing a place or picture description

UNIT-IV VISUALIZATION AND CLASSIFICATION(9)

Listening – TED talks Speaking – Interviewing a celebrity/Famous Personality Reading – Company profiles, Business Letters Vocabulary– Discourse Markers, Linking words and Phrases Collocation. Grammar – Pronouns, Conjunction, Preposition Writing – Interpretation of Charts and Graphs

LAB ACTIVITY: Picture Description, about purchasing a product, Summarizing a TED talk, Role play, Narrating an unforgettable event

UNIT V EXPRESSION COMMUNICATION (9)

Listening – Watching Movies / Listening to Dialogues and Conversations Speaking – Role play, Panel Discussion, Debate Reading – Blogs, Novels, Short Stories Vocabulary – Phrasal Verbs Grammar– Simple/Compound/Complex Sentences, Error Spotting, Punctuation. Writing – Descriptive Essay, Dialogue Writing

LAB ACTIVITY: Listening /Reading Comprehension, Developing a story using given Vocabulary, Mini Presentation on General topic (ICT tools), Group Discussion

TOTAL PERIODS: 45

TEXTBOOKS

1.Technical Communication: Principles and Practice Meenakshi Raman &Sangeeta Sharma Oxford University Press 3rd Edition (or latest)

2.Communication Skills Sanjay Kumar &PushpLata, Oxford University Press, 2nd Edition (2015)

Reference Book

1.A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.(English For Technical Communication (With CD) By AyshaViswamohan, McGraw-Hill Education, ISBN : 0070264244.)

2. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.

3. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

4.Effective Technical Communication*:* M. Ashraf Rizvi, McGraw-Hill Education, 2nd Edition (2017)

Mapping with Programme Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1	1	-	-	2	-	-	-	-	3	2	-	-
CO2	1	2	-	-	2	-	-	2	-	3	2	-	-
CO3	1	2	-	-	-	-	-	1	-	3	2	-	-
CO4	1	3	-	-	3	-	1	2	-	3	2	-	-
CO5	1	2	-	-	2	-	1	3	-	3	2	-	-

Assessment Methodology	**Assessment Tools**	**Marks**
Test		15
Listening and reading Comprehension	Online tool	5
Speaking assessment (Oral)	review	10
Online assessment test	Online tool	10
Content creation Competition	Peer review	5
Attendance		5
Total		**50**

25UPHP13	PHYSICAL SCIENCE LAB FOR MECHANICAL ENGINEERING	Category	L	T	P	Credit
		BSC	0	0	2	1

Preamble/ Course Objective

- To provide an experimental foundation for the theoretical concepts introduced in the lectures
- To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments
- To introduce the concepts and techniques which have a wide application in experimental science
- To gain a practical knowledge of Engineering Chemistry in relevance to Industrial applications.
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper
- To demonstrate the synthesis of nanoparticles

Prerequisite: Nil

Course Outcome

On the successful completion of the course, students will be able to

CO1	Apply the elastic nature of materials and determine the elastic moduli of different materials.	K3
CO2	Analyse thermal properties of various material testing methods and use them in suitable applications	K3
CO3	Understand measurement technology, usage of new instruments and real time applications in engineering studies.	K3
CO4	Estimate water quality parameters such as total dissolved solids, total hardness, and chemical oxygen demand using volumetric analysis methods.	K3
CO5	Determine the concentration of metal ions such as copper in a given solution using volumetric or instrumental techniques.	K3
CO6	Synthesize metal nanoparticles using basic chemical methods and analyze their properties using suitable characterization techniques.	K3

Syllabus (20)

1. Determination of Young‟s modulus of given material by non-uniform bending method.
2. Determination of viscosity of the given liquid using Poiseuille‟smethod.
3. Determination of Thermal conductivity of a bad conductor –Lee‟sDiscmethod
4. Determinationof the thickness of a given thin material– Airwedgemethod
5. Determination of the wavelength of Laser and particle size of given powder.
6. Determination of dissolved oxygen in water.
7. Determination of total hardness of water by EDTA method
8. Preparation of Cu nanoparticles by precipitation method.
9. Estimation of available chlorine in bleaching powder
10. Estimation of copper in copper sulphate solution

Text Book

1. Practical Physics – *S.L. Gupta & V. Kumar*
2. A Textbook of Practical Physics – *M.N. Srinivasan*

3. Engineering Physics Practical Manual – *Dr.Arumugam M.*
4. Engineering Physics Lab Manual – *R.K. Shukla &Anchal Srivastava*
5. Advanced Practical Physics for Students – *B.L. Worsnop and H.T. Flint*
6. P.C. Jain & Monica Jain – *Engineering Chemistry*
7. S.S. Dara & S.S. Umare – *A Textbook of Engineering Chemistry*
8. R. Gopalan, D. Venkappayya, S. Nagarajan – *Engineering Chemistry*
9. Shashi Chawla – *Engineering Chemistry*
10. K. Mukkanti – *Practical Engineering Chemistry*

Reference Book & Web Resources

1. Elements of Properties of Matter – *D.S. Mathur*
2. Engineering Physics – *R.K. Gaur & S.L. Gupta*
3. B.Sc. Practical Physics – *C.L. Arora*
4. Experimental Physics – *Worsnop and Flint*
5. P.C. Jain & Monica Jain – *Engineering Chemistry*
6. S.S. Dara & S.S. Umare – *A Textbook of Engineering Chemistry*
7. R. Gopalan, D. Venkappayya, S. Nagarajan – *Engineering Chemistry*
8. Shashi Chawla – *Engineering Chemistry*
9. K. Mukkanti – *Practical Engineering Chemistry*
10. Dr. Sudha Rani – *Laboratory Manual of Engineering Chemistry*

Web resources

1. **https://vlab.co.in**
2. **https://ocw.mit.edu**
3. **https://nptel.ac.in/courses/115**
4. **http://hyperphysics.phy-astr.gsu.edu**
5. **https://nptel.ac.in**
6. **https://vlab.co.in**
7. **https://www.khanacademy.org/science/chemistry**
8. **https://chem.libretexts.org**
9. **http://www.chemcollective.org**

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	0	3	0	1	1	1	1	0	2	1	0
CO2	2	1	1	1	0	0	1	1	1	0	1	0	0
CO3	2	2	1	1	1	0	1	1	1	0	1	0	0
CO4	3	2	2	2	2	1	1	1	1	1	0	2	0
CO5	3	2	2	2	2	1	1	1	1	1	0	3	0
CO6	3	3	3	3	3	1	2	1	2	2	1	1	1

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
STEM based model creation	Presentation	5
Attendance		10
Total		60

25UGEP18	DESIGN THINKING AND IDEA LABORATORY	Category	L	T	P	Credit
		ESC	0	0	2	1

Course Prerequisite

- Basic Knowledge of Science and interest in creative problem solving

Course Objective

- To introduce students to the principles, methodologies, and frameworks of design thinking for solving real-world problems.To cultivate user-centric, empathetic, and creative thinking through experiential learning and hands-on activities.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand and apply fundamental learning theories and memory techniques to improve cognitive and retention skills.	K2
CO2	Develop emotional intelligence and apply the fundamentals of design thinking to analyze and solve user-centric problems.	K3
CO3	Demonstrate creative problem-solving skills and understand the engineering product design process through design thinking principles.	K4
CO4	Apply rapid prototyping and testing methods while fostering inclusive practices by appreciating individual differences in team settings..	K5
CO5	Design user-centered engineering solutions by integrating feedback and iterative development to address real-world customer challenges.	K6

Syllabus

UNIT I LEARNING AND MEMORY FUNDAMENTALS

An Insight to Learning- Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting

Remembering Memory- Understanding the Memory process, Problems in retention, Memory enhancement techniques

UNIT II: EMOTIONAL INTELLIGENCE AND INTRODUCTION TO DESIGN THINKING

Emotions: Experience & Expression-Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers

Basics of Design Thinking-Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test.

UNIT IIICREATIVE THINKING AND PRODUCT DESIGN

Being Ingenious & Fixing Problem-Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

Process of Product Design- Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design

UNIT I V PROTOTYPING AND APPRECIATING DIVERSITY

Prototyping & Testing-What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing

Celebrating the Difference- Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

UNIT V CUSTOMER-CENTRIC DESIGN AND ITERATIVE DEVELOPMENT

Design Thinking & Customer Centricity-Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design

Feedback, Re-Design & Re-Create- Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – "Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".

TEXTBOOKS:

1. Marilee Sprenger, Learning and Memory: The Brain in Action, ASCD Publishers Ltd.
2. IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

REFERENCE BOOKS

1. Peter G. Rowe, Design Thinking: Understanding How Designers Think and Work, MIT Press, 1991.
2. Don Norman, The Design of Everyday Things, Basic Books, 2013.
3. Tom Kelley and David Kelley, Creative Confidence: Unleashing the Creative Potential Within Us All, Crown Business, 2013.
4. Todd ZakiWarfel, Prototyping: A Practitioner's Guide, Rosenfeld Media, 2009.
5. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, Engineering Design: A Project-Based Introduction, Wiley, 2011.
6. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, McGraw-Hill Education, 2015.
7. Charles Platt, Make: Electronics: Learning Through Discovery, Maker Media, 2011.

IDEA LABORATORY ACTIVITIES:

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as soft wood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.
6. Familiarity and use of welding equipment.
7. Familiarity and use of normal and wood lathe.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	–	–	–	–	–	-	-	3
CO2	-	2	2	–	–	1	2	2	2	-	-
CO3	2	3	3	2	–	2	–	-	-	2	2
CO4	-	-	2	3	2	2	1	3	2	-	2
CO5	-	2	3	2	3	2	-	2	3	2	3

ASSESSMENT METHODOLOGY	ASSESSMENT TOOLS	MARKS
Knowledge & Concept Understanding	Quiz (MCQs, Short Questions on Creative Thinking, Design Process)	10
Case Study Analysis (Real-world product design & customer-centric approach)	Presentation / Group Activity	15
Prototype Development & Creativity	Models	25
Attendance		10
Total		**60**

25UGEP19	ENGINEERING GRAPHICS & AutoCAD	Category	L	T	P	Credit
		ESC	0	0	2	1

Prerequisite: Nil

Preamble/ Course Objective

- To develop knowledge of standard practices in engineering drawing, including lettering, line work, dimensioning, and projection techniques.
- To enable students to construct and interpret conic sections, spirals, involutes, helix curves, and projections of points, lines, planes, and solids.
- To understand the development and intersection of surfaces like cylinder-cylinder and cylinder-cone, essential for fabrication and design.
- To build skills in creating accurate isometric and orthographic projections for effective engineering communication.
- To introduce students to AutoCAD for creating 2D engineering drawings, enhancing their ability to use modern engineering tools.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Apply the principles of engineering drawing standards, including lettering, line types, dimensioning, and accurately construct conic sections, spirals, involutes, and helix curves.	K2
CO2	Interpret and generate projections of solid objects and their sectional views, aiding in better understanding of internal features in engineering components.	K3
CO3	Develop the lateral surfaces of solids essential for manufacturing and fabrication processes.	K3
CO4	Create isometric and orthographic projections of engineering objects to effectively communicate design intent.	K3
CO5	Utilize computer-aided drafting tools, particularly AutoCAD, to produce accurate 2D engineering drawings of simple geometries, enhancing proficiency in modern engineering software.	K3

Syllabus

UNIT-I(6)

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning. Conic sections, Involutes, Spirals, Helix.

UNIT-II(6)

Projection of Points, Lines and planes
Projection of Solids.

UNIT-III(6)

Sections of solidsand Development of surfaces

UNIT-IV(6)

Isometric projections and Conversion of pictorial to Orthographic views

UNIT-V(6)

Computer Aided Drafting: Introduction to Computer Graphics and Drafting, AutoCAD,2-D diagrams of simple geometries using Auto- CAD script.

Text Book

1. K.R.Gopalakrishna and SudhirGopalakrishna, Engineering Graphics ,Inzinc Publishers, latest edition.
2. K.Venugopal, Engineering Drawingand Graphics AutoCAD,4th edition,NewAgeInternational Publication Ltd, latest edition

Reference Book

1. N.D.Bhatt, Engineering Drawing,49th edition,Chorotar Publishing House, latest edition.
2. DavidIcook and Robert NMc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn, latest edition.
3. James D Bethuneandet.al., Modern Drafting ,PrenticeHallInt, latest edition.
4. Engineering Drawing by N.D. Bhatt and V.M. Panchallatest edition.
5. Fundamentals of Engineering Drawing" by Luzader Warren Jlatest edition.

Web Resources

1. **https://nptel.ac.in/courses/112/103/112103019/**
2. **https://archive.org/details/engineeringdrawingndbhatt**

Mapping with Programme Outcomes													
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PS O1**	**PS O2**
CO1	2	2	2	2	-	2	-	-	1	-	2	1	-
CO2	2	2	2	2	-	1	-	-	1	-	2	1	-
CO3	2	2	2	2	-	2	-	-	1	-	2	1	-
CO4	2	2	2	2	-	1	-	-	1	-	2	1	-
CO5	2	2	2	2	-	2	-	-	2	-	2	1	-

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Real Model Drawing	Review	5
CAD Simulation Test		5
Attendance		10
Total		60

25UPCE11	CAREER DEVELOPMENTSKILLS	Category	L	T	P	Credit
		EEC	0	0	2	0

Preamble/ Course Objective

To empower students with the skills for self-discovery, goal achievement, effective time management, and personal effectiveness, alongside foundational knowledge in career planning, emotional intelligence, higher education, competitive exams, and entrepreneurship

Prerequisite: Basic communication skills and foundational knowledge of workplace behavior

Course Outcome

On the successful completion of the course, the students will be able to

CO1	Help students assess themselves, explore career options, and set actionable goals through structured planning.
CO2	Develop motivation, enhance personality effectiveness, and instill discipline for personal and professional growth.
CO3	Build awareness and practice of grooming, hygiene, positive attitudes, manners, and professional behavior.
CO4	Strengthen self-awareness, time and stress management, and emotional intelligence for balanced personal development.
CO5	Introduce students to higher education paths, competitive exams, and the fundamentals of entrepreneurship and business planning

Syllabus

UNIT 110 Hrs

Career Planning: Introduction to Career Planning - Self-Assessment for Career Planning - Exploring Career Options- Developing a Career Plan;

Goal Settings: Understanding Goal Setting - Setting Effective Goals - Action Plan Development - Practical Exercises

UNIT 2 **10 Hrs**

Motivation – I: Definition and Importance of Motivation - Types of Motivation - Theories of Motivation - Factors Affecting Motivation

Personality Effectiveness: Components of Personality Effectiveness - Communication Skills - /Interpersonal Skills - Practical Exercises

Building Personality and Discipline: Introduction to Personality Development - Building Positive Habits - Discipline and Self-Control - Practical Application

UNIT 310Hrs

Grooming, hygiene and Cleanliness: Personal Hygiene Practices - Body Grooming Techniques - Environmental Cleanliness - Mental and Social Impact of Grooming and Hygiene.

Attitudes, Manners and Behaviour: Understanding Attitudes - Developing Positive Attitudes - Manners and Etiquette - Procedures and Protocols

UNIT 410Hrs

Self- Awareness & Self Confidence: Introduction to Self-Awareness- Understanding Strengths and Weaknesses- Building Self-Confidence- Practical Application

Time Management:Introduction to Time Management - Planning and Prioritizing Tasks-Overcoming Procrastination- Practical Time Management

Stress Management: Understanding Stress- Stress Management Techniques-Coping Strategies-Practical Application

Emotional Intelligence:Introduction to Emotional Intelligence- Managing Emotions- Social Awareness and Relationship Management-Practical Exercises

UNIT 5 **8 Hrs**

Introduction to Higher Education, Competitive exams:Overview of Higher Education-Competitive Exams Overview - Exam Preparation Techniques

Introduction to Entrepreneurship: Understanding Entrepreneurship- Developing a Business Idea - Business Planning

Text Book

1.Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI

2.Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

Reference Book

1.The Emotionally Intelligent Workplace by DANIEL GOLEMAN.

2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.

3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA

4. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1								2	2	2	2
CO2					2			2			2
CO3							2	2			2
CO4								2	2		2
CO5						2	2				2

Course Contents and Lecture Schedule

Unit/UNIT No	Topic	No. of Periods
UNIT 1	Introduction to Career Planning	1
	Self-Assessment for Career Planning	2
	Exploring Career Options	2

Unit/UNIT No	Topic	No. of Periods
	Developing a Career Plan	2
	Understanding Goal Setting	1
	Setting Effective Goals	1
	Action Plan Development	1
UNIT 2	Definition and Importance of Motivation	1
	Types of Motivation	1
	Theories of Motivation	1
	Factors Affecting Motivation	1
	Components of Personality Effectiveness	1
	Communication Skills	1
	Interpersonal Skills	1
	Introduction to Personality Development	1
	Building Positive Habits	1
	Discipline and Self-Control	1
UNIT 3:	Personal Hygiene Practices	1
	Body Grooming Techniques	1
	Environmental Cleanliness	1
	Mental and Social Impact of Grooming and Hygiene	3
	Understanding Attitude	
	Developing Positive Attitudes	2
	Manners and Etiquette	1
	Procedures and Protocols1	1
UNIT 4	Introduction to Self-Awareness	1
	Understanding Strengths and Weaknesses	2
	Building Self-Confidence	1
	Planning and Prioritizing Tasks	1
	Overcoming Procrastination	1
	Understanding Stress	1
	Stress Management Techniques	1
	Coping Strategies	1
	Managing Emotions	1
	Social Awareness and Relationship Management	1
UNIT 5	Overview of Higher Education	2
	Competitive Exams Overview	2
	Exam Preparation Techniques	1
	Understanding Entrepreneurship	1
	Developing a Business Idea	1

Unit/UNIT No	Topic	No. of Periods
	Business Planning	1

Assessment Methodology	Assessment Tools	Marks
Career Development Portfolio	Assignment	20
Personality Development Assignment	Assignment	20
Goal Setting and Action Plan Project	Project	15
Grooming and Etiquette Demonstration	Practical/Demo	15
Time and Stress Management Project	Project	20
Attendance and Class Participation	Continuous Assessment	10
Total		**100**

25UMCC11	IKS – CONCEPTS AND APPLICATIONS IN ENGINEERING AND SCIENCE	Category	L	T	P	Credit
		MCC	2	0	0	0

Course Prerequisite

- Basic understanding of science and engineering fundamentals

Course Objective

- Familiarize students with traditional Indian knowledge systems and their scientific
- foundations
- Explore the integration of ancient wisdom with modern engineering practices
- Understand sustainable technologies and innovations rooted in Indian traditions
- Develop appreciation for indigenous knowledge in solving contemporary challenges
- Foster research mindset towards validating and modernizing traditional practices

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the historical development and scientific basis of Indian Knowledge Systems	K2
CO2	Analyze traditional Indian practices in mathematics, astronomy, metallurgy, andmedicine	K4
CO3	Apply IKS principles to contemporary engineering and scientific problems	K3
CO4	Evaluate the sustainability aspects of traditional Indian technologies	K5
CO5	Create innovative solutions by integrating traditional knowledge with modernscience	K1

Syllabus

UNIT I INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS

Historical overview of Indian Knowledge Systems - Scientific methodology in ancient India - Major texts and scholars: Vedas, Upanishads, Charaka Samhita, Sushruta Samhita - Transmission and preservation of knowledge - Contemporary relevance and global recognition.

UNIT II: MATHEMATICS AND ASTRONOMY IN ANCIENT INDIA

Indian contributions to mathematics: Zero, decimal system, trigonometry - Aryabhata, Brahmagupta, Bhaskara's contributions - Astronomical observations and calendar systems - Navigation techniques and geographical knowledge - Applications in modern engineering calculations.

UNIT III: METALLURGY, MATERIALS, AND ARCHITECTURE

Ancient Indian metallurgy: Iron pillar of Delhi, Wootz steel - Traditional building materials and techniques -Architectural marvels: Structural engineering principles - Water harvesting and management systems - Sustainable construction practices.

UNIT IV: MEDICINE, AGRICULTRE AND LIFE SCIENCES

Ayurveda: Principles and scientific validation - Traditional agricultural practices and crop management – Biodiversity conservation methods - Food preservation techniques - Biotechnology applications in traditional practices.

UNIT V: INTEGRATION WITH MODERN SCIENCE AND TECHNOLOGY

Validating traditional knowledge through modern scientific methods - Case studies of successful IKS-modern science integration - Intellectual property and traditional knowledge protection - Research opportunities and career prospects - Future directions and challenges

TEXTBOOKS:

1. SubhashKak, “The Nature of Physical Reality”, Mount Meru Publishing, 2016
2. B.V. Subbarayappa, “Indian Astronomy: A Source Book”, Nehru Centre, 2008
3. KapilaVatsyayan, “Traditional Indian Art and Culture”, Cambridge University Press, 2015

REFERENCE BOOKS & WEB RESOURCES

1. P.P. Divakaran, “The Mathematics of India: Concepts, Methods, Connections”,Springer, 2018
2. S.N. Sen, “Ancient Indian History and Civilization”, New Age International, 2010
3. National Mission for Manuscripts - www.namami.gov.in
4. Digital Library of Traditional Ecological Knowledge - www.frlht.org
5. CSIR Traditional Knowledge Digital Library - www.tkdl.res.in

CO PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Major IKS Integration Project	Project	20
Traditional Knowledge Practical Demonstration	Practical/Demo	20
Scientific Validation Assignment	Assignment	15
Heritage Site/Museum Field Report	Field Work	15
Innovation Proposal Presentation	Presentation	20
Attendance and Lab Participation	Continuous Assessment	10
Total		**100**

25UMCC12	ENVIRONMENTALSCIENCE & SUSTAINABILITY	Category	L	T	P	Credit
		MCC	2	0	0	0

Prerequisite: Nil

Preamble/ Course Objective

- This course provides comprehensive understanding of environmental science principles and sustainability concepts essential for engineering professionals. The objectives are to:
- Understand fundamental concepts of environmental science and ecology
- Analyze environmental problems and their engineering solutions
- Develop awareness about sustainable development and green technologies
- Explore renewable energy systems and waste management strategies
- Foster environmental consciousness and responsible engineering practices

Course Outcome

On the successful completion of the course, students will be able to:

CO1	Understand fundamental principles of environmental science and ecosystem dynamics	K2
CO2	Analyze various types of pollution and their impact on human health and environment	K3
CO3	Apply principles of sustainable development in engineering design and decision-making	K4
CO4	Evaluate renewable energy technologies and waste management systems	K5
CO5	Design environmentally sustainable solutions for engineering problems	K6

Syllabus

UNIT I: Introduction to Environmental Science and Ecology (6 Hours) - Definition, scope and importance of environmental science - Structure and function of ecosystems - Biogeochemical cycles: Carbon, nitrogen, phosphorus, sulfur cycles - Biodiversity and its conservation - Environmental impact assessment principles.

UNIT II: Environmental Pollution and Control (6 Hours) - Air pollution: Sources, effects, and control measures - Water pollution: Industrial and domestic sources, treatment methods - Soil pollution: Causes, effects, and remediation techniques - Noise pollution: Sources, effects, and control - Solid waste management: 3R principles, waste-to-energy.

UNIT III: Sustainable Development and Green Technologies (6 Hours) - Concept of sustainable development and SDGs - Life cycle assessment (LCA) principles - Green building concepts and LEED certification - Cleaner production and industrial ecology - Environmental management systems (ISO 14001)

UNIT IV: Renewable Energy and Climate Change (6 Hours) - Solar energy systems: Photovoltaic and thermal applications - Wind energy: Technology and site assessment - Hydroelectric and geothermal energy systems - Climate change: Causes, effects, and mitigation strategies - Carbon footprint and carbon trading mechanisms

UNIT V: Environmental Regulations and Case Studies (6 Hours) - Environmental laws and regulations in India - Environmental clearance procedures - Corporate environmental responsibility - Case studies of environmental disasters and lessons learned - Future trends in environmental technology

Text Book

1. G. Tyler Miller Jr., "Environmental Science: Working with the Earth", Cengage Learning, 2019
2. C. Anil Kumar, "Environmental Science and Engineering", PHI Learning, 2018
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, 2017

Reference Book & Web Resources

1. Richard T. Wright, "Environmental Science: Toward a Sustainable Future", Pearson, 2017
2. Daniel B. Botkin, "Environmental Science: Earth as a Living Planet", Wiley, 2018
3. Central Pollution Control Board - www.cpcb.nic.in
4. Ministry of Environment and Forests - www.moef.gov.in
5. UN Environment Programme - www.unep.org
6. NPTEL Environmental Science Courses - nptel.ac.in

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Cognitive domain (Knowledge & Understanding)	CAT - I CAT - 2 Model Examinations	25
Affective domain (Reflection)	Group discussions on sustainability issues. Debates on case studies.	05
Behavioral domain (Application & Practice)	Field visit reports	05
Attendance		05
Total		40

SEMESTER-II

25UMAT21	DIFFERENTIAL EQUATIONS AND TRANSFORMS	Category	L	T	P	Credit
		BSC	3	1	0	4

Prerequisite : Nil

Preamble/ Course Objective

- To introduce mathematical tools to solve first order differentiation equations.
- To gain knowledge of problem-solving techniques of PDE.
- To understand concept of the Laplace transform.
- To inculcate the computation knowledge in Laplace transforms.
- To acquaint with Fourier Transform techniques used in a wide variety of situations involving functions that are not necessarily periodic.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Solve higher order differential equations	K3
CO2	Formulate and solve various types of partial differential equations	K3
CO3	Apply Laplace transforms and initial and final value theorems to solve engineering problems involving step, impulse and periodic functions.	K3
CO4	Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations	K3
CO5	Apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity	K3

Syllabus

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D, Euler 's linear equation of higher order with variable coefficients - simultaneous linear differential equations, solution by variation of parameters method.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations- Solutions of standard types of first order partial differential equations- Lagrange's linear equation- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT III LAPLACE TRANSFORM 12

Existence conditions-Transforms of elementary functions- Properties, Transform of unit step function and unit impulse function -Transforms of derivatives and integrals- Transforms of Periodic Functions- Initial and final value theorems.

UNIT IV INVERSE LAPLACE TRANSFORM 12

Inverse Laplace Transforms – Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients -Solution of simultaneous ordinary differential equations.

UNIT V FOURIER TRANSFORM 12

Fourier Integral theorem (statement only), Fourier transform and its inverse – Properties, Fourier sine and cosine transform - Properties, Convolution and Parseval's identity.

TOTAL PERIODS: 60

Text Book

1. Veerarajan. T, "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt.Ltd., New Delhi, Second reprint, 2012.

2. Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2015.

Reference Book & Web Resources

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.
5. Ray Wylie. C and Barrett. L. C, "Advanced Engineering Mathematics" Tata Mc Graw Hill EducationPvt Ltd, 6th Edition, New Delhi, 2012.

Online Courses/NPTEL/SWAYAM:

1. https://nptel.ac.in/courses/111106139
2. https://nptel.ac.in/courses/111101153
3. https://nptel.ac.in/courses/111107119

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem Based Assignment / Mind Mapping / Quiz	Google Classroom / MS/Kahoot	5
Visualization Projects(Wolfram Alpha, GeoGebra&Kahoot,)	Demo and Viva	5
Attendance		5
Total		40

25UMET22	ENGINEERING MECHANICS	Category	L	T	P	Credit
		ESC	3	1	0	4

Prerequisite: Nil

Preamble/ Course Objective:

1	To apply the fundamental concepts in determining the effect of forces on a particle.
2	To Make use of various principles in the determination of effect of forces in a rigid body
3	To understand the concepts of centroid, moment of inertia and mass moment of inertia
4	To Solve problems in static friction and forces acting on the trusses
5	To understand the dynamics of particles and rigid bodies

Course Outcome

On the successful completion of the course, students will be able to

CO1	Apply the Fundamental concepts of Mechanics and operation of forces to solve equilibrium of particles in 2D and 3D.	K3
CO2	Apply Varignon's theorem to equilibrium of rigid bodies in 2D & 3D.	K3
CO3	Apply the concepts of force system in practical applications.	K3
CO4	Evaluate the centroid, moment of inertia and mass moment of inertia of composite plane area and sections.	K3
CO5	Apply the concepts of dynamics in particles and rigid bodies.	K3

UNIT-I **STATICS OF PARTICLES** **(12)**

Introduction – Units And Dimensions – Laws of Mechanics – Newton's Laws -lami's Theorem- Parallelogram, Triangular Law and Polygon Law of Forces principle of Transmissibility - Vectorial Representation of Forces –

Fundamental Vector Operations of Forces – Free Body Diagram – Equilibrium of a Particle in 2 D – Forces in Space – Equilibrium of a Particle in Space – Equivalent Systems of Forces.

UNIT-II **STATICS OF RIGID BODIES** **(12)**

Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon"s theorem –Single equivalent force - Free body diagram – Types of supports and their reactions - Equilibrium of Rigid bodies in 2Dand 3D

UNIT-III **APPLICATION OF FORCE SYSTEM** **(12)**

Friction Force: Types of Friction - Laws of Coulomb Friction – Simple Contact Friction - Two Bodies in Contact - Ladder Friction. Analysis of trusses by method of joints.

UNIT-IV **PROPERTIES OF SURFACES** **(12)**

Centroid of areas – simple and composite areas - Theorem of Pappus and Guldinus – Centre of mass– simple and composite volumes - Moment of inertia - simple and composite areas – Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Radius of gyration – Product of inertia - Mass moment of inertia of simple solids.

UNIT-V **DYNAMICS OF PARTICLES AND RIGID BODIES** **(12)**

Displacement, Velocity and Acceleration – Relative Motion -Curvilinear Motion - Newton's Laws of Motion – D' Alembert's Principle, Work Energy Principle - Impulse and Momentum – Impact of Elastic Bodies. Rigid Body Motion - Translation and Rotation – General Plane Motion of Simple

Rigid Bodies.	
TEXT BOOKS:	
1	Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2017.
2	Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 12th Edition, Tata McGraw-Hill Publishing company, New Delhi (2019)
Reference Book & Web Resources	
1	Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 2019.
2	Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 14th Edition, Pearson Education 2017.
3	Kottiswaran. N, Engineering Mechanics (Statics and Dynamics), Sri Balaji Publications, Erode
4	Dubey, N.H, "Engineering Mechanics – Statics and Dynamics", McGraw Hill Education (India) Pvt Ltd.
WEB REFERENCES:	
1	https://nptel.ac.in/courses/112/105/112105164/
2	https://nptel.ac.in/courses/112/103/112103109

Mapping with Programme Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	3	1		2	1		1		1	1	1
CO2	3	2	3	1		2	1		1		1	1	1
CO3	3	2	3	1		2	1		1		1	1	1
CO4	3	2	3	1		2	1		1		1	1	1
CO5	3	2	3	1		2	1		1		1	1	1

Assessment Methodology	**Assessment Tools**	**Marks**
Test	Pen & paper	25
Problem based Assignment	Google form	5
MCQ	Online Quiz	5
Attendance		5
Total		40

25UEET23	APPLIED ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	Category	L	T	P	Credit
		ESC	3	0	0	3

Course Objective:

• To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour, and mutually enriching interaction with Nature.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand holistic vision of life.	K2
CO2	Enhance socially responsible behavior.	K2
CO3	Understand the responsibility of environmental work.	K2
CO4	Understand the Competence and Capabilities for Maintaining Health and Hygiene.	K2
CO5	Appreciate the aspiration for excellence (merit) and gratitude for all.	K2

Prerequisite : Nil

Preamble/ Course Objective:

Students will be able to:

- Understand the fundamental concepts of electrical circuits and apply network laws to analyze them.
- Learn the working principles and applications of electrical machines and power systems.
- Gain basic knowledge of semiconductors, electronic devices, and analog circuits.
- Understand digital electronics and apply Boolean logic to design simple digital systems.
- Introduce the concepts of instrumentation and transducers used in measurement systems across industries.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Analyze DC and AC electrical circuits using Ohm's law, Kirchhoff's laws, and basic circuit analysis techniques	K3
CO2	Explain the working principles of transformers, motors, and the structure of power systems	K2
CO3	Describe the functioning of basic semiconductor devices and analog electronic circuits.	K2

CO4	Apply logic gates and Boolean algebra to design and analyze simple digital circuits	K3
CO5	Identify appropriate sensors and measurement instruments for physical quantities used in industrial applications	K3

SYLLABUS

Unit I: Fundamentals of Electrical Engineering
Ohm's Law, Kirchhoff's Laws - Mesh and Nodal Analysis - Introduction to AC circuits: RMS, Average value, Power Factor - Single-phase and Three-phase systems – Star and Delta connections-Power and Energy measurement using wattmeter

Unit II: Electrical Machines and Power Systems
Transformers: Construction, Principle, EMF equation - DC Machines: Working of DC generator and motor (brief) - Induction Motors: Construction and Principle - Basics of Power Generation, Transmission, and Distribution.

Unit III: Fundamentals of Electronics Engineering
Semiconductor Basics: Intrinsic & Extrinsic semiconductors - Diodes: PN junction diode, Zener diode and their applications - BJT and FET: Operation and characteristics (qualitative) - Rectifiers and Voltage Regulation

Unit IV: Digital Electronics
Number Systems: Binary, Decimal, Hexadecimal - Logic Gates: AND, OR, NOT, NAND, NOR, XOR - Boolean Algebra and Simplification - Basic Combinational Circuits: Half Adder, Full Adder, Multiplexer - Introduction to Microcontrollers (e.g., 8051 or Arduino basics)

Unit V: Instrumentation and Measurements
Measurement Systems: Functional Elements - Transducers: Types, Selection criteria - Measurement of Physical Parameters: Temperature, Pressure, Displacement, Flow Sensors in Industrial Applications - Basic concepts of Data Acquisition and PLCs

Text Book

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath – Tata McGraw Hill – 2010
2. Basic Electrical, Electronics and Instrumentation Engineering, R. Muthusubramanian, S. Salivahanan, K.A. Muraleedharan – Tata McGraw Hill – 2010
3. Applied Electronics, R. S. Sedha – S. Chand Publishing – 2008
4. Electronic Devices and Circuits, David A. Bell – Oxford University Press – 2010
5. Electronic Instrumentation, H. S. Kalsi – Tata McGraw Hill – 3rd Edition – 2010

Reference Book

1. **Fundamentals of Electrical Engineering,** Leonard S. Bobrow – Oxford University Press – 2nd Edition – 2011
2. **Electrical and Electronic Technology,** Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith – Pearson Education – 10th Edition – 2012
3. **Digital Principles and Applications,** Donald P. Leach, Albert Paul Malvino – Tata

McGraw Hill – 7th Edition – 2011
4. **Measurement Systems: Application and Design**, Ernest O. Doebelin – McGraw Hill – 5th Edition – 2004
5. **Transducers and Instrumentation,** D.V.S. Murty – PHI Learning – 2nd Edition – 2008

Web Resources

1. NPTEL Course on Basic Electrical Technology
   https://nptel.ac.in/courses/108/105/108105053
2. NPTEL Course on Basic Electronics
   https://nptel.ac.in/courses/117/106/117106086
3. Tutorials Point – Basic Electrical and Electronics
   https://www.tutorialspoint.com/basic_electrical_engineering/index.htm
4. All About Circuits – Electronics Textbook
   https://www.allaboutcircuits.com/textbook
5. Electronics-Tutorials Online Reference
6. https://www.electronics-tutorials.ws/

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	2	-	-	-	-	-	1	3	-
CO2	3	2	2	2	2	-	-	-	-	-	1	3	-
CO3	3	2	2	2	2	-	-	-	-	-	1	3	-
CO4	3	3	3	2	3	-	-	-	-	-	2	3	-
CO5	3	2	2	3	3	-	-	-	-	-	2	3	-

Assessment Methodology	Assessment Tools	Marks
Test		25
MCQ unit wise 10 questions	Moodle / Google form	5
Virtual lab based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UMET24	MACHINING PROCESSES	Category	L	T	P	Credit
		PC	3	0	0	3

Prerequisite: Nil

Preamble/ Course Objective

- Introduce the fundamentals of turning operations on lathes, including machine types, work holding devices, machining parameters, and calculation of material removal rate and machining time. Familiarize students with drilling and allied operations.
- Provide insight into basic machining operations using shaper, planer, and slotting machines, including their types and specific operations.
- Explore advanced machining operations, with a focus on milling machines, their classifications, operations.
- Explore surface finish processes, classifications, and grinding techniques to achieve desired surface quality using appropriate machines and parameters.
- Develop an understanding of cutting tools and cutting fluids, covering tool materials, geometry; wear mechanisms, tool life criteria, and the selection and properties of cutting fluids.

Course Outcome

CO1	Understand and apply the fundamentals of turning operations on lathesand describe various drilling machines and allied operations such as boring	K2
CO2	Explain the working principles and operations of basic machining tools including shapers	K1
CO3	Demonstrate knowledge of milling operations and advanced	K2
CO4	Explain the working principles of surface finishing processes	K3
CO5	Analyze cutting tool materials	K3

Syllabus

UNIT-I **(09)**

TURNING, DRILLING AND ALLIED OPERATIONS Lathe–Types, Designation, Work holding devices–Cutting Speed, Feed and Depth of Cut, MRR-Operations, Machining Time. Drilling Machines - Types, Operations, Machining Time - Boring, Reaming and Tapping (Definition of operations only)

UNIT-II **(09)**

BASIC MACHINING OPERATIONS Shaper, Types, Shaping Operations, Planner, Types, Planning Operation, Slotting Machine Operations.

UNIT-III **(09)**

ADVANCED MACHINING OPERATIONS Milling Machine, Types, Milling Process, Milling Operations, MRR, Machining Time. Gear Hobbing.

UNIT-IV **(09)**

SURFACE FINISHING PROCESS Surface Finish and Surface Roughness Honing – Lapping – Super finishing – Abrasive Belt Finishing – Mass Finishing Processes – Polishing–Buffing. Grinding: Types of grinding–Types of Grinding machines–Size and specification of Grinding machines-Work Holding Devices–Grinding Operations-Grinding Fluids–Grinding

UNIT-V **(09)**

CUTTING TOOLS/FLUIDS Tool Materials, Nomenclature and Geometry of Cutting Tools, Tool wear Mechanisms, Tool Life–Tool Life Criteria. Cutting Fluids-Categories, Desirable Properties, Selection of Cutting Fluids.

Text Book

1.B.S.NagendraParashar,R.K.Mittal."ElementsofManufacturingProcesses"-Prentice-Hall of India Pvt. Ltd; New Delhi -1, latest edition.

2.R.K.Singal,MridulSingal,RishiSingal."Fundamentals of Machining and Machine Tools"-I.K. International Publishing Home Pvt.Ltd;New Delhi, latest edition.

Reference Book

1. Roy.A.Lindberg,"ProcessandMaterialsofManufacture",PrenticeHallIndiaPvt. Ltd, latest edition.
2. Machining: Fundamentals and Recent Advances" by João Paulo Davim, latest edition.
3. Modern Machining Processes by P. Pandey and H. Shan latest edition.
4. Manufacturing Engineering and Technology by SeropeKalpakjian and Steven R. Schmid, latest edition.
5. A Textbook of Manufacturing Technology by R.K. Rajput.Latest edition.

Web Resources

2. **https://onlinecourses.nptel.ac.in/noc23_me16/preview**
3. **https://onlinecourses.nptel.ac.in/noc23_me99/preview**

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Knowledge & Understanding	CAT-1 CAT-2	10
Assignments		10
Seminar / Presentation	Demo	5
Model Examination	For all 5 Units	10
Attendance		5
Total		**40**

25UCSI25	PROBLEM SOLVING USING PROGRAMMING LANGUAGE	Category	L	T	P	Credit
		ESC	1	0	2	2

Course Prerequisite:

- Programming in C
- Web Technology

Course Objective:

- To impart the knowledge of Python basic structure, components, object storage, exception handling, SQL and Web design.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand Python's basic concepts, data types, variables, and control statements.	Understand
CO2	Understand the components of Python programming and storage statements.	Understand
CO3	Understand the functions, modules, packages, and interfaces in Python.	Understand
CO4	Understand the exception handling and Sql	Understand
CO5	Develop a web application using HTML	Apply

SYLLABUS

UNIT I INTRODUCTION (9)

Basic Hardware of Computers – Python Programming-History - Features -basic syntax - Data types - variables - Manipulating Numbers - Text Manipulations - Control Statements- Python Built-in Functions.

UNIT II COMPONENTS OF PYTHON PROGRAMMING (9)

Operator Basics - Numbers - String - List - Tuples - Dictionaries - Files - Object Storage - Type Conversion - Type Comparison - Statements – Assignments.

UNIT III FUNCTIONS AND PACKAGE (9)

Classes and Objects - creating a class, class methods, class inheritance. Functions Definition and Execution - Arguments - Return Values - Advanced Function Calling - Modules - Importing modules – Packages and Interfaces - Creating a module.

UNIT IV EXCEPTION HANDLING AND SQL (9)

Exception Handling in Python- SQL-DDL, Insert/Delete/Update, Simple Queries (select/ project/ join/ aggregate queries), Complex queries (With Clause, Nested Sub queries, Views)

UNIT V HTML (9)

HTML – Form Elements, Input types and Media elements - CSS3, Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface

TEXTBOOKS:

1. Martin C. Brown, “The Complete Reference - Python”, Tata McGraw Hill Indian Edition, 2010. (UNIT 1-3)
2. Krishnan, “Database Management Systems”, McGraw Hill Higher Education, 3rd

Edition, 2002(Unit 4)
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", O'Reilly publishers, 3rd Edition, 2014(Unit 5)

REFERENCES

1. Wesley J Chun, -Core Python Applications Programming, Prentice Hall, 2012.
2. Eric Matthes, "A Hands-On, Project-Based Introduction to Programming", 2nd Edition,2019.
3. James F. Kurose, "Computer Networking: A Top-Down Approach", Pearson Education, 6th Edition, , 2012
4. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web - How to Program", Pearson Education, 5th Edition, 2012
5. Silberschatz, Korth and Sudarshan, "Database System Concepts", McGraw-Hill (Indian Edition released), 7th Edition, 2021

ONLINE/ NPTEL COURSES:

1. Programming, Data Structures and Algorithms using Python- https://nptel.ac.in/courses/106106145
2. The Joy of Computing using Python-https://nptel.ac.in/courses/106106182
3. Python for Data Science- https://nptel.ac.in/courses/106106212

PRACTICE EXERCISES:

1. Identify and solve simple real-life/scientific/technical problems. (Electricity Billing, Retail shop billing, Sin series, etc).
2. Python programming using simple statements and expressions (exchange the values of two variables, circulatethe values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists and tuples.
5. Implementing real-time/technical applications using Sets and dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of a shape)
7. Implement DDL and DML Commands. Platform can be Oracle.
8. Implement View.
9. Creation of college website using HTML
10. Implementation of various types of CSS.

CO PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
1	3	2	2	1	3	-	-	1	1	-	3
2	3	2	2	1	3	-	-	1	1	-	3
3	3	2	2	1	3	-	-	1	1	-	3
4	3	2	2	1	3	-	-	2	1	-	3
5	3	3	3	2	3	-	-	3	1	3	3

Assessment Methodology	Assessment Tools	Marks
Theory Test		15
Coding assignments	Online submission	10
Mini project implementation	Code demo and documentation	10
Model Practical		10
Attendance		5
Total		50

25UEEP26	ELECTRICAL AND ELECTRONICS ENGINEERING LAB	Category	L	T	P	Credit
		ESC	0	0	2	1

Prerequisite : Nil

Preamble/ Course Objective:

The objective of the Basic Electrical and Electronics Engineering Lab is :

- To provide foundational knowledge of electrical and electronic components and their behavior in basic DC and AC circuits.
- To develop practical skills in operating and testing electrical machines such as transformers, DC motors, and induction motors under load conditions.
- To enable students to analyze and verify the characteristics of semiconductor devices such as diodes, rectifiers, and Zener diodes.
- To introduce digital logic circuits and enhance understanding of number systems, logic gates, and combinational circuits using hands-on implementation.
- To expose students to transducers and instrumentation concepts for measurement of physical quantities and amplification of low-level signals.

Course Outcome		
On the successful completion of the course, students will be able to		
CO1	Apply Ohm's Law and Kirchhoff's Laws to verify basic electrical circuit behaviour.	K3
CO2	Analyze the performance characteristics of single-phase transformers, DC machines, and induction motors under varying load conditions.	K4
CO3	Demonstrate the VI characteristics of PN junction and Zener diodes and construct rectifier circuits with and without filters.	K3
CO4	Implementation of basic digital logic circuits including logic gates, half adder and full adder using discrete components.	K3
CO5	Analyze the working of transducers like LVDT and instrumentation amplifiers for measurement of physical parameters.	K4

SYLLABUS – LIST OF EXPERIMENTS (30)

1. Verification of Ohm's Law and Kirchhoff's Laws (KVL & KCL).
2. Measurement of three phases power using two wattmeter method.
3. Load test on single phase transformer.
4. Load test on DC shunt motor.
5. Open circuit characteristics of DC Shunt generator.
6. Load test on single phase induction motor.
7. VI Characteristics of PN Junction Diode and Zener Diode.

8. Half-Wave and Full-Wave Rectifiers with and without Filter.
9. Verification of Logic Gates and Implementation of Boolean Expressions.
10. Implementation of Half Adder and Full Adder using Logic Gates.
11. Gain Measurement of an Instrumentation Amplifier.
12. Measurement of displacement using LVDT.

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

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	10
Attendance		10
Total		60

25UMEP27	MACHINING PROCESS LAB	Category	L	T	P	Credit
		PC	0	0	2	1

Prerequisite: Manufacturing Process

Preamble/ Course Objective : The objective of this course is to provide students with hands-on experience and theoretical knowledge of essential manufacturing processes involving both conventional and modern machine tools.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Demonstrate the ability to perform basic lathe operations such as plain turning, facing, step turning, chamfering, grooving, knurling, taper turning, and thread cutting.	**K3**
CO2	Identify and describe the functions of various machine tools such as lathe, shaper, milling, grinding	**K3**
CO3	Operate shaping, milling, grinding, and hobbing machines to manufacture mechanical components such as cubes, contours, cylindrical parts, and spur gears.	**K3**
CO4	Develop and simulate CNC part programs to produce components with specified dimensions.	**K3**
CO5	Design simple machine elements using CAD tools and fabricate them using 3D printing technology.	**K3**

Syllabus (30)

Lathe:

- Plain turning and facing
- Step turning, grooving, chamfering and knurling
- Taper turning and external thread cutting using lathe

Shaping Machine:

- Cube shaping, V-Shaping

Milling Machine:

- Spline , key way milling
- Contour milling using vertical milling machine

Gear Cutting:

- Spur gear cutting in Hobbing machine

Grinding Machine:

- Cylindrical grinding

3D Printing:

- Designing and Printing of Machine Elements

Text Book

- B.S.NagendraParashar&R.K.Mittal – Elements of Manufacturing Processes, Prentice Hall India Pvt. Ltd.,2011.
- R.K.Singal, MridulSingal, Rishi Singal. “Fundamentals of Machining and MachineTools”-I.K.InternationalPublishingHomePvt.Ltd;NewDelhi,2008.

Reference Book & Web Resources

- Department of Mechanical Engineering "Manufacturing Process Laboratory Manual", MVIT, 2023
- Kalpakjain S, Schimd S, “Manufacturing Engineering and Tech”, Pearson Education, 7th edition, New Delhi, 2018
- Machining: Fundamentals and Recent Advances" by João Paulo Davim, latest edition. 2008
- Roy.A.Lindberg, “Process and Materials of Manufacture”, Prentice Hall India Pvt.Ltd,2006.
- https://openoregon.pressbooks.pub/manufacturingprocesses45

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	20
Record work		10
Model exam		15
Viva		5
Attendance		10
Total		60

25UGEP28	FABRICATION LAB	Category	L	T	P	Credit
		ESC	0	0	2	1

Prerequisite:

- Basic understanding of **forces**, **energy**, **motion**, and **electricity**.
- Exposure to **basic fitting**, **carpentry**, and **sheet metal** work.

Preamble/ Course Objective

1. To practice the usage of various tools towards assembly and dis-assembly of different items / equipment.
2. To make simple part / component using welding processes.
3. To train on the basic wiring practices of boards, machines, etc.
4. To provide a hands-on experience on the use of electronic components, equipment, sensors and actuators.
5. To expose to modern computer tools and advanced manufacturing / fabrication processes.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Assemble and dis-assemble various items / equipment.	K3
CO2	Make simple parts using suitable welding processes.	K3
CO3	Setup wiring of distribution boards, machines, etc.	K3
CO4	Utilize the electronic components to fabricate a simple equipment, aided with sensors and actuators.	K3
CO5	Assemble and dis-assemble various items / equipment.	K3

Syllabus

LIST OF ACTIVITIES

(A). Dis-assembly & Assembly Practices

i) Tools and its handling techniques.

ii) Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.

iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.

iv. Dis-assembly and assembly of a Bicycle, IC Engines.

(B). Metal Joining

i. Welding Procedure, Soldering and Brazing & Safety Measures.

ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.

iii. Hands-on session of preparing base material & Joint groove for welding.

iv. Hands-on session of Carbon Steel & Stainless Stell plates / pipes, for fabrication of a simple part.

(C). Electrical Wiring Practices

I. Electrical Installation tools, equipment & safety measures.

II. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box,

III. Hands-on session of electrical connections for Lightings, Fans, Calling Bells.

IV. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

(D). Electronics Components / Equipment Practices

i. Electronic components, equipment & safety measures.

ii. Dis-assembly and assembly of Computers.
iii. Hands-on session of Soldering Practices in a Printed Circuit Breaker.
iv. Hands-on session of Bridge Rectifier, Op-Amp and Tran impedance amplifier.
v. Hands-on session of integration of sensors and actuators with a Microcontroller.
vi. Demonstration of Programmable Logic Control Circuit.

(E). Contemporary Systems

i. Demonstration of Solid Modeling of components.
ii. Demonstration of Assembly Modeling of components.
iii .Fabrication of simple components / parts using 3D Printers.
iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

Text Book

1. Stephen Christena, Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics, Crestline Books,latest edition.
2. H. Lipson, Fabricated - The New World of 3D Printing, Wiley, latest edition.

Reference Book & Web Resources

1. Code of Practice for Electrical Wiring Installations (IS 732:2019)
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Oxford University Press, 7th ed. (Indian edition).
3.Fabrication and Welding Engineering by Roger Timings, latest edition.
4.Welding and Metal Fabrication, International Edition by Larry Jeffus, latest edition.
5.Introduction to Microelectronic Fabrication, Volume 5 by Richard Jaeger, latest edition.

Mapping with Programme Outcomes													
COs	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	2	-	3	2	-	1	2	2	-	2	-
CO2	3	2	3	-	3	3	2	2	2	2	2	2	-
CO3	3	2	2	-	3	3	-	1	2	2	2	2	-
CO4	3	3	2	2	3	2	-	2	2	2	-	3	-
CO5	3	2	3	2	3	-	2	2	2	2	2	3	-

Assessment Methodology	**Assessment Tools**	**Marks**
Cognitive domain (Knowledge & Understanding)	Model Examinations	20
Affective domain (Reflection)	Lab Records & Observation	20
Behavioral domain (Application & Practice)	Hands-on Practice (Dis-assembly, Welding, Wiring, Soldering, 3D Printing)	15
Attendance		05
Total		60

25UPCE21	COMMMUNICATION SKILLS	Category	L	T	P	Credit
		EEC	0	0	2	0

Preamble/ Course Objective: Ability to plan and manage their career paths effectively. It focuses on developing self-assessment, goal setting, and decision-making skills. Students will learn to research career options and align them with personal strengths and values.

Prerequisite: Carrier Development Skills

Course Outcome

On the successful completion of the course, the students will be able to

CO1	Develop sustained motivation and enhance interpersonal skills for effective communication and teamwork.
CO2	Build active listening and conversation skills essential for collaborative and respectful team interactions
CO3	Strengthen reading comprehension and writing clarity through critical analysis and audience-focused expression.
CO4	Improve public speaking and presentation skills while fostering self-assessment through SWOT analysis.
CO5	Promote team collaboration and communication through practical activities like debates and group problem-solving

Syllabus

UNIT 1: **10 Hrs**

Motivation –II: Intrinsic vs. Extrinsic Motivation- Goal Setting and Achievement -

Building and Sustaining Motivation

Interpersonal skills: Effective Communication - Active Listening - Conflict Resolution - Teamwork and Collaboration

UNIT 2: **10Hrs**

Listening Skills: Roles and Responsibilities in a Team - Building Trust and Respect Among Team Members – Effective Team Communication

Conversation skills: Starting and Maintaining a Conversation - Non-Verbal Communication Cues- Active Listening and Responding.

UNIT 3: **10 Hrs**

Reading Skills: Skimming and Scanning Techniques – Critical reading and Interpretation

Writing Skills:Grammar and Syntax - Clarity and Conciseness- Audience Awareness

UNIT 4: 10 Hrs

Presentation Speaking Skills: Speech Structure and Organization – Verbal Delivery Techniques

Public speaking skills: Confidence and overcoming Anxiety –Effective message Delivery

SWOT Analysis: Identifying Internal Factors – Analyzing External Factors

UNIT 5: 8 Hrs

Team Building: Roles and Responsibilities in a team – Communication and Trust – Conflict resolution and Problem Solving

Active Sessions: Debate – Picture Connector

Text Book

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI

2.Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

Reference Book

1.The Emotionally Intelligent Workplace by DANIEL GOLEMAN.

2.Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.

3.Top Talking in English (international communication skills) by CHARLES T. RAJENDRA

4.Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	2	2	2	2
CO2	-	-	-	-	-	-	-	-	3	3	-
CO3	-	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	-	-	-	-	2	-	2	2
CO5	-	-	-	-	-	-	-	-	3	3	-

Course Contents and Lecture Schedule

Unit/UNIT No	Topic	No. of Periods
UNIT 1	Intrinsic vs. Extrinsic Motivation	2
	Goal Setting and Achievement	2

Unit/UNIT No	Topic	No. of Periods
	Building and Sustaining Motivation	2
	Effective Communication Active Listening	1
	Conflict Resolution	1
	Teamwork and Collaboration	2
UNIT 2	Roles and Responsibilities in a Team	2
	Building Trust and Respect Among Team Members	2
	Effective Team Communication	2
	Starting and Maintaining a Conversation	2
	Non-Verbal Communication Cues	1
	Active Listening and Responding	1
UNIT 3	Skimming and Scanning Techniques	2
	Critical reading and Interpretation	2
	Grammar and Syntax	2
	Clarity and Conciseness	2
	Audience Awareness	2
UNIT 4	Speech Structure and Organization	2
	Verbal Delivery Techniques	2
	Confidence and overcoming Anxiety	2
	Effective message Delivery	2
	Identifying Internal Factors	1
	Analyzing External Factors	1
UNIT 5	Roles and Responsibilities in a team	2
	Communication and Trust	2
	Conflict Resolution and Problem Solving	2
	Debate	1
	Picture connector	1

Assessment Methodology	Assessment Tools	Marks
Test 1 (Modules 1-2)	Internal Tests	15
Test 2 (Modules 3-5)	Internal Tests	15
Presentation Skills Demonstration	Practical Assessment	15
Public Speaking and Confidence Assessment	Practical Assessment	10
SWOT Analysis Report	Assignment	10
Active Listening and Conversation Skills Demo	Practical Assessment	10
Team Building Activity and Leadership Role	Project	10
Debate Participation and Performance	Practical Assessment	10

Assessment Methodology	Assessment Tools	Marks
Attendance and Class Participation	Continuous Assessment	5
		100

25UMCC21	IKS IN HUMANITIES AND SOCIAL SCIENCE	Category	L	T	P	Credit
		MCC	0	0	2	0

Course Prerequisite:

- Basic understanding of Indian history and culture

Course Objective:

- This course explores Indian Knowledge Systems in the context of humanities and social sciences, providing students with a deeper understanding of India's intellectual heritage.

Course Outcomes:

On the successful completion of the course, students will be able to:

CO1	Understand the philosophical foundations and methodologies of Indian knowledge systems in the humanities.	Understand
CO2	Analyze Indian contributions to literature, arts, social organization, and governance systems	Analyze
CO3	Apply principles from Indian philosophical traditions to contemporary social and ethical issues	Apply
CO4	Evaluate the relevance and adaptability of traditional knowledge in modern social contexts	Evaluate
CO5	Create connections between ancient wisdom and contemporary challenges in society	Create

Syllabus

UNIT I: Philosophical Foundations of Indian Knowledge Systems (6 Hours) - Darshanas (Schools of Philosophy): Samkhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta - Epistemology in Indian philosophy: Pramanas (means of knowledge) - Ethics and moral philosophy in Indian traditions - Concept of Dharma, Artha, Kama, and Moksha - Comparative study with Western philosophical traditions

UNIT II: Indian Literary and Artistic Traditions (6 Hours) - Sanskrit literature: Vedas, Upanishads, Puranas, Epics (Ramayana, Mahabharata) - Classical poetry and drama: Kalidasa, Bhartrhari, Bhasa - Regional literature and folk traditions - Indian classical music and dance: Theoretical foundations - Visual arts: Sculpture, painting, and architectural styles - Aesthetics in Indian tradition: Rasa theory and Alamkarashastra

UNIT III: Social Organization and Governance (6 Hours) - Ancient Indian social structure and organization - Varna and Ashrama systems: Historical context and evolution - Village self-governance: Panchayati Raj origins - Arthashastra: Principles of statecraft and administration - Justice system: Dharmashastra and Rajadharma - Economic systems: Trade, agriculture, and crafts

UNIT IV: Educational Systems and Knowledge Transmission (6 Hours) - Gurukula system: Teacher-student relationship - Ancient universities: Nalanda, Takshashila, Vikramshila - Oral tradition and preservation of knowledge - Women's education in ancient India - Integration of spiritual and material learning - Comparison with modern educational approach

UNIT V: Contemporary Relevance and Applications (6 Hours) - Indian knowledge systems

in modern governance - Traditional conflict resolution mechanisms - Environmental consciousness in Indian traditions - Community-based development models - Gender studies: Women in Indian philosophical traditions - Relevance of Indian ethics in corporate governance - Cultural preservation and modernization challenges

LEARNING ACTIVITIES

Research Projects: 1. **Philosophical Analysis Project** - Study of a specific philosophical school - Comparison with contemporary thought - Presentation of findings

2. **Literary Heritage Study**
   - Analysis of classical texts
   - Cultural significance evaluation
   - Creative interpretation through modern media
3. **Social Systems Research**
   - Historical analysis of governance models
   - Contemporary applications study
   - Policy recommendation development
4. **Case Study Analysis**
   - Traditional knowledge applications
   - Success stories and challenges

Future implementation strategies

TEXTBOOKS

1. S. Radhakrishnan, "Indian Philosophy", Oxford University Press, 2008
2. A.L. Basham, "The Wonder That Was India", Rupa Publications, 2017
3. KapilaVatsyayan, "Traditional Indian Art and Culture", Cambridge University Press, 2015

REFERENCE BOOKS

1. Heinrich Zimmer, "Philosophies of India", Princeton University Press, 1989
2. RomilaThapar, "Early India: From the Origins to AD 1300", Penguin Books, 2015
3. K.M. Munshi, "The History and Culture of the Indian People", BharatiyaVidyaBhavan
4. Digital Library of India: https://www.dli.gov.in
5. Sahapedia - Encyclopedia of Indian Culture: https://www.sahapedia.org
6. Indian Council of Historical Research: https://ichr.ac.in

Archaeological Survey of India: https://asi.nic.in

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Philosophical Analysis Assignment	Assignment	25
Comparative Study Project (Ancient vs Modern)	Project	20
Literary/Artistic Tradition Presentation	Presentation	20
Heritage Site Visit and Report	Field Work	10
Contemporary Application Case Study	Assignment	15
Attendance and Class Participation	Continuous Assessment	10
Total		100

25UMCC22	HOLISTIC WELLNESS	Category	L	T	P	Credit
		MCC	0	0	1	0

Course Prerequisite

- Nil

Course Objective

- Foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being. create a balanced lifestyle that promotes overall health and happiness through practical activities.
- Explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the basic principles of holistic wellness. Apply strategies for maintaining physical health, including nutrition and exercise	Understand
CO2	Practice mindfulness techniques to enhance mental and emotional well-being.	Analyze
CO3	Develop a personal wellness plan incorporating various aspects of holistic health.	Apply
CO4	Apply advanced techniques in mindfulness, meditation, and stress management.	Evaluate
CO5	develop resilience and adaptability in maintaining wellness. Refine and sustain a personalized holistic wellness plan.	Create

Syllabus

UNIT I INTRODUCTION TO HOLISTIC AND PHYSICAL WELLNESS

Overview of holistic wellness: physical, mental, emotional, and internal health- The importance of balance in overall well-being. Importance of physical activity and exercise- Understanding nutrition and its role in health- Sleep hygiene and its impact on well-being.

Hands-on activity: Self-assessment of current wellness status.Designing a personalized fitness and nutrition plan.

UNIT II: MENTAL AND EMOTIONAL WELLNESS:

Stress management techniques- The role of Yoga, mindfulness and meditation in mental health- Emotional intelligence and its impact on relationships-Music therapy.

Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.

UNIT III: INTEGRATING WELLNESS PRACTICES:

Combining physical, mental, emotional, and Internal wellness practices into daily life - Developing a balanced wellness plan.

Hands-on activity: Creating a comprehensive personal wellness plan.

UNIT IV: EMOTIONAL RESILIENCEAND ADVANCED MINDFULNESS

Deepening mindfulness practices for enhanced mental clarity- Exploring different forms of meditation (e.g., guided, transcendental, movement-based). Building emotional resilience through positive psychology practices- Cognitive-behavioural strategies for managing stress and anxiety.

Hands-on activity: Developing and practicing a resilience toolkit. Daily meditation practice and journaling reflections.

UNIT V: INTERNAL GROWTH AND SUSTAINING WELLNESS PRACTICES:

Exploring the deeper aspects of internal wellness and self-actualization- Reflective practices for discovering life purpose and meaning. Strategies for maintaining wellness habits over the long term- Adapting wellness plans to life changes and challenges-

Hands-on activity: Revising and finalizing a long-term personal wellness plan. Creating a vision board or personal mission statement.

TEXTBOOKS:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

REFERENCE BOOKS

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4. Swami Budhanandha., Will power and its development., AdvaitaAshramaMayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5. KalderdonAdizesIchak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023)
6. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
7. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).

WEB RESOURCES

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						2		2			
CO2						2					
CO3						2					3
CO4						2					3
CO5						2					3

Assessment Methodology	Assessment Tools	Marks
MCQ Test		30
Presentation		20
Activity		20
Assignment		20
Attendance		10
Total		100

SEMESTER-III

APPLICATIONS OF FOURIER SERIES AND Z-TRANSFORMS			
Course Code:	25UMAT34	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	04
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mathematics		

Course Objectives:

The students will be able to

- To learn the Dirichlet's conditions and expand periodic functions into Fourier series.
- To understand the concept of Root Mean Square value and apply Parseval's theorem on Fourier coefficients.
- To apply the method of separation of variables to classify partial differential equations and solve the one-dimensional wave equation.
- To gain the knowledge of one-dimensional heat conduction and two-dimensional steady state heat equations.
- To apply the concept of Z-transforms and solve difference equations using inverse Z-transforms

Unit 1	**FOURIER SERIES**	**12 Periods**

Dirichlet ‘s conditions – General Fourier series - Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: K3

Unit 2	**PARSEVAL’S THEOREM & HARMONIC ANALYSIS**	**12 Periods**

Root Mean Square Value – Parseval ‘s theorem on Fourier Coefficients. Complex form of Fourier series – Harmonic Analysis.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: K3

Unit 3	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12 Periods**

Method of separation of variables – Classification of PDE – Fourier Series Solutions of one-dimensional wave equation.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: K3

Unit 4	**ONEAND TWO-DIMENSIONAL HEAT EQUATIONS**	**12 Periods**

One-dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Cartesian form only).		
Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving	
	RBT Level: K3	
Unit 5	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS**	**12 Periods**
Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.		
Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving	
	RBT Level: K3	
Total		**60 Periods**

Suggested Activities and Evaluation Methods:

Tutorials, / MCQ (Gate Related Questions), Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1-Construct Fourier series expansions of periodic functions including odd, even and half-range series with change of interval.

CO2- Compute RMS values and Fourier coefficients using Parseval's theorem and harmonic analysis in complex form.

CO3- Classify PDEs and **solve** the one-dimensional wave equation by applying separation of variables and Fourier series.

CO4-Determine the solution of one-dimensional heat conduction equation and **calculate** the steady state solution of two-dimensional heat equation.

CO5-Apply Z-transform properties and convolution theorem to **formulate** and **solve** difference equations using inverse Z-transforms.

Textbooks:

T1: H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Co. New Delhi, 2019.

T2: Balaji, "Engineering Mathematics II and Transforms and Partial Differential Equations", Balaji publishers, 18thEdition, 2018.

T3:B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 4th Edition, 2020**.**

References:

R1: Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 11th Edition 2025.

R2:B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi 2018.

R3:N.P Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New

Delhi, 10th Edition, 2021.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/111105121
2. https://nptel.ac.in/courses/111105035
3. https://nptel.ac.in/courses/111105093
4. https://onlinecourses.nptel.ac.in/noc23_ma90/preview
5. https://nptel.ac.in/courses/111106111

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2	2	1	1	-	-	-	1	-	1	-	-
CO2	3	2	2	1	1	-	-	-	1	-	1	-	-
CO3	3	2	2	1	1	-	-	-	1	-	1	-	-
CO4	3	2	2	1	1	-	-	-	1	-	1	-	-
CO5	3	2	2	1	1	-	-	-	1	-	1	-	-
AVG	3	2	2	1	1	-	-	-	1	-	1	-	-

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

MECHANICS OF SOLIDS			
Course Code:	25UMET31	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3 : 1 : 0	**Credits:**	04
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mechanical Engineering		

Course Objectives:

To equip students with the fundamental knowledge and analytical skills to evaluate stresses, strains, deflection, torsion, and stability in structural and mechanical components such as beams, shafts, springs, columns, and pressure vessels.

Unit 1	**Simple Stress, Strain and Bending Theory**	**12 Periods**

Simple Stresses and Strain – Relation between three modulus and Poisson's ratio – Thermal Stress – Principal stress and Principal planes - Shear Force – Bending Moment – Cantilever and simply supported beams subjected to point loads and uniformly distributed loads

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Theory: K3

Unit 2	**Bending and Shear Stresses in Beams**	**12 Periods**

Theory of simple bending-stress variation in beam cross Section, Normal and Shear stress in Beams – Beam of uniform strength for bending, combined direct and bending stresses.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Theory: K4

Unit 3	**Deflection of Beams**	**12 Periods**

Deflection of beams - Double integration method –moment area method

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Theory: K4

Unit 4	**Torsion and Springs**	**12 Periods**

Torsion of circular solid and Hollow shafts–Shafts in Series and parallel–Combined bending and torsion-Application of Torsion in helical springs–Open and closed coil springs, Leaf Springs.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Theory: K4

Unit 5	**Columns and Pressure Vessels**	**12 Periods**

Theory of columns – Long column and short column - Euler's formula – Rankine's formula. Introduction to thin cylinder – Thick cylinder –Spherical shells – Lame's Equation

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Theory:K4
Total	**60 Periods**

Suggested Activities and Evaluation Methods:

Tutorials, Demo, Quiz / MCQ (Gate Related Questions),
Students' performance in continuous Assessment / Student Presentations,
Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply the fundamental concepts of stress and strain, including thermal stresses and principal stresses, and analyze shear force and bending moment in various beam configurations.

CO2: Analyze normal and shear stress distributions in beams using the theory of simple bending and design beams of uniform strength under combined loading conditions.

CO3: Solve deflection problems in beams using double integration and moment area methods, and apply energy methods such as strain energy and virtual work principles.

CO4: Analyze torsional behavior of solid and hollow circular shafts, analyze shafts in series and parallel, and apply torsion theory to design various types of springs.

CO5: Analyze the stability of columns using Euler's and empirical formulae, and determine stresses in thin and thick-walled cylinders using Lame's theory including compound cylinders with interference fit.

Textbooks:

T1: Strength of Materials- R.K.Bansal - Laxmi Publications, New Delhi, 2020

T2: Strength of Materials- R.K. Rajput - S.Chand and Company Ltd., New Delhi, 2022

T3: Strength of Materials- Bhavikatti. S. S - Vikas Publishing House (P) Ltd., New Delhi, 2021

References:

R1: Mechanics of Materials- Beer F, Jonston E R, DeWolf J- McGraw-Hill Publications, 2020

R2: Strength of Materials- U.G.Jindal- Galgotia Publication Pvt. Ltd., New Delhi, 2018

Web links and Video Lectures (e-Resources):

1. http://nptel.ac.in/courses/105106116
2. http://nptel.ac.in/courses/105102090
3. http://nptel.ac.in/courses/112107147

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	3	-	-	-	-	-	-	-	-	2	-	3
CO2	3	2	3	2	-	-	-	-	-	-	2	-	3
CO3	2	2	-	1	-	-	-	-	-	-	1	-	3
CO4	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	3	3	3	2	-	-	-	-	-	-	2	-	3
AVG	2.8	2.6	1.8	1							1.8		3

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

FLUID MECHANICS AND MACHINERY			
Course Code:	25UMET32	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mechanical Engineering		

Course Objectives:

1. The properties of fluids and concept of control volume are studied
2. To understand the importance of dimensional analysis
3. The applications of the conservation laws to flow through pipes are studied
4. To understand the importance of various types of flow in turbines.
5. To understand the importance of various types of flow in pumps.

Unit 1	**FLUID PROPERTIES AND FLOW CHARACTERISTICS**	**12 Periods**

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching
	RBT Level:K3

Unit 2	**FLOW THROUGH CIRCULAR CONDUITS**	**12 Periods**

Hydraulic and energy gradient - Introduction to Laminar and Turbulent flow - Laminar flow through circular conduits and circular annuli Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

Teaching Learning Process	**Pedagogy:** Laboratory Demonstrations
	RBT Level: K3

Unit 3	**DIMENSIONAL ANALYSIS**	**12 Periods**

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

Teaching Learning Process	**Pedagogy:**
	RBT Level: K4

Unit 4	**PUMPS**	**12 Periods**

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump working principle – Rotary pumps –classification.

Teaching Learning Process	**Pedagogy:** Laboratory Demonstrations, Case Studies & Industrial Applications
	RBT Level: K3

Unit 5	**TURBINES**	**12 Periods**

Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.

Teaching Learning Process	**Pedagogy:** Laboratory Demonstrations, Case Studies & Industrial Applications
	RBT Level: K3

Total	**60 Periods**

Suggested Activities and Evaluation Methods:

- Tutorials, Demo, Industrial Visit, Quiz / MCQ (Gate Related Questions), Case Study
- Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Explain the properties of fluids and apply the concept of control volume to analyze fluid flow problems.

CO2: Apply dimensional analysis and similitude principles to solve and correlate fluid flow and hydraulic system problems.

CO3: Analyze the application of conservation laws of mass, momentum, and energy to fluid flow through pipes.

CO4: Evaluate the significance of different types of fluid flow in turbines and analyze their effect on performance.

CO5: Evaluate the significance of different types of fluid flow in pumps and analyze their effect on performance.

Textbooks:

T1: Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.

T2: Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011

T3: Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016.

References:

R1: Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.

R2: Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010

Web links and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	3	3	-	-	3	3	2	-	-	3	-	-
CO2	3	3	3	-	-	3	3	2	-	-	3	-	-
CO3	3	3	3	-	-	3	3	2	-	-	3	-	-
CO4	3	3	3		-	3	3	3	-	-	3	3	3
CO5	3	3	3	-	-	3	3	3	-	-	3	3	3
AVG	3	3	3	-	-	3	3	2	-	-	3	-	-

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

APPLIED THERMODYNAMICS			
Course Code:	**25UMET33**	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mechanical Engineering		

Course Objectives:

To impart knowledge on thermodynamic principles and enable analysis of energy, entropy, steam power cycles, and psychrometric processes for practical engineering applications.

Unit 1	**Basic concepts: Thermodynamics**	**12 Periods**

Ideal and Real gases: Laws of perfect gases – Boyle's law – Charle's law – Gay Lussac law – Joule's law – Avogadro's law – state equation of gases – specific heat of gases. VanderWalls equation, Redlich Kwong equation, Dieterici equation, compressibility charts. Gas mixtures: Mole fraction, mass fraction – calculation of mixture properties.

Teaching Learning Process	**Pedagogy:** Lecture method & Problem-solving sessions
	RBT Level: K1, K2

Unit 2	**Energy and Entropy**	**12 Periods**

Energy and Entropy: I law of thermodynamics – energy balance of closed and open systems. Steady and unsteady flow systems. II Law of thermodynamics – Entropy generation principle, its application, entropy balance of closed and open systems.

Teaching Learning Process	**Pedagogy:** Lecture method & Problem-solving sessions
	RBT Level: K2,K3

Unit 3	**Steam & Power Cycles**	**12 Periods**

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. P-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods – Reheat and Regenerative cycles, Binary and Combined cycles.

Teaching Learning Process	**Pedagogy:** Lecture method & Problem-solving sessions
	RBT Level: Theory: Practical:

Unit 4	**Thermodynamic Relations**	**12 Periods**

General thermodynamic property relations: Maxwell equations – Tds equations – property relations of gases – Clausius-Clapeyron equation – Joule-Thomson coefficient – Gibbs phase rule – equilibrium condition.

Teaching Learning Process	**Pedagogy: Lecture method** & **Problem-solving sessions**
	RBT Level: K2, K3

Unit 5	**Introduction to Refrigeration Cycles**	**12 Periods**

Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications.

Teaching Learning Process	**Pedagogy: Lecture method & Problem-solving sessions**
	RBT Level: K2, K3,
Total	**60 Periods**

Suggested Activities and Evaluation Methods:

- Tutorials, Demo, Industrial Visit, Quiz / MCQ (Gate Related Questions), Case Study.
- Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Explain the behavior of ideal and real gases using gas laws and equations of state, and compute thermodynamic properties of pure gases and gas mixtures.

CO2: Apply the First and Second Laws of Thermodynamics to analyze energy and entropy balances in closed and open systems under steady and unsteady flow conditions

CO3: Determine thermodynamic properties of steam using steam tables and diagrams, and analyze Rankine cycle performance including reheat, regenerative, and combined cycles.

CO4: Analyze thermodynamic property relations and phase equilibrium using Maxwell relations, Tds equations, Clausius–Clapeyron equation, and Gibbs phase rule.

CO5: Evaluate psychrometric properties and processes using psychrometric charts and equations, and solve practical air–vapour mixture problems in engineering applications.

Textbooks:

T1: P.K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publishing Co. Ltd., New Delhi,2020.

T2: R.K. Rajput, *A Textbook of Engineering Thermodynamics*, Laxmi Publications Pvt. Ltd., New Delhi, 2021.

References:

R1: Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen, *Fundamentals of Thermodynamics*, John Wiley & Sons, 9th Edition, 2021

R2: Yunus A. Çengel and Michael A. Boles, *Thermodynamics: An Engineering Approach*, McGraw Hill Education, 9th Edition, 2019

Web links and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/noc22_me113/preview

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	2	-	3
CO2	3	3	-	2	-	-	-	-	-	-	2	-	3
CO3	3	3	2	-	-	-	-	-	-	-	3	2	3

CO4	3	3	-	2	-	-	-	-	-	-	2	-	3
CO5	2	3	2	-	-	-	-	-	-	-	2	-	2
AVG	3	2.8	0.5	0.5	-	-	-	-	-	-	2.2	-	3
1 – Low, 2 – Medium, 3 – High, '-' – No correlation													

METALLURGY AND MATERIALS SCIENCE& LAB			
Course Code:	25UMEI31	**Course Type:**	Integrated
Teaching Periods / Week (L:T:P):	3:0:2	**Credits:**	04
Total Teaching Periods:	60 Periods	**CAM+ ESE Mark:**	50+50
Teaching Department:	Mechanical Engineering		

Course Objectives:

To impart knowledge on

- To acquaint students with the basic concepts and properties of materials science.
- To impart fundamental knowledge of ferrous and non-ferrous metal processing.
- To help students select appropriate materials for designing engineering components.
- To familiarize students with various testing methods performed on metals.
- To develop futuristic insight into metals, alloys, and their applications.

Unit 1	**Crystal Structures and Metallography**	**12 Periods**

Crystal structures; Solid solutions – Types; Metallography; Metallurgical microscopes; Specimen preparation; Cooling curves; Allotropy concept

Practicals: Study of metallurgical microscope, Preparation of specimen for microscopic examination

Teaching Learning Process	**Pedagogy:** Lecture (chalk & board), PPT, Demonstration of microscopes, Case discussions
	RBT Level: Theory: K1–K2 Practical: K3–K4

Unit 2	**Phase Diagrams and Ferrous Materials**	**12 Periods**

Binary phase diagrams – construction & interpretation; Types – Eutectic, Eutectoid, Peritectic, Peritectoid; Iron-Carbon equilibrium diagram; Classification of steels & alloy steels; Cast irons

Practicals: Identification of Metal 1, Identification of Metal 2, Identification of Metal 3

Teaching Learning Process	**Pedagogy:** Lecture + PPT + Graphical construction of diagrams + Case studies
	RBT Level: Theory: K1–K3 Practical: K3–K4

Unit 3	**Heat Treatment of Steels**	**12 Periods**

Objectives of heat treatment of steel, Critical temperature; TTT diagram; Annealing, Normalizing, Hardening; Hardenability tests; Tempering; Martensitic transformation; Surface hardening processes

Practicals: Study of heat treatment processes, Study of quenching mediums, Hardening of steel, Normalizing of steel, Annealing of steel, Jominy end quenching test

Teaching Learning	**Pedagogy:** Lecture + PPT + Demonstration of heat treatment

Process	setups + Numerical exercises
	RBT Level: Theory: K2–K4 Practical: K3–K4

Unit 4	**Non-Ferrous Metals, Alloys, and Mechanical Testing**	**12 Periods**

Non-ferrous metals & alloys: Cu, Al, Ni, Zn, Pb-based alloys; Metal matrix composites; Mechanical properties; Testing – Tensile, Compression, Torsion, Hardness, Impact

Practicals:

Tension test, Impact test – Izod, Brinell Hardness, Rockwell Hardness, Ductility test (Al, GI, MS), Impact test – Charpy

Teaching Learning Process	**Pedagogy:** Lecture + PPT + Animations + Lab demonstrations
	RBT Level: Theory: K1–K3 Practical: K3–K4

Unit 5	**Plastic Deformation, Fracture, Creep, and Fatigue**	**12 Periods**

Plastic deformation, Slip and Twinning; Hot, Cold, Warm working; Recovery &Recrystallization; Fracture mechanics; Creep & Fatigue failures; Microstructure analysis; Hardness, tensile & impact testing

Practicals:

Compression test, Fatigue test, Creep test.

Teaching Learning Process	**Pedagogy:** Lecture + PPT + Case studies + Lab discussions
	RBT Level: Theory: K2–K4 Practical: K4–K5

Total	**60 Periods**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: understand fundamental concepts of crystal structures, phase diagrams, and metallography.

CO2: Identify and classify ferrous and non-ferrous metals and alloys.

CO3: Apply heat treatment and testing techniques to improve material properties.

CO4: Analyze microstructures, mechanical properties, and failure mechanisms in metals.

CO5: Evaluate and select suitable materials for engineering applications.

Textbooks:

T1: V. Raghavan, Materials Science and Engineering: A First Course, 6th Edition, PHI Learning Pvt. Ltd., New Delhi, 2015 (Latest Reprint 2023).

T2: Marc A. Meyers and Krishan Kumar Chawla, Mechanical Behavior of Materials, 3rd Edition, Cambridge University Press, 2022.

T3: V. Raghavan, Physical Metallurgy: Principles and Practice, 4th Edition, PHI Learning Pvt.

Ltd., New Delhi, 2020.

References:

R1: Donald R. Askeland and Wendelin J. Wright, *The Science and Engineering of Materials*, 8th Edition, Cengage Learning, 2022.
R2: William D. Callister Jr. and David G. Rethwisch, *Materials Science and Engineering: An Introduction*, 11th Edition, Wiley, 2023.
R3: Sidney H. Avner, *Introduction to Physical Metallurgy*, 2nd Edition, McGraw-Hill, 1974.
R4: George E. Dieter Jr., *Mechanical Metallurgy*, 3rd Edition, McGraw-Hill Book Company, New York, 1986.

Web links and Video Lectures (e-Resources):

2. NPTEL Video Lectures – *Materials Science*

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2	1	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	2	-
CO3	2	3	3	2	-	-	-	-	-	-	-	3	-
CO4	2	3	3	2	1	-	-	-	-	-	-	3	2
CO5	2	3	3	2	2	-	-	-	-	-	-	3	2
AVG	2.4	2.6	2.4	1.2	0.6	-	-	-	-	-	-	2.6	0.8

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

ADVANCED MANUFACTURING PROCESS LAB

Course Code:	25UMEP31	**Course Type:**	Practical
Teaching Periods / Week (L:T:P):	0: 0: 2	**Credits:**	1
Total Teaching Periods:	30	**CAM+ ESE Mark:**	60+40
Teaching Department:	**Mechanical Department**		

Course Objectives:

1. To help students gain hands-on experience in operating conventional, CNC, and gear manufacturing machines used in modern manufacturing industries
2. To enable students to understand and apply basic manufacturing, machining, and foundry practices through practical laboratory experiments.

Practical Exercises:	**30 Periods**

List of Experiments:

Lathe Machine:

- Drilling & Boring operation

Drilling Machine:

- Drilling & Tapping operation

Gear cutting:

- Spur gear cutting using a Milling Machine
- Helical gear cutting using a Milling Machine
- Helical gear cutting using a Gear Hobbing Machine

Grinding Machine:

- Grinding a single point cutting tool using a tool & cutter grinding machine

CNC Machine:

- Study of CNC Machines and Part Programming
- Turning operation on a CNC Turning center
- Machining operation on a CNC Machining center

Foundry:

- Preparation of mould cavity using a solid pattern
- Preparation of mould cavity using a split pattern

References:

1.kalpakjain S, Schimd S "Manufacturing Engineering and Tech"Pearson Education, 7th Edition, New Delhi, 2018

2. P.N. Rao "Manufacturing Technology" McGrawhill, Fifth edition, 2018

3. Liam Russell, CNC Programming, Charles M Dominquez,2025

Course Outcomes:

After Successful completion of this course, the student should be able to

1. To perform basic machining operations such as drilling, boring, and tapping

using lathe and drilling machines.

2. To carry out spur and helical gear cutting operations using milling and gear hobbing machines.
3. To Execute CNC turning and machining operations by understanding basic CNC programs and machine controls.
4. To Grind and identify single point cutting tools with correct geometry using a tool grinding machine.
5. To Prepare mould cavities using solid and split patterns by following standard foundry practices.

CO–PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	-	-	-	3	-
CO2	3	2	2	-	2	-	-	-	-	-	-	3	-
CO3	3	2	-	-	3	-	-	-	-	-	-	3	-
CO4	2	1	-	-	2	-	-	-	-	-	-	3	-
CO5	2	2	1	-	1	-	-	-	-	-	-	3	-
AVG	2.6	1.8	0.6	-	2	-	-	-	-	-	-	3	-

1–Low, 2–Medium, 3–High, '-' –No correlation

FLUID MECHANICS AND MACHINERY LABORATORY			
Course Code:	25UMEP32	**Course Type:**	Practical
Teaching Periods / Week (L:T:P):	0:0:2	**Credits:**	1
Total Teaching Periods:	30	**CAM+ ESE Mark:**	60+40
Teaching Department:	**Mechanical Engineering**		

Course Objectives:

1. To identify safe operating practices and requirements for laboratory experiments.
2. To design and conduct an experiment as well as to analyze and interpret data.
3. To cover the elements of fluid mechanics in fluid flow systems.
4. To cover a range of experimental techniques aiming to provide students with a general knowledge and understanding of the subject fluid mechanics and machinery, including recommendations for further studies.

Practical Exercises:	**30 Periods**

List of experiments:

1. Determination of the coefficient of discharge of given Orificemeter.
2. Determination of the coefficient of discharge of given Venturimeter.
3. Determination of the Pipe Friction (Major Losses) and minor losses in pipes due to bends, elbows, sudden contraction, expansion etc.,
4. Calculation of the rate of flow using Rotameter.
5. Conducting experiments and drawing the characteristics curves of centrifugal pump.
6. Conducting experiments and drawing the characteristics curves of submersible pump.
7. Conducting experiments and drawing the characteristics curves of jet pump.
8. Conducting experiments and drawing the characteristics curves of pump in series and parallel.
9. Conducting experiments and drawing the characteristics curves of reciprocating pump.
10. Conducting experiments and drawing the characteristics curves of Gear pump.
11. Conducting experiments and drawing the characteristics curves of Pelton wheel.
12. Conducting experiments and drawing the characteristics curves of Francis turbine.
13. Conducting experiments and drawing the characteristics curves of Kaplan turbine.
14. Conducting experiments and drawing the characteristics curves of hydraulic ram.

Text Books:

1. CWR, Hydraulics Laboratory Manual,2004
2. N. Kumarasamy, Fluid Mechanics and Machinery laboratory manual, Charotar Publishing House Pvt. Ltd.2023.

Reference Books:

1. S K Agrawal, Fluid Mechanics and Machinery, Tata McGraw-Hill Education, 2003
2. Subramanya, Fluid Mechanics and Hydraulic Machines, Tata McGraw-Hill Education,2018.
3. S C Gupta, Fluid Mechanics and Hydraulic Machines, Pearson Education India,2006.
4. Robert W. Fox , Alan T. McDonald , John W. Mitchell , Fox and McDonald's Introduction to Fluid Mechanics, Wiley ,10th Edition , 2020

Web Reference:

1. http://en.wikipedia.org
2. http://www.engineeringtoolbox.com

3. https://onlinecourses.nptel.ac.in/

Course Outcomes:

After Successful completion of this course, the student should be able to

1. Identify and follow safe operating practices, laboratory rules, and standard procedures while performing fluid mechanics and fluid machinery experiments.
2. Design and conduct experiments related to fluid flow and fluid machinery using appropriate experimental setups and instruments.
3. Analyze and interpret experimental data to evaluate fluid flow behavior and performance characteristics of fluid machinery.
4. Apply fundamental elements of fluid mechanics to explain and assess fluid flow systems under various operating conditions.
5. Demonstrate comprehensive knowledge of experimental techniques in fluid mechanics and fluid machinery and relate the learning to practical applications and further studies.

CO–PO & PSO Mapping

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

1–Low, 2–Medium, 3–High, '-' –No correlation

PERSONALITY DEVELOPMENT			
(Common to all Branches)			
Course Code:	25UPCE31	**Course Type:**	Employability Enhancement Course
Teaching Periods / Week (L:T:P):	0:0:2	**Credits:**	0
Total Teaching Periods:	30	**CAM+ ESE Mark:**	
Teaching Department:			

Course Objectives:

To impart knowledge on students to develop a well-rounded personality by enhancing essential personal and professional skills. The course aims to foster self-awareness, effective communication, interpersonal abilities, emotional intelligence, confidence, leadership, and goal-setting strategies

Unit 1	**Workplace and Email Etiquette:**	**6 Periods**

Workplace and Email Etiquette: Professional Behavior and Dress Code – Email and Meeting Etiquette

Microsoft office suite: MS Word(Document Creation and Formatting) - MS Excel (Data Analysis and Functions) - MS PowerPoint (Creating Effective Presentations)

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 2	**Business Communication**	**6 Periods**

Business Communication: Verbal and Non - Verbal Communication – Written Communication in Business.

Sales and Negotiations: Sales Techniques and Strategies – Negotiation Tactics and Styles.

Customer Service: Effective Communication Skills- Customer support channels and Tools

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 3	**Decision Making & problem solving**	**6 Periods**

Decision Making: Types of Decision Making – Decision Making models and Techniques – Cognitive Biases and Risk Assessment

Problem Solving: Problem Identification and Analysis – Creative and Critical Thinking techniques – Implementation and Evaluation techniques

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 4	**Interview Skills**	**6 Periods**

Interview Skills: Preparation and Research – Effective Communication and Presentation

Resume Building: Resume Formats and Structure – Tailoring Resumes for Specific Jobs

Mannerism: Body Language – Respect and Courtesy in Interactions

Behavioral skills: Emotional Intelligence – Adaptability and flexibility

Teaching Learning Process	Pedagogy:	
	RBT Level: Theory: Practical:	
Unit 5	**Group Discussion& Mock Interview**	**6 Periods**

Group Discussion: Effective communication and Active Listening – Leadership and Participation skills – Critical Thinking and Topic Analysis

Monk Interview: Common Interview Questions and Ideal Responses – Feedback and Self Assessment

Teaching Learning Process	Pedagogy:	
	RBT Level: Theory: Practical:	
Total		**30 Periods**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply workplace etiquette and use Microsoft Office tools effectively for professional communication and documentation.

CO2: Demonstrate effective communication skills in business contexts, including sales, negotiation, and customer service scenarios.

CO3: Apply structured decision-making and problem-solving techniques in professional and organizational settings.

CO4: Prepare for interviews and present oneself professionally with an effective resume, proper mannerisms, and behavioral skills.

CO5: Demonstrate confidence and clarity in group discussions and interviews through guided practice and feedback.

Textbooks:

T1: Personal Development and Soft Skills By BARUNKMITRA, Oxford Higher Education, 2024

T2: Seven Habits of Highly Effective People by STEPHENCOVEY, 1989

References:

R1: Kumar, Sanjay, & Pushp, Lata. Communication Skills. Oxford University Press (Oxford Higher Education), 2018.

R2: Konar, Nira. Communication Skills for Professionals. PHI Learning Private Limited, 2016.

Web links and Video Lectures (e-Resources):

1.

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO	-	-	-	-	2	-	-	-	2	2	-	-	-

1													
CO 2	-	-	-	-	-	-	-	2	2	2	-	-	-
CO 3	2	-	-	2	-	-	-	-	-	-	2	-	
CO 4	-	-	-	-	-	-	-	-	2	2	2	-	-
CO 5	-	-	-	-	-	-	-	-	2	2	2	-	-
AVG	0.5	-	-	0.5	2	-	-	0.5	1.6	1.6	1.2	-	-
1 – Low, 2 – Medium, 3 – High, '-' – No correlation													

INDIAN CONSTITUTION AND HUMAN RIGHTS			
(Common to All Branches of UG Engineering Programs)			
Course Code:	25UMCC31	**Course Type:**	Mandatory Course (Audit)
Teaching Periods / Week (L:T:P):	2:0:0	**Credits:**	0 (Zero)
Total Teaching Periods:	30	**CAM+ ESE Mark:**	Pass / Fail (Satisfactory / Unsatisfactory)
Teaching Department:	General Engineering		

Course Objectives:

To impart knowledge on:

1. Historical background, Preamble, and salient features of the Indian Constitution
2. Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties
3. Structure and functioning of Union, State, and Local Self Governments
4. Universal Human Rights principles and international protection frameworks
5. Contemporary human rights issues and remedial mechanisms in India

Unit 1	**INTRODUCTION TO INDIAN CONSTITUTION**	**Periods: 6**

Historical Background: Making of the Constitution - Constituent Assembly and its key members - Draft Committee. Preamble: Philosophy and Core Values - Sovereign, Socialist, Secular, Democratic, Republic - Justice, Liberty, Equality, Fraternity. Salient Features of Indian Constitution: Written Constitution - Lengthy document - Blend of Rigidity and Flexibility - Federal Structure with Unitary Bias - Parliamentary System.

Instructional Activity

Timeline Activity on Constitutional History (or) Preamble Analysis Worksheet

Teaching Learning Process	Pedagogy: Interactive Lecture, Think-Pair-Share, Video-based Learning (Documentary on Constituent Assembly), Group Discussion
	RBT Level: Theory: L1, L2

Unit 2	**FUNDAMENTAL RIGHTS AND DUTIES**	**Periods: 6**

Fundamental Rights (Articles 12-35): Right to Equality (Art. 14-18) - Right to Freedom (Art. 19-22) - Right Against Exploitation (Art. 23-24) - Right to Freedom of Religion (Art. 25-28) - Cultural and Educational Rights (Art. 29-30) - Right to Constitutional Remedies (Art. 32): Writs - Habeas Corpus, Mandamus, Prohibition, Certiorari, Quo Warranto. Directive Principles of State Policy (Articles 36-51): Classification - Socialistic, Gandhian, Liberal-Intellectual Principles. Fundamental Duties (Article 51A): Citizen Responsibilities - 11 Duties. Relationship and Conflict between Fundamental Rights and Directive Principles.

Instructional Activity

Case Study Analysis on Landmark Supreme Court Judgments (or) Mock PIL Filing Exercise (or) Rights Violation Scenario Analysis

Teaching Learning Process	Pedagogy: Case Study Method, Role Play (Mock Court), Jigsaw Activity, Debate Session (FR vs DPSP), Scenario-based Learning, Problem-Based Learning	
	RBT Level: Theory: L1, L2	
Unit 3	**UNION AND STATE GOVERNMENT STRUCTURE**	**Periods: 6**
Union Executive: President - Election, Powers, Position - Vice-President - Prime Minister and Council of Ministers - Cabinet Committees. Union Legislature: Parliament - Lok Sabha and Rajya Sabha - Composition, Functions - Legislative Process - Bill to Act. State Executive: Governor - Chief Minister - State Council of Ministers. State Legislature: Legislative Assembly and Council - State Law-making Process. Centre-State Relations: Legislative, Administrative, and Financial Relations - Role of Finance Commission. Local Self Government: 73rd Amendment (Panchayati Raj) - 74th Amendment (Urban Local Bodies) - Three-tier System.		
Instructional Activity		
Flowchart Creation (Bill to Law) (or) Field Visit Report on Local Panchayat/Municipality		
Teaching Learning Process	Pedagogy: Simulation Exercise, Collaborative Learning, Comparative Analysis (Venn Diagrams), Field Visit/Virtual Tour, Guest Lecture by Government Official	
	RBT Level: Theory: L1, L2	
Unit 4	**HUMAN RIGHTS: CONCEPTS AND FRAMEWORKS**	**Periods: 6**
Evolution of Human Rights: Historical Development - Natural Rights Theory - Magna Carta - French Declaration - American Bill of Rights. Universal Declaration of Human Rights (UDHR) 1948: 30 Articles - Civil, Political, Economic, Social, Cultural Rights. International Human Rights Instruments: ICCPR - ICESCR - CEDAW - CRC - CAT - CERD. Human Rights in Indian Constitution: Part III and Part IV Provisions. National Human Rights Commission (NHRC): Composition - Functions - Powers - Procedure. State Human Rights Commissions - National Commission for Women, SC, ST, Minorities.		
Instructional activities		
NHRC Case Study Analysis		
Teaching Learning Process	Pedagogy: Video Case Study, Seminar Presentation	
	RBT Level: Theory: L1, L2, L3	
Unit 5	**CONTEMPORARY HUMAN RIGHTS ISSUES**	**Periods: 6**
Rights of Vulnerable Groups: Women (POSH Act, Domestic Violence Act) - Children (POCSO, JJ Act) - Elderly (Maintenance Act) - Persons with Disabilities (RPWD Act 2016). Rights of Marginalized Communities: SC/ST (Prevention of Atrocities Act) - Minorities - LGBTQ+ (Navtej Singh Johar Case). Right to Information (RTI Act 2005): Provisions and Application. Right to Education (RTE Act 2009). Environmental Rights: Right to Clean Environment - Sustainable Development - PIL on Environmental Issues. Digital Rights: Right to Privacy (Puttaswamy Case) - Data Protection - Cyber Rights. Human Rights Violations and Remedies: Legal Aid - Grievance Redressal Mechanisms.		
Instructional activities		
RTI Application Drafting Workshop (or) Case Study on HR Violations		

Teaching Learning Process	Pedagogy: Problem-Based Learning, Panel Discussion, RTI Workshop	
	RBT Level: Theory: L1, L2, L3	
Total		**Periods: 30**

Suggested Activities and Evaluation Methods:

Active Learning: Case Studies, Role Play, Mock Court/Parliament, Group Discussions, Debates, Panel Discussions

Practical Activities: RTI Application Drafting, Field Visits to Panchayat/Municipal Offices,

Digital Tools: Kahoot Quizzes, Mentimeter Polls, Online Discussion Forums, Digital Portfolios

Assessment Methods: Entry/Exit Tickets, One-Minute Papers, Peer Review, Reflective Journals, Group Presentations

Evaluation: Continuous Assessment through Formative Activities, End-Semester Viva-voce/Written Test

Course Outcomes:

After successful completion of this course, the student should be able to:

CO1: Explain the historical evolution, Preamble, and salient features of the Indian Constitution.[L2: Understand]

CO2: Describe Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties and explain their interrelationship. [L2: Understand]

CO3: Describe the structure and functions of Union, State, and Local Self Governments in India. [L2: Understand]

CO4: Apply the principles of Universal Human Rights to identify international protection frameworks. [L3: Apply]

CO5: Illustrate contemporary human rights issues and demonstrate the use of remedial mechanisms available in India. [L3: Apply]

Textbooks:

T1: D.D. Basu, "Introduction to the Constitution of India", 24th Edition, LexisNexis, 2020.

T2: M.V. Pylee, "India's Constitution", 16th Edition, S. Chand Publishing, 2017.

T3: S.K. Kapoor, "Human Rights Under International Law and Indian Law", Central Law Agency, 2018.

References:

R1: Granville Austin, "The Indian Constitution: Cornerstone of a Nation", Oxford University Press, 2019.

R2: J.N. Pandey, "Constitutional Law of India", 57th Edition, Central Law Agency, 2020.

R3: K.K. Ghai, "Human Rights", Kalyani Publishers, 2019.

R4: P.M. Bakshi, "The Constitution of India", Universal Law Publishing, 2020.

Web Links and Video Lectures (e-Resources):

1. Constitution of India - https://legislative.gov.in/constitution-of-india

2. National Human Rights Commission - https://nhrc.nic.in 3. United Nations Human Rights - https://www.ohchr.org 4. SWAYAM Course on Indian Constitution - https://swayam.gov.in 5. NPTEL Course on Constitution of India - https://nptel.ac.in 6. Lok Sabha TV Documentaries - https://www.youtube.com/c/LokSabhaTVChannel 7. PRS Legislative Research - https://prsindia.org
CO-PO & PSO Mapping

SEMESTER-IV

STATISTICAL AND NUMERICAL METHODS			
Course Code:	25UMAT41	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	04
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mathematics		

Course Objectives:

- To understand and apply concepts related to discrete and continuous random variables, including important distributions.
- To apply large sample tests, conduct chi-square tests for goodness of fit and independence of attributes and perform one-way and two-way classifications.
- To solve linear systems using iterative and direct methods, and apply the power method to find dominant eigen values and eigen vectors.
- To utilize numerical methods for solving ordinary differential equations.
- To apply numerical techniques for solving partial differential equations.

Unit 1	**Probability and Random Variables**	**12Periods**

Probability – The axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables –Moment generating functions – Binomial distribution – Poisson distribution – Geometric distribution – Uniform distribution – Exponential distribution – Normal distribution.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: K3

Unit 2	**Testing of Hypothesis and Design of Experiments**	**12 Periods**

Large sample test for single proportion– difference of proportions– Tests for single mean– difference of means– difference of standard deviations– Test for ratio of variances – Chi– square test for goodness of fit and independence of attributes, one way and two-way classifications.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: K3

Unit 3	**Solution of Linear System and Numerical Integration**	**12 Periods**

Gaussian elimination and Gauss – Jordan methods – LU – decomposition methods – Crout's method – Jacobi and Gauss – Seidel iterative methods – sufficient conditions for convergence – Power method to find the dominant eigenvalue and eigenvector and Integration By Trapezoidal and Simpson's Rules.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: K3

Unit 4	**Numerical Solution of Ordinary Differential Equations**	**12 Periods**

Euler's method – Euler's modified method – Taylor's method and Runge – Kutta method for simultaneous equations and 2nd order equations – Stability analysis of single step methods – Multistepmethods – Milne's and Adams' methods.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving	
	RBT Level: K3	
Unit 5	**Numerical Solution of Partial Differential Equations**	**12 Periods**
Numerical solution of Laplace equation and Poisson equation by Liebmann's method – solution of one-dimensional heat flow equation –Bender – Schmidt recurrence relation – Crank–Nicolsonmethod – Solution of one – dimensional wave equation.		
Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving	
	RBT Level: K3	
Total		**60Periods**

Suggested Activities and Evaluation Methods:
Tutorials, MCQ (Gate Related Questions), Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply probability theory principles and probability distributions such as Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

CO2: Perform large sample tests, test for ratio of variances, chi-square test and one-way and two-way classifications.

CO3: Compute the numerical solution of linear systems using direct and iterative methods and find the dominant eigenvalue and eigenvector of a given matrix using Power method.

CO4: Solve ordinary differential equations numerically using Euler's, Runge-Kutta, Milne's and Adams' methods.

CO5: Solve partial differential equations numerically using Liebmann's, Bender-Schmidt and Crank-Nicolson methods.

Textbooks:

T1:S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.

T2: H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Co., New Delhi,21st Edition 2019.

T3:B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2021.

References:

R1: William Mendenhall, Robert J. Beaver, Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning; 15thEdition 2019.

R2: Atul Goyal, Madhuchanda Rakshit Suchet Kumar, "Numerical Methods", New India publishing Agency, 1st Edition, 2019.

R3: Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition 2019.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/111105090
2. https://onlinecourses.nptel.ac.in/noc26_ma41/preview
3. https://nptel.ac.in/courses/111101003

4. https://archive.nptel.ac.in/courses/111/105/111105035/
5. https://nptel.ac.in/courses/111105093

CO-PO& PSO Mapping

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PO 8	PO9	PO10	PO11	PSO1	PSO 2
CO 1	3	2	2	1	1	-	-	-	1	-	1	-	-
CO 2	3	2	2	1	1	-	-	-	1	-	1	-	-
CO 3	3	2	2	1	1	-	-	-	1	-	1	-	-
CO 4	3	2	2	1	1	-	-	-	1	-	1	-	-
CO 5	3	2	2	1	1	-	-		1	-	1	-	-
AV G	3	2	2	1	1	-	-	-	1	-	1	-	-

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

KINEMATICS AND DYNAMICS OF MACHINERY			
Course Code:	25UMET41	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	04
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mechanical Engineering		

Course Objectives:

To impart knowledge on
- Provide insights into the fundamentals of mechanisms and cams.
- Understand the basics of flywheels and balancing of rotating and reciprocating unbalanced systems.
- Enhance knowledge of single degree of freedom and damped vibrations.
- Provide a detailed overview of forced vibrations.
- Discuss the fundamentals of gyroscopes and governors.

Unit 1	**MECHANISMS AND CAMS**	**12 Periods**

Mechanisms – Terminology and definitions – Kinematics inversions of 4 bars and slider crank chain – Kinematic analysis in simple mechanisms. Types of cams and followers - Terminology and definitions – Displacement diagrams – SHM, uniform velocity, uniform acceleration and retardation. Graphical constructions of cam profiles – Disc cam with knife edge follower, roller follower and flat-faced follower.

Teaching Learning Process	**Pedagogy:** Lecture method, chalk & board, PowerPoint presentations, animations, numerical problem solving, model/video demonstrations.
	RBT Level: Theory: K1, K2,K3, K4

Unit 2	**FLYWHEELS AND BALANCING**	**12 Periods**

Turning moment diagrams – Fluctuation of energy and speed – Energy stored in a flywheel – Mass of flywheel – Dimensions of flywheel.

Balancing – Static and dynamic balancing of rotating masses – Balancing of several masses rotating in the same plane and in different planes – Partial balancing of locomotives – Variation of tractive force, hammer blow, and swaying couple

Teaching Learning Process	**Pedagogy:** Lecture method, chalk & board, PowerPoint presentations, numerical problem solving, analytical derivations, case
	RBT Level: Theory: K1, K2,K3, K4

Unit 3	**FUNDAMENTALS OF VIBRATION**	**12 Periods**

Basic features of vibratory systems – Lumped mass systems – Degrees of freedom – Free vibration of longitudinal, transverse, and torsional single degree of freedom systems – Equations of motion – Natural frequency – Whirling of shafts and critical speed – Dunkerley's method – Torsional vibration of two- and three-rotor systems.

Damped free vibration – Types of damping – Critical damping coefficient – Damping factor – Logarithmic decrement.

Teaching Learning Process	**Pedagogy:** Lecture method, chalk & board, PowerPoint presentations, animations, numerical problem solving, model/video demonstrations.
	RBT Level: Theory: K1, K2,K3, K4

Unit 4	**FORCED VIBRATION**	**12 Periods**

Forced vibration of single degree freedom system with damping- Response to periodic forcing- Harmonic Forcing - Force transmissibility and amplitude transmissibility - Reciprocating and rotating unbalance - vibration isolation and transmissibility - Support motion – self excited vibration with examples

Teaching Learning Process	**Pedagogy:** Lecture method, chalk & board, PowerPoint presentations, animations, numerical problem solving, model/video demonstrations.
	RBT Level: Theory: K1, K2,K3, K4

Unit 5	**GOVERNORS AND GYROSCOPES**	**12 Periods**

Gyroscopes and gyroscopic effects-Effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships gyroscopic couple, (Demonstration of models in video). Governors - types and applications - Watt, Porter and Proell governors-Spring loaded governors Hartnell and Hartung with auxiliary springs. Sensitiveness-isochronisms and hunting.

Teaching Learning Process	**Pedagogy:** Lecture method, chalk & board, PowerPoint presentations, animations, numerical problem solving, model/video demonstrations.
	RBT Level: Theory: K1, K2,K3, K4

Total	**60 Periods**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Investigate mechanisms and cams.

CO2: Determine the principles of flywheels and rotating and reciprocating masses.

CO3: Analyze single degree of freedom free and damped vibrations

CO4: Evaluate the force transmitted to the foundation for mechanical systems under forced Vibrations.

CO5: Apply the fundamentals of gyroscopes and governors.

Textbooks:

T1: Rattan, S. S., *Theory of Machines*, 5th Edition**,** McGraw Hill Education (India) Pvt. Ltd., 2022**.**
T2: Rao, J. S., and Dukkipati, R. V., *Mechanism and Machine Theory*, 3rd Edition, New Age International Publishers, 2019**.**
T3: Ambekar, A. G., *Mechanism and Machine Theory*, 1st Edition**,** PHI Learning Private Limited, 2009**.**
T4: Khurmi, R. S., and Gupta, J. S., *Theory of Machines*, Revised Edition, S. Chand Publishing, 2021**.**

References:

R1: Pennock, G. R., Papadopoulos, E., and Shigley, J. E., *Theory of Machines and Mechanisms*, 6th Edition, Oxford University Press, 2024**.**
R2: Rao, S. S., *Mechanical Vibrations*, 7th Edition**,** Pearson Education, 2023**.**
R3: Inman, D. J., *Engineering Vibration*, 5th Edition, Pearson Education**,** 2022**.**
R4: Norton, R. L., *Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines*, 7th Edition**,** McGraw Hill Education, 2020**.**

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in

CO-PO& PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO 1	3	2	2	2	1	–	–	–	–	–	–	2	2
CO 2	3	3	2	2	1	–	–	–	–	–	–	3	2
CO 3	3	3	2	3	1	–	–	–	–	–	–	3	2
CO 4	3	3	2	3	2	–	–	–	–	–	–	3	3
CO 5	3	2	2	2	1	–	–	–	–	–	–	2	3
AVG	3	2.6	2	2.4	1.2	–	–	–	–	–	–	2.6	2.4

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

THERMAL ENGINEERING			
Course Code:	25UMET42	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60
Teaching Department:	Mechanical Engineering		

Course Objectives:

- To Study of IC engines
- To Study of combustion in IC engines
- To Understanding of emission, its impact on environment and control
- To Study of compressible fluid flow
- To Study of propulsion system

Unit 1	**IC Engines: Classification ,Operating And Performance Characteristics**	**12 Periods**

Classification of IC engines – petrol and diesel engines; two stroke and four stroke engines – scavenging in two stroke engines - port and valve timing diagram - fuel supply system in SI and CI engines - ignition system and its types – cooling system and its types – lubrication system and its types - lubricants - governing of IC engines– engine operating characteristics – power – cruising – idle and low engine speed – high engine speed – cold start - performance characteristics – heat balance test for IC engines.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching , Laboratory Demonstrations
	RBT Level:K2

Unit 2	**Fuels Combustion And Emissions**	**12 Periods**

Fuels: liquid and gaseous fuel and their characteristics –desirable properties of fuels for SI and CI engines–flashpoint, fire point, calorific value, Combustion process in IC engines – Flame propagation, normal and abnormal combustion, delay period, knocking and detonation, knocking rate of fuel, cetane number, octane number, supercharging and turbo charging – combustion chamber and types. Engine emission -formation of nitrogen oxides, carbon monoxide, hydrocarbon and particulates- emission standards.

Compressor: Introduction to compressors - Rotory and Reciprocating Compressor working and application in Industry (Theory only)

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching ,Laboratory Demonstrations
	RBT Level: K4

Unit 3	**Basic Concepts And Isentropic Flows**	**12 Periods**

Basic principles – stagnation properties – sonic velocity – Mach number – and mach waves – Isentropic flow through variable area - Mach number variation – stagnation and critical states – area ratio as a function of Mach number, mass flow rate, flow through nozzles and diffusers.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching
	RBT Level: K4

Unit 4	**Flow Through Ducts And Shock Waves**	**12 Periods**

Flow in constant area ducts with friction, flow in constant area ducts with heat transfer – multi dimensional flows. Normal shocks – development of a shock wave, governing equations, Mach number after the shock, pressure and temperature across the shock. Oblique shocks–Nature of flow through Oblique shock waves, fundamental relations and equations.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching Case Studies & Industrial Applications
	RBT Level: K5

Unit 5	**Jet And Space Propulsion**	**12 Periods**

Principle of jet propulsion – air craft jet engines – jet engine cycle – turbojet – turbofan– turboprop–turbo fan engines-engine performance–thrust and efficiency, thrust power, propulsion power, propulsion efficiency and thermal efficiency–engine- aircraft matching. Rocket engines – introduction – space missions.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching Case Studies & Industrial Applications
	RBT Level: K4

Total	**60 Periods**

Suggested Activities and Evaluation Methods:

- Tutorials, Demo, Industrial Visit, Quiz / MCQ (Gate Related Questions), Case Study
- Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Explain the classification, construction, and working principles of SI and CI engines, and demonstrate the functioning of fuel supply, ignition, cooling, lubrication, and governing systems.

CO2: Analyze the combustion phenomena in IC engines, including flame propagation, abnormal combustion, knocking/detonation, and evaluate the influence of fuel properties and emission formation mechanisms.

CO3: Apply compressible flow relations involving Mach number, stagnation properties, and isentropic processes to nozzles and diffusers, and analyze flow variations through variable-area ducts.

CO4: Examine shock waves (normal and oblique) and evaluate compressible flow behavior in constant-area ducts under friction and heat transfer to predict flow characteristics.

CO5: Describe the principles of jet propulsion and rocket engines, apply performance equations to determine thrust and efficiency, and assess the matching requirements between engine and aircraft operation.

Textbooks:

T1: Collin R. Ferguson–Internal Combustion Engines-Applied Thermo sciences, Wiley,2004.

T2: Yahya S.M., Fundamentals of Compressible Flow, New Age International, New Delhi, 2018.

T3: Hill P. and Peterson C., Mechanics and Thermodynamics of Propulsion, Pearson

Education,2020.

References:

R1: Willard W. Pulkrabek– Internal Combustion Engines, Prentice Hall of India, 2004.

R2: J.B. Heywood– Internal Combustion Engines – fundamentals, McGraw Hill, 2017.

R3: Cambel, A.B. and Jennings, 'Gas dynamics and Compressible Flow", Tata McGraw Hill,1958.

R4: V. Ganesan – Internal Combustion Engines, Tata McGraw Hill,2017.

Web links and Video Lectures (e-Resources):

1. https://www.coursera.org/course/introthermodynamics
2. http://nptel.ac.in/courses/112104033

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	3	3	-	-	3	3	2	-	-	3	-	-
CO2	3	3	3	-	-	3	3	2	-	-	3	-	-
CO3	3	3	3	-	-	3	3	2	-	-	3	-	-
CO4	3	3	3		-	3	3	3	-	-	3	3	3
CO5	3	3	3	-	-	3	3	3	-	-	3	3	3
AVG	3	3	3	-	-	3	3	2	-	-	3	-	-

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

MECHATRONICS, ROBOTICS AND CONTROL			
Course Code:	25UMET44	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	3 : 0: 0	**Credits:**	3
Total Teaching Periods:	45	**CAM+ ESE Mark:**	40+60
Teaching Department:	**Mechanical Department**		

Course Objectives:

- To enable students to understand and describe the fundamental principles of electro-mechanical systems, actuators, control units, and robotics, and explain their applications in various engineering and automation scenarios.

Unit 1	**Introduction**	**09 Periods**

Electro-mechanical systems; Energy domains and system integration; Typical applications; Case studies – automobiles, home appliances, medical instruments, and industrial systems.

Teaching Learning Process	**Pedagogy:** PowerPoint, Video Lecture, Mind Mapping, Experiential Learning
	RBT Level: Theory: K2

Unit 2	**Actuators**	**09 Periods**

Role and requirements of actuators in robotic systems; Electrical actuators for robotics – DC servo motors, BLDC motors, stepper motors (principle of operation, characteristics, control methods, and applications); Mechanical transmission elements used in robots – gear trains, harmonic drives, belt and screw drives; Fluid power actuators – pneumatic and hydraulic actuators for robotic manipulators and grippers**.**

Teaching Learning Process	**Pedagogy:** PowerPoint, Video Lecture, Mind Mapping, Experiential Learning
	RBT Level: Theory: K2

Unit 3	**Machine Controls**	**09 Periods**

Microprocessors – basic architecture and operation; Microcontrollers and their features; Programmable Logic Controllers (PLC) – principle of operation, architecture, and programming basics; Analog and digital input/output modules; Interfacing of sensors and actuators with controllers; Timers, counters, internal relays, and data handling; Overview of industrial automation systems.

Teaching Learning Process	**Pedagogy:** PowerPoint, Video Lecture, Mind Mapping, Experiential Learning
	RBT Level: Theory: K2

Unit 4	**Robotics – Configuration and Kinematics**	**09 Periods**

Introduction to industrial robots; Robot configurations – serial and parallel manipulators; Degrees of freedom and workspace; Coordinate frames and link parameters; Rotation matrices; Homogeneous transformation matrices; Forward (direct) kinematics; Inverse kinematics for position and orientation of robotic manipulators.

Teaching Learning Process	**Pedagogy:** PowerPoint, Video Lecture, Mind Mapping, Experiential Learning	
	RBT Level: Theory: K2	
Unit 5	**Robotics – Sensors, Control and Applications**	**09 Periods**
Robot sensors – position, proximity, force, and vision sensors; Robot vision systems and basic image processing concepts; Motion control of robotic manipulators; Robot programming methods; Introduction to robot control architectures; Industrial robot applications – pick and place, sorting, assembly, welding, inspection, and material handling.		
Teaching Learning Process	**Pedagogy:** PowerPoint, Video Lecture, Mind Mapping, Experiential Learning	
	RBT Level: Theory: K2	
Total		**45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Explain the fundamentals of electro-mechanical systems and describe their applications in domains such as automobiles, home appliances, and medical devices.

CO2: Describe the operating principles, characteristics, and selection criteria of various sensors used for engineering measurements.

CO3: Explain the working principles of different actuators, including hydraulic, pneumatic, electrical motors, solenoids, and smart materials.

CO4: Discuss the basic architecture and functioning of microprocessors, microcontrollers, and PLCs in machine control and automation systems.

CO5: Interpret the fundamental concepts of robot configurations, kinematics, vision, and control used in industrial robotic applications.

Textbooks:

T1: W. Bolton, *Mechatronics: A Multidisciplinary Approach*, 7th Edition, Pearson Education, 2018.

T2: John J. Craig, *Introduction to Robotics: Mechanics and Control*, 4th Edition, Pearson Education, 2022.

T3: Gregory K. McMillan and Robert A. Cameron, *McGraw-Hill's Process/Industrial Instruments and Controls Handbook*, 6th Edition, McGraw-Hill Education, 2019.

T4: Alciatore, D.G. and Histand, M.B., Introduction to Mechatronics and Measurement Systems, 6th Edition, McGraw-Hill, 2023.

References:

R1: M. P. Groover, Automation, Production Systems and Computer-integrated Manufacturing, Prentice Hall,2022.

R2: S. Mukherjee, "Essentials of Robotics Process Automation", Khanna Book Publishing, 2021

R3: Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, 5th Edition, Pearson Education, 2023

R4: R.K. Rajput, Robotics and Industrial Automation, Second Revised Edition, S. Chand Publishing, New Delhi, 2014.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/107/106/107106090/
2. https://nptel.ac.in/courses/112/101/112101098/
3. https://nptel.ac.in/courses/112/107/112107289/
4. https://nptel.ac.in/courses/112/104/112104298/

CO-PO& PSO Mapping

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

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

COMPUTER AIDED MACHINE DRAWING THEORY & LAB			
Course Code:	25UMEI41	**Course Type:**	Integrated
Teaching Periods / Week (L:T:P):	2 : 0 : 2	**Credits:**	3
Total Teaching Periods:	45	**CAM+ ESE Mark::**	50+50
Teaching Department:	Mechanical		

Course Objectives:

To impart knowledge on interpret drawings of machine components so as to prepare assembly Drawings manually.

Unit 1	**Conventions**	**09 Periods**

Conventions for sectioning and dimensioning, screw threads, rivets, bolts, nuts, pins, keys, cotter, gear, springs and welds. Component drawing assigning fits and tolerance machine symbol, surface finish geometrical tolerance.

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory:K2

Unit 2	**Preparation of manual drawings of parts and assembly**	**36 Periods**

Preparation of manual drawings of parts and assembly of:

Joints

- Cotter joints –sleeve

Couplings

- Split muff couplings

Bearing

- swivel bearing

Machine Components

- Screw jack
- Stop valve – steam

Practical: Preparation of 2D Computer aided Drawings for Parts and Assembly

Preparation of 2D Computer aided Drawings for Parts and Assembly of the following,

- Flange coupling
- Knuckle Joint
- Universal Coupling
- Plumber Block
- Foot Step Bearing

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: K2 Practical:K3

Total	**45 Periods**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model

Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Understand the standard conventions of engineering drawing and the significance of dimensions, fits, tolerances, surface finish, and geometrical tolerances in machine component drawings.

CO2: Prepare and interpret assembly drawings of mechanical joints and machine elements using standard drafting practices and CAD software to ensure correct assembly and functionality.

Text books:

T1: Bhatt, N.D "Machine Drawing", Charotar Publishing House.2022

T2: Gopalakrishnan,K.R, "Machine Drawing", SUBHAS Publications,2021

References:

R1: Sidheswar, "Machine Drawing" Tata McGraw Hill edition, 2020

R2: Sadhu Singh and P.L. Sah, Fundamentals of Machine Drawing, PHI, 2019

Web links and Video Lectures (e-Resources):

3. https://nptel.ac.in/courses/112104031
4. https://nptel.ac.in/courses/112103019

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2	2	-	2	-	-	-	2	-	-		
CO2	3	2	3	-	3	-	-	-	2	-	-		
AVG											-		

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

****CONTINUOUS ASSESSMENT-III FOR THEORY AND END SEMESTER EXAMINATION, THE MAXIMUM MARK WILL BE "100"**

****PART A = 3 X 10 = 30; PART B (Either or) 1 X 70 = 70**

THERMAL ENGINEERING LAB			
Course Code:	25UMEP41	**Course Type:**	Practical Course (PC)
Teaching Periods / Week (L:T:P):	0 : 0 : 2	**Credits:**	01
Total Teaching Periods:	30	**IAT + ESE Marks:**	60+40
Teaching Department:	Mechanical Engineering		

Course Objectives:

1. To provide hands-on experience in evaluating the performance of fuels using standard experimental methods.
2. To experimentally analyze air machinery, heat transfer equipment, and internal combustion engines.
3. To assess the performance of refrigeration, air-conditioning systems, and cooling towers.

Practical Exercises: **30 Periods**

PRACTICE EXERCISES:

Fuel Analysis

1. Determination of kinematic viscosity using Redwood viscometer.
2. Determination of flash and fire point using Cleveland open cup apparatus.
3. Determination of calorific value of solid fuel using bomb calorimeter.
4. Determination of calorific value of gaseous fuel using Junker's gas calorimeter.

Air Machinery (Compressors & Blowers)

5. Performance test on reciprocating air compressor.
6. Performance test on centrifugal air blower.

I.C. Engine

7. Valve and port timing diagrams of 4-stroke and 2-stroke IC engines.
8. Performance test on single-cylinder 4-stroke petrol engine.
9. Performance test on multi-cylinder 4-stroke petrol engine.
10. Performance test on single-cylinder 4-stroke diesel engine.
11. Performance test on multi-cylinder 4-stroke diesel engine.

Refrigeration and Air Conditioning

12. Performance test on cooling tower.
13. Performance test on refrigeration system.
14. Performance test on air-conditioning system.

References:

1. P.K. Nag, *Engineering Thermodynamics*, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2020.

2. V. Ganesan, *Internal Combustion Engines*, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2023

Web Resource

1.https://nptel.ac.in/courses/112103262

2.https://nptel.ac.in/courses/112105123

Course Outcomes:

After Successful completion of this course, the student should be able to

1. Determine fuel properties such as viscosity, flash point, fire point, and calorific value using

standard laboratory instruments

2. Evaluate the performance of air machinery including reciprocating compressors and centrifugal blowers

3. Analyze heat transfer processes by determining thermal conductivity, heat transfer coefficients, and heat exchanger performance

4. Conduct performance analysis of internal combustion engines and interpret valve and port timing diagrams

5. Assess the performance of refrigeration, air-conditioning systems, and cooling towers using experimental data

CO–PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	2	–	–	–	–	–	–	2	–
CO2	3	3	–	2	2	–	–	–	–	–	–	2	–
CO3	3	3	2	–	2	–	–	–	–	–	–	3	2
CO4	3	3	–	2	2	–	–	–	–	–	–	2	–
CO5	2	3	2	–	2	–	–	–	–	–	–	2	–
AVG	3	2	–	–	2	–	–	–	–	–	–	2	–

1–Low, 2–Medium, 3–High, '-' –No correlation

DYNAMICS OF MACHINERY LAB			
Course Code:	25UMEP42	**Course Type:**	Practical
Teaching Periods / Week (L:T:P):	0:0:2	**Credits:**	01
Total Teaching Periods:	30 Periods	**CAM+ ESE Mark:**	60+40
Teaching Department:	Mechanical Engineering		

Course Objectives:

- Teach the principles and working of various governors and their applications.
- Demonstrate the working of different mechanisms, balancing methods, and vibration modes.
- Develop understanding of practical aspects of rotating machinery, stability, and dynamic behavior.

Practical Exercises: **Periods : 30**

UNIT I Mechanisms and Vibrations

1. Demonstration of four bar inversion mechanism
2. Natural frequency of single mass, single helical spring system
3. Natural frequency of combination of springs – springs in parallel, springs in series
4. Natural frequency of undamped torsional single rotor and double rotor system; effect of inertia (I) and stiffness (k)
5. Determination of radius of gyration of a given compound pendulum
6. Determination of radius of gyration, moment of inertia – bifilar suspension method / trifilar suspension method
7. Damping coefficient of torsional single rotor system – effect of depth of immersion in oil and damping ratio
8. Resonance frequency of equivalent spring-mass system – undamped and damped conditions; plot amplitude vs frequency for different damping

UNIT II– Governors, Balancing, and Machinery

9. Determination of characteristic curves of Watt, Porter, Proell, and spring-loaded governors
10. Static and dynamic balancing of rotating masses
11. Whirling of shafts / determination of critical speed with and without rotors
12. Gyroscopic couple verification
13. Journal bearing – pressure distribution for different loads at different speeds
14. Cam motion analysis
15. Generation of involute gear profile
16. Tracing of coupler curves
17. Determination of error in straight line drawn by Watt chain mechanism

SOFTWARE REQUIRED

1. MATLAB / Simulink
2. SolidWorks / CAD software (for gear profile, cam analysis)

3. Any vibration analysis or mechanism simulation software

References:

R1: Bansal, R. K., A Textbook of Theory of Machines, 6th Edition, Laxmi Publications, 2021**.**
R2: Rattan, S. S., Theory of Machines, 5th Edition, McGraw Hill Education (India) Pvt. Ltd., 2022.
R3: Uicker, J. J., Pennock, G. R., and Shigley, J. E., Theory of Machines and Mechanisms, 6th **Edition**, Cambridge University Press, 2023.
R4: Rao, S. S., Mechanical Vibrations, 7th Edition**,** Pearson Education, 2023**.**
R5: Inman, D. J., Engineering Vibration, 5th Edition, Pearson Education, 2022**.**

Course Outcomes:

After Successful completion of this course, the student should be able to

1. Demonstrate the working principles of governors and understand their performance characteristics.
2. Analyze the vibration behavior of mechanical systems and determine natural frequencies.
3. Apply static and dynamic balancing techniques to rotating machinery.
4. Evaluate mechanical systems such as shafts, bearings, cams, and gear profiles using experimental data.
5. Develop practical skills for designing and testing mechanisms and rotating machinery components.

CO–PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	–	–	–	–	–	–	2	2
CO2	3	3	2	3	1	–	–	–	–	–	–	3	2
CO3	3	3	2	3	2	–	–	–	–	–	–	3	3
CO4	3	2	2	2	1	–	–	–	–	–	–	2	2
CO5	3	2	2	2	1	–	–	–	–	–	–	2	3
AVG	3	2.4	2	2.4	1.2	–	–	–	–	–	–	2.4	2.4

1–Low, 2–Medium, 3–High, '-' –No correlation

ROBOTICS LAB			
Course Code:	25URAP48	**Course Type:**	Theory
Teaching Periods / Week (L:T:P):	0: 0: 2	**Credits:**	1
Total Teaching Periods:	30	**CAM+ ESE Mark:**	60+40
Teaching Department:	**Robotics and Automation**		

Course Objectives:

- To understand the basics of pneumatic and hydraulic systems and their use in operating cylinders.
- To learn the design and testing of electro-pneumatic and electro-hydraulic circuits using electrical switches and valves.
- To gain practical knowledge of PLC-based automation for controlling single and multi-cylinder operations.

Practical Exercises: **30 Periods**

CYCLE – I: BASIC UNDERSTANDING (PNEUMATICS & HYDRAULICS)

1. Design and Testing of Actuation of a Double-Acting Pneumatic Cylinder Using a Two-Way Pressure Valve.
2. Design and Testing of Basic Hydraulic Circuit for Actuation of a Double-Acting Cylinder.
3. Study of Directional Control Valves Used in Hydraulic Systems.
4. Design and Testing of Electro-Pneumatic Actuation of a Double-Acting Cylinder Using Electrical Push Button Switch in Meter-In Circuit.
5. Design and Testing of Electro-Pneumatic Actuation of a Double-Acting Cylinder Using Electrical Push Button Switch in Meter-Out Circuit.
6. Simulation of Pneumatic Cascade Control Circuit for Two-Cylinder Sequential Operation Using FluidSIM.

CYCLE – II: AUTOMATION & PLC CONTROL

7. Design and Testing of Electro-Hydraulic Actuation of Double-Acting Cylinder Using Electrical Push Button Switch.
8. Design and Implementation of PLC-Based Logic Control of a Double-Acting Cylinder Using Two Push Button Switches
9. Design and Testing of PLC-Based Pneumatic Circuit for Single-Cycle Automation of Multi-Cylinders with Sequence $A^+ \rightarrow B^+ \rightarrow A^- \rightarrow B^-$
10. Design and Testing of PLC-Based Pneumatic Circuit for Single-Cycle Automation of Multi-Cylinders with Sequence $A^+ \rightarrow B^+ \rightarrow B^- \rightarrow A^-$

CYCLE – III PROGRAMMING

11. To study and program basic robotic movements using a Dobot manipulator.
12. To perform automated pick-and-place operations using a Dobot robotic arm.
13. To implement color-based object identification and sorting using a Dobot robot and sensor system.
14. Study and implementation of laser engraving operations using a Dobot robotic manipulator.

Textbooks:

1. James R. Daines, Fluid Power: Hydraulics and Pneumatics, 4th Edition, Goodheart-Willcox Publishers, 2025.
2. Frank D. Petruzella, Programmable Logic Controllers with Ladder Logic, 2023 Edition, McGraw-Hill Education, 2023.
3. Festo Didactic, Electro-Pneumatics Basic Level TP201 Workbook, Latest Edition, Festo Didactic, 2022.

References:

1. Jarosław Stryczek and Urszula Warzyńska (Eds.), Advances in Hydraulic and Pneumatic Drives and Control 2023, Springer, 2024
2. DOBOT Magician User Manual
3. DOBOT Conveyor Belt User Manual
4. Craig, John J. Introduction to robotics: mechanics and control, 4th Edition. Pearson Education India, 2022.
5. Groover, Mikell P., Mitchell Weiss, and Roger N. Nagel. Industrial robotics: technology, programming and application. McGraw-Hill Higher Education, 2017.
6. Niku, Saeed B. Introduction to robotics: analysis, control, applications. John Wiley & Sons, 2020.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Understand the basic components, symbols, and working of pneumatic and hydraulic systems, including electro-pneumatic and electro-hydraulic actuation of double-acting cylinders.

CO2: Understand the principles of PLC-based automation, sequential control of multi-cylinder systems.

CO3: Apply robotic programming techniques to control a Dobot manipulator for industrial automation tasks including material handling, object sorting, and laser engraving operations.

CO–PO & PSO Mapping

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

1–Low, 2–Medium, 3–High, '-' –No correlation

PROFESSIONALISM AND BASIC APTITUDE			
(Common to all Branches)			
Course Code:	25UPCE41	**Course Type:**	**Employability Enhancement Course**
Teaching Periods / Week (L:T:P):	3:0:0	**Credits:**	0
Total Teaching Periods:	30	**CAM+ ESE Mark:**	
Teaching Department:			

Course Objectives:

To impart knowledge on students improve communication, teamwork, and time management. It teaches how to behave professionally and work well with others. Students will learn problem-solving and leadership skills.

Unit 1	**Attitude, Adaptability& Values**	**06 Periods**

Attitude: Positive thinking and optimism - Growth mindset vs. fixed mindset - Self-motivation and initiative - Managing negative attitudes and stress

Adaptability: Change management - Cognitive flexibility - Continuous learning - Workplace diversity adjustment

Values: Personal vs. professional values - Integrity and honesty - Respect and empathy - Ethical decision-making

Perception and learning: Sensory perception and attention - Factors affecting perception - Types of learning - Learning styles and strategies

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 2	**Leadership**	**06 Periods**

Leadership: Leadership styles-Effective communication-Decision-making-Team motivation

Creativity: Brainstorming-Innovation-Problem-solving-Imagination

Reaching your potential: Self-awareness - Goal setting - Time management - Continuous improvement

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 3	**General Aptitude**	**06 Periods**

Number System: Types of Numbers - Prime and Composite Numbers -Place Value and Face Value - Conversions between Number Bases

HCF & LCM: Prime Factorization Method - Division Method - Relationship between HCF and LCM - Word Problems on HCF and LCM

Factorial Concepts: Definition and Notation of Factorial - Factorial Identities - Factorial in Permutations and Combinations - Trailing Zeros in Factorials

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 4	**Quantitative Aptitude – 1**	**06 Periods**

Profit and Loss: Cost Price and Selling Price - Profit and Loss Percentage - Marked Price and Discount - Successive Transactions

Percentage, Ratio and Proportion: Percentage Basics and Calculations - Ratio Simplification and Comparison - Direct and Inverse Proportion - Percentage to Ratio Conversions

Simple Interest and Compound Interest: Simple Interest Formula and Calculation - Compound Interest Basics - Difference between SI and CI - Time and Rate-Based Problems

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Unit 5	**Probability, Permutation and Combination**	**06 Periods**

Probability: Basic Probability - Sample Space - Independent and Dependent Events - Complementary Events

Permutation and Combination: Fundamental Principle of Counting - Permutations - Combinations - Circular Permutations

Pipe and Cistern: Inlet and Outlet Pipes - Filling and Emptying Time - Pipes Working Together - Alternate Inlet–Outlet Problems

Teaching Learning Process	**Pedagogy:**
	RBT Level: Theory: Practical:

Total	**Periods:45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply positive attitude, adaptability, ethical values, and effective perception and learning strategies for personal and professional development.

CO2: Build leadership, creativity, and self-awareness to communicate effectively, solve problems, and achieve continuous growth

CO3: Apply number system concepts, HCF & LCM methods, and factorial principles to solve quantitative problems efficiently

CO4: Calculate profit/loss, percentage, ratio, proportion, and interest problems to make informed financial and quantitative decisions.

CO5: Solve problems on probability, permutations, combinations, and pipe-cistern scenarios using logical and mathematical reasoning

Textbooks:

T1: Aggarwal, R. S. *Quantitative Aptitude for Competitive Examinations*. S. Chand & Company Ltd., **2018**.

T2:Sharma, Arun. *Quantitative Aptitude for CAT*. Tata McGraw-Hill Education Pvt. Ltd., **2014**.

References:

R1: Agarwal, Er. Deepak, & Gupta, D. P. *Rapid Quantitative Aptitude*. S. Chand & Company Ltd., **2019**.

R2: Mittal, P. K. ***Numerical Ability and Quantitative Aptitude for Competitive Examinations*****. Jain Book Agency, 2017**

Web links and Video Lectures (e-Resources):

1. https://quants0.blogspot.com/p/home-quantitative-aptitude.html

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	-	3	-	-	-	3	2	2	2	2	2	-	-
CO2	2	1	1	1	1	1	1	1	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO4	2	-	2	-	-	-	-	2	-	-	2	-	-
CO5	2	2	2	-	-	-	-		2	-	2	-	-
AVG	1.6	1.6	1.4	0.2	0.2	0.8	0.6	5	0.8	0.4	1.6	-	-

1 – Low, 2 – Medium, 3 – High, '-' – No correlation