



**First Year Curriculum
Admission Year 2026-27**

**Bachelor of Technology
Mechanical Engineering**

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

SEMESTER 1

- a. **Course Name:** Elements of Thermal and Fluid Systems
- b. **Course Code:** 03010901PC01
- c. **Prerequisite:** Knowledge of Physics and Mathematics
- d. **Rationale:** This course introduces basic principles and applications of Thermal and Fluid Systems for students in various engineering branches
- e. **Course Learning Objective:**

CLOBJ 1	Understand the fundamentals of thermodynamics including thermodynamic systems, properties, laws of thermodynamics, energy equations, steam formation, and applications in engineering devices such as boilers, turbines, and compressors.
CLOBJ 2	Explain the basic principles of fluid mechanics by identifying properties, classifications, and behavior of fluids, along with understanding the layout and working of hydropower plants.
CLOBJ 3	Describe the construction, working, and applications of steam generators including various types of boilers, boiler mountings, accessories, and thermal power plant layout.
CLOBJ 4	Analyze the operation and performance of internal combustion engines by studying engine classifications, Otto and Diesel cycles, four-stroke engines, and calculations related to power and efficiency.
CLOBJ 5	Understand refrigeration and air conditioning systems including refrigerants, vapor compression and absorption systems, domestic refrigeration, and air conditioning units such as window and split ACs.
CLOBJ 6	Explain the fundamentals of pumps and compressors including their classifications, types, basic working principles, and industrial applications.

f. Course Learning Outcomes:

CLO 1	Explain the fundamentals of first law of thermodynamics and its applications.
CLO 2	Estimate the fundamental properties of Gas and Steam.
CLO 3	Explain the fundamentals of Fluid Properties and its application.
CLO 4	Calculate the Power and efficiency of the Internal Combustion engine
CLO 5	Explain the working principle of Steam Generators, IC engines, Refrigeration, Air Conditioning, Pumps and Compressors

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	2	3	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to Thermodynamics Thermodynamics, Change of State, Path, Process, Cycle, Thermodynamic systems and properties, Statement of Zeroth Law, First Law, and Second Law of Thermodynamics. Steady Flow energy equation, Application of first law of Thermodynamics to boilers, turbines, and compressors. Flow and Non-flow process, Formation of steam and its types.	30%	10
2	Basics of Fluid Mechanics Classification of fluids, Properties of fluid, Types of fluid, and Layout of Hydropower Plant.	10%	3
3	Steam Generators and its Applications Classification; Cochran, Lancashire, Babcock and Wilcox Boiler, Function of Boiler Mounting and Accessories. Layout of Thermal Power Plant	20%	6
4	Internal Combustion (IC) Engine Classification, Otto and Diesel Cycle, Four Stroke Petrol and Diesel Engine; Calculation of Power and Efficiency.	20%	5
5	Refrigeration and Air Conditioning Refrigerant, Vapor compression refrigeration system, Vapor absorption refrigeration system, Domestic refrigeration, Window and split air conditioners.	15%	4
6	Basics of Pumps and Compressor Basics of Pumps and Compressor, Classification, Types of Pumps and Compressors.	5%	2

i. Text Book and Reference Book:

1. Elements of Mechanical Engineering, By Sadhu Singh. Published by S. Chand Publishing, Revised Edition, 2013.
2. Elements of Mechanical Engineering, By S. B. Mathur and S. Domkundwar. Published by Dhanpat Rai & Sons, 2013.
3. Fundamental of Mechanical Engineering, By G. S. Sawhney. Published by PHI Learning, Third Edition, 2015.
4. Engineering Thermodynamics, By P. K. Nag. Published by McGraw Hill Education India, Sixth Edition, 2017.
5. Fluid Mechanics and Hydraulic Machines, By R. K. Bansal. Published by Laxmi Publications, Revised Ninth Edition, 2022.
6. Thermal Science and Engineering, By D. S. Kumar. Published by S. K. Kataria & Sons, Fourth Edition, 2022.

- a. **Course Name:** Linear Algebra and Calculus
- b. **Course Code:** 03019101BS02
- c. **Prerequisite:** Elementary Algebra, Matrices, Differentiation and Integration
- d. **Rationale:** This syllabus builds essential mathematical tools for engineering applications, covering differential equations, Laplace transforms, and vector calculus.
- e. **Course Learning Objective:**

CLOBJ 1	Analyze and solve systems of linear equations using matrix methods and understand eigenvalue problems.
CLOBJ 2	Apply first-order ordinary differential equations to model physical phenomena like cooling and electrical circuits.
CLOBJ 3	Understand the principles of partial differentiation for multivariable functions and their applications.
CLOBJ 4	Utilize multiple integration techniques in various coordinate systems to compute geometric properties.
CLOBJ 5	Develop mathematical modelling skills for engineering applications through calculus and linear algebra.

f. Course Learning Outcomes:

CLO 1	Understand the concept of eigenvalues and eigenvectors of a matrix.
CLO 2	Formulate first-order differential equation to solve the real-world problem.
CLO 3	Apply partial differentiation to optimize multivariable function.
CLO 4	Evaluate multiple integration in cartesian and polar coordinates.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Linear Algebra Linear Algebra: Review of Determinant and Matrices, types of matrices, Rank of a matrix, System of Linear equations homogenous and non-homogenous equations, solving techniques- Gauss Elimination method, Gauss-Jordan method, Consistency and inconsistency of the system, Eigenvalues and Eigenvector: Eigenvalues and Eigenvector, Algebraic multiplicity and Geometric multiplicity, Caley-Hamilton theorem, Diagonalization	30%	18
2	First order ordinary differential equations and applications First Order Ordinary Differential Equations: Exact and non-exact	20%	12

	differential equations, Integrating factor- function of x only and functions of y only, Linear and non-linear differential equations, Applications: Newton's Law of cooling, Growth model and RL-Circuit and RC-Circuit		
3	Partial Differentiation and its application Partial Differentiation: Functions of several variables, Limit of function, continuity, partial differentiation, chain rule, Implicit functions and their derivatives, Homogeneous functions and Euler's theorem Applications of Partial Differentiation: Tangent plane and normal line, Maxima and minima	30%	18
4	Multiple Integration Multiple Integration: Double integration, change of order, change into polar form, triple integrations Applications: Area, Volume	20%	12

i. Text Book and Reference Book:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India.
2. Howard Anton and Chris Rorres, Elementary Linear Algebra, 9th Edition, Wiley India.
3. James Stewart, Calculus with Early Transcendental Functions, Cengage Learning.
4. Maurice D. Weir, Joel Hass, and Frank R. Giordano, Thomas' Calculus, Pearson Education.

- a. **Course Name:** Physics of Wave and Motion
- b. **Course Code:** 03019201BS02
- c. **Prerequisite:** Knowledge of Physics and some basic concepts in Mathematics like differentiation, integration, limit, differential equation, vector calculus up to 12th science level.
- d. **Rationale:** Knowledge of physics is essential for all Engineering branch because physics is the foundation subject of all the branches of engineering and it develops scientific temperament and analytical capability of engineering students. Comprehension of basic physics concepts enables the students to solve engineering problem logically and develop scientific approach.
- e. **Course Learning Objective:**

CLOBJ 1	Understand the mechanical and thermal properties of materials including elasticity and specific heat models.
CLOBJ 2	Apply the principles of simple harmonic motion and wave optics to physical systems.
CLOBJ 3	Analyze the behavior of ultrasonic waves and their applications in non-destructive testing.
CLOBJ 4	Study the fundamentals of lasers, including Einstein's coefficients and types of laser systems.
CLOBJ 5	Explain the principles of superconductivity, including the Meissner effect and London equations.

f. Course Learning Outcomes:

CLO 1	Analyze mechanical and thermal properties of solids using Einstein and Debye models.
CLO 2	Conceptualize wave phenomena such as interference and diffraction in optical systems.
CLO 3	Evaluate the properties and production methods of ultrasonic waves for engineering applications.
CLO 4	Demonstrate knowledge of laser technology and the characteristics of superconducting materials.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Properties of Material Mechanical Properties: Elastic properties, Model of elastic behavior, tensile stress-strain curve, shear strength of perfect and real crystals. Thermal Properties: Thermo-electric effects, Wiedemann-Franz law, Phonons, Modes of heat transfer, Specific heat of solids, Einstein and Debye Model.	20%	9
2	Motion in a Plane Transformation of coordinates, Newton's laws and its completeness in describing particle motion, Problems including constraints and friction, Motion of a rigid body in the plane; Rotation in the plane; Angular momentum about a point of a rigid body in planar motion.	20%	9
3	Waves & Vibration Transverse wave on a string, Wave equation on a string, Harmonic waves, Standing waves and their Eigen frequencies, longitudinal waves and the wave equation, Acoustics waves and speed of sound, Phase velocity and group velocity. Acoustics of Civil structure and mechanical system: Reflection of sound, Echo, Reverberation, Reverberation time, Absorption of sound, Absorption coefficient, Sabine's formula Condition for good acoustic of the building, Engineering applications of ultrasound-non destructive testing.	35%	15
4	Lasers Einstein's theory of matter-radiation interaction, Absorption, Spontaneous and Stimulated Emission of Radiation, Characteristics of Laser, Components of Laser, Types of Laser: Nd:YAG Laser, CO2 Laser, Diode Laser, Applications of Lasers.	25%	12

i. Text Book and Reference Book:

1. Engineering Mechanics, By M.K. Harbola. Published by Cengage Learning.
2. Engineering Mechanics – Dynamics, By J.L. Meriam. Published by Wiley Publication.
3. Mechanical Vibrations, By J.P. Den Hartog. Published by McGraw Hill Publication.
4. Engineering Physics, By H.K. Malek and A.K. Singh. Published by McGraw Hill Publication.

- a. **Course Name:** Programming for Problem Solving
- b. **Course Code:** 03010501ES01
- c. **Prerequisite:** Requires Basic Knowledge of Computer
- d. **Rationale:** This course is design to provide basic ideas of computer programming. This course also makes help to understand programming language. It will help to develop their logical abilities
- e. **Course Learning Objective:**

CLOBJ 1	To understand the basic principles, organization, and components of computer systems.
CLOBJ 2	To develop understanding of computer programming concepts and programming languages.
CLOBJ 3	To develop algorithms and flowcharts for solving basic engineering problems.
CLOBJ 4	To write, compile, debug, and execute programs using the C programming language.
CLOBJ 5	To analyze and solve computational problems using structured C programs.
CLOBJ 6	To develop simple application-based projects using C programming language.

f. Course Learning Outcomes:

CLO 1	Recognize the computer's basic principles and organizations.
CLO 2	Understand concepts of Computer Programming Language.
CLO 3	Develop the algorithm for solving basic Engineering Problems.
CLO 4	Write, compile, and debug programs with C Programming.
CLO 5	Analyse the solved complex computational program written in C.
CLO 6	Develop simple projects using C Language.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to 'C' Programming What is C language, History of C language, Application areas of C, Features of C language, structure of C Program, execution flow of program, reading a character, writing a character, formatted input, formatted output functions.	10%	8
2	Constants, Variables, Data Types, Operators and Expressions Constants, Variables, Data Types: Character Set, C tokens, Keywords and Identifiers, Constants, Variables, Data types,	15%	5

	Declaration of Variables, Assigning values to variables, typedef, and Defining symbolic constants. Operators and Expression: Introduction to Operators and its types, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Operator precedence and associativity.		
3	Control structures in C Decision Making & branching: Decision making with If &If .. Else statements, If .. Else statements (Nested Ladder), The Switch, The break statement & goto statements, The ternary (?:) Operator Looping: The while statement, & The Do.. While loop, The FOR loop, Jump within loops – Programs	15%	4
4	Arrays and Strings Arrays: Introduction, One-dimensional array, Two-dimensional array, Concept of Multidimensional arrays. Strings: String declaration, storage, Built-in-string functions.	20%	7
5	User-Defined Functions, Structure and Unions User-Defined Functions: Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function, Macros, Pre-processing. Structure and Unions: Introduction, Structure definition, declaring and initializing Structure variables, Accessing Structure members, Copying & Comparison of structures, Arrays of structures, Arrays within structures, Structures within Structures, Structures and functions, Unions	20%	10
6	Pointers, Dynamic memory allocation and File Management in C Pointers: Basics of pointers, pointer to pointer, pointer and array, Pointer to array, array of pointers , functions returning Pointers Dynamic memory allocation: Introduction to Dynamic memory allocation, malloc(), calloc(), free(), realloc(). File Management in C: Introduction and standard file handling functions.	20%	8

i. Text Book and Reference Book:

1. Programming in ANSI C, By E. Balaguruswamy. Published by Tata McGraw-Hill Publication.
2. C Programming: Test Your Skills, By Ashok Kamthane. Published by Pearson Education.
3. Computer Fundamentals, By P.K. Sinha and Priti Sinha. Published by BPB Publications, 4th Edition.
4. Star C Programming, By STAR Certification. Published for C Certification Exam.
5. Programming with C, By Byron Gottfried. Published by Tata McGraw Hill Education.
6. C: The Complete Reference, By Herbert Schildt. Published by McGraw Hill Publication.
7. Let Us C, By Yashavant Kanetkar. Published by BPB Publications.

- a. **Course Name:** Electrical and Electronics Engineering
- b. **Course Code:** 03010601ES02
- c. **Prerequisite:** Basic knowledge of Physics, Mathematics, and fundamental concepts of electricity and electronics.
- d. **Rationale:** The main objective of this subject is introductory treatment of the field of Electrical and Electronics Engineering to the students of various branches of engineering
- e. **Course Learning Objective:**

CLOBJ 1	To understand and apply fundamental electrical laws and circuit theorems in electrical circuits.
CLOBJ 2	To analyze the performance and behavior of single-phase and three-phase AC circuits.
CLOBJ 3	To evaluate the operating regions of BJTs through DC analysis and Q-point determination using load line analysis.
CLOBJ 4	To design DC regulated power supplies using voltage regulators and understand the operation of various transducers.

f. Course Learning Outcomes:

CLO 1	Apply fundamental electrical laws and circuit theorems to electrical circuits.
CLO 2	Analyse single-phase and three phase AC circuits
CLO 3	Evaluate the operating regions of BJTs through DC analysis and Q-points using load line analysis
CLO 4	Design DC-regulated power supplies using voltage regulators and introduce various transducers with operation.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	DC Circuits Concepts of Electrical Current, Voltage, Power and Energy. Electrical circuit elements (R, L and C), voltage and current sources, - Ohm's Law and Kirchoff's Laws, simplifications of networks using series and parallel resistance circuits and its examples, star-delta conversions. Superposition, Thevenin's and Norton Theorems.	20%	10
2	AC Circuits Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of instantaneous, peak (maximum), average and R.M.S. values, frequency, cycle, period, peak factor and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors, examples based on theory. Analysis with phasor diagrams of R, L, C, R-L, R-C and R-L-C series circuits and it's example. study of parallel R-L, R C and R-L-C circuit, concept of impedance , admittance, conductance and susceptance in case of above combinations and relevant voltage-current phasor diagrams, Resonance in series and parallel circuits. Q-factor. concept of active, reactive and apparent power and power factor. Concept of three-phase supply and phase sequence. Voltages, currents and power relations in three-phase balanced star-connected loads and delta-connected loads along with phasor diagrams with examples.	30%	13
3	Diode and Transistors 12 30 Introduction to Ideal Diode, Effect of temperature Ideal diodes, unbiased diode and Forward and reverse bias of Diode. PIV, surge current, Diode as Uncontrolled switch. Rectifiers: Half wave, Full wave, and bridge wave. Ripple factor, PIV rating. Choke and Capacitor input filter rectifiers, Clipper and Clamper circuits, Construction and working of BJT, Characteristics & specifications of BJT (PNP & NPN transistors), Biased and unbiased BJT, Configuration of the transistor, the concept of gain & BW, Operation of BJT in the cut-off, saturation & active regions (DC analysis), BJT as a switch, Transistor as an amplifier, Voltage divider bias and analysis, VDB load line and Q point	30%	12
4	Voltage Regulators and Transducers Basic series and shunt regulator, Types of voltage regulator IC: Fixed and adjustable positive and negative linear voltage regulator, IC linear fixed voltage regulator (78XX, 79XX,) Linear Adjustable Regulator, DC Regulated Power supply. Introduction of Transducers. Types of Transducers and its applications	20%	10

i. Text Book and Reference Book:

1. A Textbook of Electrical Technology Vol. 2, By B.L. Theraja. Published by S. Chand Publication.
2. Electrical Engineering Fundamentals, By V.D. Toro. Published by Prentice Hall India, 2nd Edition, 1988.
3. Electrical and Electronics Technology, By E. Hughes. Published by Pearson Publication, 10th Edition, 2010.
4. Basic Electrical Engineering, By D.P. Kothari and I.J. Nagrath. Published by Tata McGraw Hill, 3rd Edition, 2010.
5. Basic Electrical Engineering, By D.C. Kulshreshtha. Published by McGraw Hill Publication, 1st Edition, 2009.
6. Introduction to Electrical Engineering, By M.S. Sarma. Published by Oxford University Press, 2001.

- a. **Course Name:** - Principles of Communication Skills
- b. **Course Code:** 03010001HM01
- c. **Prerequisite:** Knowledge of English Language studied till 12th standard
- d. **Rationale:** Basic Communication Skills are essential for all Engineers
- e. **Course Learning Objective:**

CLOBJ 1	Understand the fundamental grammatical structures including parts of speech, punctuation, tenses, phrases, clauses, determiners, Quantifiers, sentence types, and basic concepts of phonetics (IPA symbols, speech sounds, stress, and intonation) for accurate and effective language use.
CLOBJ 2	Develop basic reading and listening comprehension skills by using appropriate strategies to understand simple texts and spoken content with improved pronunciation awareness.
CLOBJ 3	Organize and express ideas clearly in written form through picture-based perception activities.
CLOBJ 4	Build confidence and fluency in spoken communication through correct pronunciation practice, meeting and greeting activities, extempore speech, and everyday conversational exercises.
CLOBJ 5	Apply goal-setting and self-reflection techniques to monitor personal language learning progress, pronunciation improvement, and overall communication skills development.

f. Course Learning Outcomes:

CLO 1	Enable students to apply essential grammar rules for accurate and effective communication.
CLO 2	Develop ability to construct clear and coherent sentences and paragraphs using varied sentence structures.
CLO 3	Enhance reading and listening comprehension through identification of main ideas, details, and contextual meanings.
CLO 4	Build s confidence in everyday communication using appropriate greetings, expressions, and speaking skills.
CLO 5	Encourage creative and logical thinking through picture perception and extempore activities.
CLO 6	Help students set and track realistic personal and academic goals for continuous self-improvement.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	2	1	-	-	20	-	30	50

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Parts of Speech, Punctuation Overview of 8 parts of speech Basic punctuation marks and their usage Importance of grammar in writing	10%	4
2	Tenses Types: Present, Past, Future Forms and correct usage Common tense errors	8%	2
3	Phrase and Clauses; Types of Sentences (Structure Wise) Difference between phrases and clauses Classification of Simple, Compound & Complex Interchange of Simple to Compound, Simple to Complex, Compound to Complex	10%	4
4	Picture Perception Observing and interpreting images Building a short story or description Improving vocabulary and creativity	15%	4
5.	Paragraph Development Structure: topic sentence, development, conclusion	8%	2
6.	Meeting and Greeting (Initiating a conversation) Basic conversation skills Formal and informal greetings Common phrases for starting interactions	8%	2
7.	Reading Comprehension (Basic Level) Types – Skimming & Scanning Reading short passages Identifying main ideas and details Answering basic questions	12%	4
8.	Listening Comprehension (Basic Level) Listening to short audios/Conversation Understanding and responding to key information	8%	2
9	Extempore Speech Speaking on random topics Organizing thoughts quickly Improving fluency and confidence	15%	4
10	Goal Setting and Tracking Setting SMART goals Planning and tracking progress Self-assessment and reflection	7%	2

i. Text Book and Reference Book:

1. English Grammar in Use, By Raymond Murphy. Published by Cambridge University Press, 2019.
2. A Practical English Grammar, By Thomson and Martinet. Published by Oxford University Press, 1986.
3. The St. Martin's Guide to Writing, By Rise B. Axelrod and Charles R. Cooper. Published by Bedford/St. Martin's, 2021.
4. Tactics for Listening (Basic), By Jack C. Richards. Published by Oxford University Press, 2011.
5. Active Skills for Reading: Book 1, By Neil J. Anderson. Published by Cengage Learning, 2013.
6. Speak with Impact, By Allison Shapira. Published by HarperCollins Leadership, 2018.

- a. **Course Name:** Student Induction Program with Essence of Indian Knowledge System
b. **Course Code:** 03010001MC01
c. **Prerequisite:** Basic awareness about higher education, social values, ethics, and Indian culture will be beneficial for understanding the course effectively.
d. **Rationale:** This course helps students adapt to the academic environment, develop confidence, communication skills, ethical values, and understand the essence of Indian Knowledge System for holistic personal and professional growth.

e. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
15	-	-	0	-	50	-	-	-	50

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

f. **Course Content:**

Sr. No.	Content	Weightage	Teaching Hours
1	Activities in Mathematics 1. Exploring 3D Shapes (Cylinder, Cone, Cube, Cuboid) 2. The Geometry of Conic Sections: Properties and Applications 3. Measuring the Height of a Tree or Building Using Trigonometry 4. Techniques for Measuring Top and Bottom Angle Reflections 5. Fundamental Elements of Set Theory 6. Set Theory Tools for Probability Analysis 7. Key Concepts in Combinatorial Mathematics 8. Probability Fundamentals: Key Ideas and Concepts 9. Foundations of Statistical Theory: Key Concepts Explained 10. Principles of Geometric Progressions and Series 11. Matrix Application in Cryptography 12. An experimental approach to measure velocity and acceleration 13. Analysing Rate of Change and Optimisation 14. Utilising Integration for Problem Solving 15. A B C of Tangram	25%	12
2	Activities in Communication Skills Phase-1: Part of Speech, Articles, Tenses, Basic Sentence Formation Phase-2: Verb, Subject Verb Agreement, Active Passive Voice, Idioms and Phrases Phase-3: Introduction to IKS, Indian ways of Speaking and Listening, Healthy Daily Life: The Indian Way, Indian Achievers and Innovations.	25%	12
3	Activities in Computer Science Computer Basic Architecture: Introduction to Computer Systems, Von Neumann Architecture, Components of a Computer: CPU, Memory, I/O devices, Data Representation and Number Systems, Registers, ALU, Control Unit, Memory Hierarchy: Cache, RAM, ROM, Secondary Storage Indian Knowledge System in Context of Computing: Historical Contributions of Indian Scholars to Mathematics and Computing, Algorithms in Ancient Indian Texts,	25%	12

	<p>Concept of Zero and Decimal Number System, Indian Logic and Computation Models, Sanskrit Computational Models and Grammar, Traditional Indian Computing Tools and Techniques, Integration of Traditional Knowledge with Modern Computing Emerging Technologies in Computer Engineering: Introduction to Artificial Intelligence and Machine Learning, Internet of Things (IoT), Blockchain Technology, Quantum Computing Basics, Edge Computing and Cloud Computing Advances, Cybersecurity Trends and Challenges, 5G and Networking Innovations, Bioinformatics and Computational Biology, Robotics and Automation in Computing.</p>		
4	<p>Activities of Physics Measurement, Electrostatics, Electromagnetism, Optics, Laser and Fiber Optics, Vedic Physics and Cosmology</p>	25%	12

Semester - 2

- a. **Course Name:** Differential Equations and Vector Calculus
- b. **Course Code:** 03019102BS02
- c. **Prerequisite:** Differential Calculus, Integral Calculus, Vector Algebra, Differential Equations
- d. **Rationale:** This syllabus builds essential mathematical tools for engineering applications, covering differential equations, Laplace transforms, and vector calculus.
- e. **Course Learning Objective:**

CLOBJ 1	Understand second and higher-order ordinary differential equations and their solution techniques.
CLOBJ 2	Apply Laplace transform methods and inverse transforms for solving differential equations arising in engineering applications.
CLOBJ 3	Analyze periodic functions using Fourier series and half-range expansions.
CLOBJ 4	Apply vector integration techniques such as line integrals and Green's theorem in mathematical and physical problems.
CLOBJ 5	Formulate and solve engineering and scientific problems using differential equations and vector calculus methods.

f. Course Learning Outcomes:

CLO 1	Solve Second and Higher-Order Ordinary Differential Equations
CLO 2	Apply Laplace Transform to Solve Differential Equations.
CLO 3	Apply Fourier series techniques to approximate periodic functions in mathematical and engineering contexts.
CLO 4	Compute and interpret vector differentiation concepts.
CLO 5	Evaluate vector integrals.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Second and Higher-Order Ordinary Differential Equations Homogeneous Linear ODE, Homogeneous constant coefficient linear ODE, non-homogeneous linear constant coefficient linear ODE, Undetermined coefficient and Variation of Parameter, Applications of higher order linear differential equations in Free oscillations, forced oscillations, Damped oscillations, RLC circuit	25%	15
2	Laplace Transformations and Its Applications: Definition and Laplace transformation of elementary functions, Properties of	30%	18

	Laplace Transformations - linearity property, First-Shifting Theorem, Derivative of Laplace transformation, Integration of Laplace transformation, Laplace transformation of Integral, Laplace transformation of derivatives, Inverse Laplace Transformation, Convolution theorem and Application of Laplace Transformation to solve ODE.		
3	Fourier Series: Fourier Series of periodic functions with arbitrary period, Even and Odd functions, Half-Range Fourier Series.	15%	9
4	Vector Calculus: Vector Differentiation: Vector-valued functions, smooth curve, vector differentiation, scalar-valued function, Gradient of scalar valued function, Divergence and curl of vector-valued functions, Laplacian operator, Scalar potential function, Vector Integration: Line integral of scalar functions, Line integral of vector valued function, conservative vector field and independent of path, Green's theorem..	30%	18

i. Text Book and Reference Book:

1. Advanced Engineering Mathematics by Erwin Kreyszig; Wiley India Education.
2. Introductory Course in Differential Equations by D. A. Murray; Orient Longman (India).
3. Fourier Series and Boundary Value Problems by James Brown and Ruel Churchill; McGraw Hill.
4. Elementary Differential Equations and Boundary Value Problems by William E. Boyce and Richard C. D'Prima; Wiley India Edition.
5. Advanced Engineering Mathematics" by K. A. Stroud and Dexter Booth; Macmillan Publication.

- a. **Course Name:** Engineering Graphics and Design
- b. **Course Code:** 03010901ES02
- c. **Prerequisite:** Zeal to learn the subject.
- d. **Rationale:** Engineering Graphics is the language of communication for Engineers. Engineering Graphics course provides tools and techniques of communication for various fields of Engineering.
- e. **Course Learning Objective:**

CLOBJ 1	Understand the use of drawing instruments, BIS standards, scales, and engineering drawing conventions.
CLOBJ 2	Develop the ability to construct various engineering curves using standard drafting techniques.
CLOBJ 3	Understand and draw projections of points, lines, and planes using orthographic projection methods.
CLOBJ 4	Develop skills in drawing sections of solids and development of surfaces using reference planes.
CLOBJ 5	Apply principles of orthographic and isometric projections for visualization of 3D objects.
CLOBJ 6	Introduce basic 2D and 3D drafting techniques using AutoCAD software.

f. Course Learning Outcomes:

CLO 1	Understand the uses of drawing instruments, accessories, scales and BIS drawing standards in engineering graphics.
CLO 2	Form various engineering curves using basic drafting techniques.
CLO 3	Illustrate the projections of points, lines and planes in different quadrants using orthographic projection techniques.
CLO 4	Draw section of solids and development of surfaces using reference planes.
CLO 5	Draw orthographic and isometric projections of 3D objects using basic principles of projection.
CLO 6	Draft 2D and 3D engineering drawings with aid of basic AutoCAD.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	4	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction Scope of Engineering Drawing in all Branches of Engineering, Uses of Drawing Instruments and Accessories, Introduction to Drawing Standards BIS-SP-46, Representative	10%	5

	Fraction, Engineering Scales, Dimensioning Terms and Notations, Types of Lines used in Engineering. Practice recommended by BIS.		
2	Engineering Curves Classification of Engineering Curves, Application of Engineering Curves, Constructions of Engineering Curves - Conics, Spirals, Involutives and Cycloids with Tangents and Normals.	15%	10
3	Principles of Projections Types of Projection, Parallel Projection, One-point Perspective projection. Introduction to principal planes of projections, Projections of the points: Projections of the points located in same quadrant and different quadrants. Projections of line: Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes. Projections of planes: Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane.	20%	0
4	Projections and Development of Solids Projections of Solids: Classifications of basic Solids, Projections of Solids - Right Regular Prism, Pyramid, Cone, Cylinder, Tetrahedron and Cube; Sectional Views. Development of Surfaces: Methods of Development of Lateral Surfaces of Right Regular Solids, Parallel Line Development and Radial Line Development, Applications of Development of Surfaces.	20%	10
5	Orthographic and Isometric Projections Orthographic Projections: Principle of orthographic projections, Conversion of pictorial views into orthographic projections including sectional orthographic projections. Isometric Projections: Conversion of orthographic views into isometric projections/views.	20%	5
6	Computer Aided Drafting Basic User Interface of Drafting Software, Demonstration of basic modelling commands, Preparation of 2D and 3D models using Drafting Software.	15%	0

i. Text Book and Reference Book:

1. A Text Book of Engineering Graphics, By P. J. Shah, S. Chand & Company Ltd., New Delhi, 1st Edition, 2021.
2. Engineering Drawing, By N. D. Bhatt, Charotar Publishing House, 55th Edition, 2010.
3. A Text Book of Engineering Drawing, By P. S. Gill, S. K. Kataria & Sons, 2013 Edition.
4. Engineering Graphics with AutoCAD, By James D. Bethune, Pearson Education, 2020 Edition

- a. **Course Name:** Mechanics of Solids
- b. **Course Code:** 03010402ES01
- c. **Prerequisite:** Understanding of Physics, Maths, Units, Force etc.
- d. **Rationale:** Mechanics of Solids is a conceptual application of principles of mechanics in Engineering
- e. **Course Learning Objective:**

CLOBJ 1	Understand the concepts of forces, equilibrium, and rigid body mechanics in engineering applications.
CLOBJ 2	Apply principles of centroid and moment of inertia for engineering structures and components.
CLOBJ 3	Analyze stresses, strains, and elastic behavior of materials under different loading conditions.
CLOBJ 4	Evaluate shear force, bending moment, and stresses developed in beams.
CLOBJ 5	Understand the principles of friction and their applications in engineering systems.

f. Course Learning Outcomes:

CLO 1	Correlate real-life problems of rigid bodies with engineering mechanics and determine the resultant & moment of various force system acting in 2-Dimension & 3- Dimension.
CLO 2	Evaluate centroid of line, area and volume; and Moment of inertia of area.
CLO 3	Understand simple stresses and strains, understand principal stresses and strains.
CLO 4	Analyze the internal and external forces & stresses in a beam, bending stresses, shear stress in beams.
CLO 5	Know basics of friction and its importance through simple applications.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction Forces/Equilibrium of Rigid body, Scalars and vectors, system of forces, resultant force, Statics of particles. Free-body diagrams. Equilibrium of a particle in two dimensions, Resultants of three or more concurrent forces, Resolution of a force into components. Concurrent force system in space: Resolution of a force into rectangular components in space, Coplanar Non-Concurrent Force Systems, Moments about Points	15%	6

	and Axes, Non-coplanar Non-concurrent Forces.		
2	Centroid and Moment of Inertia Centroid and center of gravity. Determination of Centroid, Centroid of volumes. Theorems of Pappus- Guldinus and its applications. Second moment of areas, Definition of the moment of inertia. Determination of moment of areas by integration, Parallel axis theorem for Moment of Inertia. MI of composite areas, Concept of Mass moment of inertia of bodies.	15%	6
3	Stresses and Strains Concept of stresses and strains, Types of stress, types of strain, Hook's Law, Elastic Constants. Relation between Poisson's Ratio, Modulus of Elasticity, Modulus of Rigidity and Bulk Modulus, Thermal Stresses, Eccentric load. Principal planes, Principal stresses and principal strains, Analytical and graphical method (Mohr's circle) for finding normal and shear stress on an oblique section of a body subjected to direct and shear stresses, Determination of principal stresses and location of principal planes, maximum shear stress and location of plane of maximum shear.	20%	12
4	Beams Types of beam, types of load, types of support. Reactions, Shear Forces and Bending Moments – relationship between them, Shear force and bending moment diagrams, Point of contraflexure. Theory of simple bending, Moment of Resistance, Bending stresses in beams, Beam of Uniform strength, Shear stress concept, Derivation of shear stress, Bending and Shear stresses in rectangular, circular, T-section and I-section.	30%	12
5	Friction The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Analysis of systems involving dry frictions such as ladders, spheres etc, Belt Friction, Analysis of flat and v-belt.	10%	4

i. Text Book and Reference Book:

1. Engineering Mechanics: Statics and Dynamics By R. C. Hibbeler; Prentice Hall of India
2. Engineering Mechanics: Statics and Dynamics By S. Rajasekaran; Vikas Publication
3. Engineering Mechanics: Statics and Dynamics By J. A. Desai and B. B. Mistry; Popular Prakashan
4. Engineering Mechanics By S. S. Bhavikatti and K. G. Rajashekarappa; Wiley Eastern Ltd.
5. Theory of Structures By R. S. Khurmi; S. Chand & Co. Ltd.
6. Theory of Structures By S. Ramamrutham; Dhanpat Rai Publishing Company
7. Engineering Mechanics By J. L. Meriam and L. G. Kraige; John Wiley & Sons, New York

- a. **Course Name:** Advanced Communication and Interpersonal Skills
- b. **Course Code:** 03010002HM01
- c. **Prerequisite:** Basic Communication Skills are essential for all Engineers
- d. **Rationale:** Strengthen core language and soft skills through applied grammar, communication tasks, and vocabulary building.
- e. **Course Learning Objective:**

CLOBJ 1	Apply core grammatical principles including subject–verb agreement, reported speech, and active–passive voice to improve accuracy in spoken and written communication.
CLOBJ 2	Expand functional vocabulary and language usage by applying synonyms, antonyms, homonyms, idioms, and contextual word meanings effectively.
CLOBJ 3	Develop effective reading comprehension skills to understand, interpret, and respond to intermediate-level texts and spoken content.
CLOBJ 4	Enhance written and spoken expression through structured essay writing, Paragraph development, confident self-introduction, and professional grooming practices.
CLOBJ 5	Develop self-management and personal development skills by applying SWOT analysis, practicing effective time management strategies, and engaging in reflective learning processes.

f. Course Learning Outcomes:

CLO 1	Remember the essential rules of English grammar and core vocabulary required for accurate communication.
CLO 2	Understand spoken and written texts at an intermediate level to grasp meaning, ideas, and context.
CLO 3	Apply grammatical structures, vocabulary, and writing skills in essays, self-introductions, and everyday communication.
CLO 4	Analyze personal strengths and weaknesses through SWOT analysis to enhance grooming and personality development.
CLO 5	Analyze communication habits and daily routines to improve time management and professional effectiveness.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	2	2	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Subject Verb Agreement Rules of subject-verb matching, Singular vs plural forms, Common agreement errors	10%	1
2	Reported Speech Direct and indirect speech, Changing tenses, pronouns, and time expressions, Reporting statements, questions, and commands	10%	1
3	Active and Passive Voice Difference between Active and Passive, Rules for converting sentences, Usage in real-life contexts	10%	1
4	Building Vocabulary Word meanings and usage, Synonyms and antonyms, Homonyms, Homophones, Homographs, Idioms	10%	2
5	Grooming and Personality Development Importance of dressing and professional etiquette, Building confidence and positive body language	10%	2
6	SWOT Analysis with Self Introduction Identifying strengths, weaknesses, opportunities, threats, Preparing and delivering a confident self-introduction, Developing self-awareness and a growth mindset	10%	2
7	Reading Comprehension (Intermediate Level) Understanding written texts, Finding main ideas and supporting details, Answering questions accurately	10%	2
8	Listening Comprehension (Intermediate Level) Listening for specific information, Identifying tone and purpose, Responding appropriately	10%	1
9	Essay Writing Structure of an essay: introduction, body, conclusion, Organizing ideas logically, Using appropriate language and tone	10%	2
10	Time Management Importance of managing time, Prioritization, Creating schedules	10%	1

i. Text Book and Reference Book:

1. Technical Communication: Principles and Practice By Sangeeta Sharma and Meenakshi Raman; Oxford University Press
2. Personality Development and Soft Skills By Barun K. Mitra; Oxford University Press
3. High School English Grammar and Composition By Wren and Martin; S. Chand Publishing
4. English Grammar in Use By Raymond Murphy; Cambridge University Press
5. Communication Skills and Soft Skills By Suresh Kumar; Pearson Publication

- a. **Course Name:** Environmental Science
- b. **Course Code:** 03010002MC01
- c. **Prerequisite:** Knowledge of Physics, Chemistry and Mathematics up to 12th science level and Biology up to 10th science level
- d. **Rationale:** The proposed syllabus of Environmental Science is comprehensive and multidisciplinary, reflecting the interconnectedness of ecological systems, technological development, human behavior, and urban planning. This rationale explains the relevance and importance of each thematic area covered: Environmental Health, Ecology, and Quality of Life; Pollution Prevention; Population Growth and Global Environmental Challenges; Environmental Information Systems and Technological Tools; Smart Cities

e. Course Learning Objective:

CLOBJ 1	Understand the fundamentals of Environmental Science and the interaction between humans and the environment.
CLOBJ 2	Explain various types of environmental pollution, their impacts, and pollution control techniques.
CLOBJ 3	Develop awareness regarding environmental laws, policies, and global environmental agreements.
CLOBJ 4	Analyze contemporary environmental issues and sustainable development practices.
CLOBJ 5	Understand the concept of climate resilient cities and sustainable urban planning.

f. Course Learning Outcomes:

CLO 1	Analyze the impact of human activities on environmental sustainability and ecosystems.
CLO 2	Promote awareness about biodiversity conservation and its importance for ecological balance.
CLO 3	Assess the effects of pollution and propose strategies for pollution control and waste management.
CLO 4	Describe the significance of climate change and its global implications on ecosystems and human life.
CLO 5	Develop skills to evaluate and mitigate environmental risks in industrial and urban development.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	0	0	-	50	-	-	-	50

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	FUNDAMENTALS OF ENVIRONMENTAL SCIENCE: Definition, Principles and Scope of Environmental Science. Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Laws of thermodynamics, heat transfer processes, mass and energy transfer across various interfaces, material balance. Meteorological parameters - pressure, temperature, precipitation, humidity, radiation and wind velocity. Interaction between Earth, Man and Environment. Biogeographic provinces of the world and agro-climatic zones of India. Concept of sustainable development goals. Environmental education and awareness. Environmental ethics.	15%	3
2	ENVIRONMENTAL POLLUTION AND CONTROL: Air, Noise, Water, Soil, Thermal, Marine, and Radioactive pollution, focusing on sources, types of pollutants, and their impacts on human health, plants, and materials. It includes the measurement techniques and standards for air and water quality, along with pollution control devices and methods. Key topics include criteria air pollutants, noise indices, wastewater treatment, and soil pollution management.	25%	4
3	ENVIRONMENT MANAGEMENT AND LEGISLATION: Overview of Environmental Laws in India: Constitutional provisions in India (Article 48A and 51A), Forest Conservation Act, 1980, Water (Prevention and Control of Pollution) Act, 1974 amended 1988 and Rules 1975, Air (Prevention and Control of Pollution) Act, 1981 amended 1987 and Rules 1982, Environmental (Protection) Act, 1986 and Rules 1986, The Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016, The Solid Waste Management Rules, 2016, Noise Pollution (Regulation 8 and Control) Rules, 2000, Environmental Conventions and Agreements: Stockholm Conference on Human Environment 1972, Montreal Protocol, 1987, Basel Convention (1989, 1992), Earth Summit at Rio de Janeiro, 1992, Agenda-21, Global Environmental Facility (GEF), Convention on Biodiversity (1992), UNFCCC, Kyoto Protocol, 1997, Clean Development Mechanism (CDM), Copenhagen Summit, 2009.	25%	3
4	CONTEMPORARY ENVIRONMENTAL ISSUES: Current Environmental Issues in India: Environmental issues related to water resource projects - Narmada dam, Tehri dam etc., Hydro-power projects in Jammu & Kashmir etc.. Water conservation-development of watersheds, Rain water harvesting and ground water recharge. National river conservation plan - Namami Gange and Yamuna Action Plan. Eutrophication and restoration of lakes. Conservation of wetlands, Ramsar sites in India. Climate change - adaptability, energy security, food security and sustainability. Wild life conservation projects: Project tiger, Project Elephant etc., Carbon sequestration and carbon credits. Waste Management – Swachha Bharat Abhiyan. Sustainable Habitat: Green Building,	15%	3

	GRIHA Rating Norms. Vehicular emission norms in India. Epidemiological Issues: Fluorosis, Arsenocosis, Goitre, Dengue. Environmental Disasters: Minnamata Disaster, Love Canal Disaster, Bhopal Gas Disaster, 1984		
5	CLIMATE RESILIENT CITY: Introduction to Climate Resilience – Understanding the need for cities to adapt to climate change. Impact of Climate Change on Cities – Urban heat islands, flooding, pollution, and infrastructure challenges. Sustainable Urban Planning – Role of green spaces, energy-efficient buildings, and smart city concepts. Green Infrastructure – Importance of urban forests, permeable surfaces, and nature-based solutions. Case Studies and Future Trends – Learning from cities like Singapore, Rotterdam, and Copenhagen.	20%	2

i. Text Book and Reference Book:

1. "Textbook of Environmental Studies for Undergraduate Courses" by Erach Bharucha.
2. "Basics of Environmental Studies" by U. K. Khare.
3. "Environmental Studies" by Anindita Basak.
4. "Environmental Sciences" by Daniel B. Botkin and Edward A. Keller.
5. "Air Pollution" by M. N. Rao and H. V. N. Rao.
6. "Environmental Engineering" by Howard S. Peavy, Donald R. Rowe, and George Tchobanoglous.

- a. **Course Name:** Privacy and Security in Online Social Media
- b. **Course Code:** 03M10002UE01
- c. **Prerequisite:** Basic knowledge of social media, privacy and security.
- d. **Rationale:** The course explores the fundamentals of Online Social Networks (OSNs), focusing on data collection, analysis, trust, security, and privacy.
- e. **Course Learning Objective:**

CLOBJ 1	Understand the concepts, architecture, and applications of Online Social Networks (OSNs) and their impact on society.
CLOBJ 2	Develop analytical skills to evaluate trust, reputation, privacy, and security issues in social networking platforms.
CLOBJ 3	Apply social media data collection, processing, and analysis techniques using APIs and analytical tools.
CLOBJ 4	Enhance awareness regarding cyber threats, phishing, misinformation, and ethical issues related to online social systems.
CLOBJ 5	Encourage research aptitude and critical thinking in emerging areas of social media analytics, security, and digital investigations.

f. Course Learning Outcomes:

CLO 1	Understand Online Social Networks and Data Collection – Explain the fundamentals of online social networks, data collection methods, and the challenges and opportunities associated with them.
CLO 2	Analyze Trust, Credibility, and Reputation in Social Systems – Evaluate the role of trust and reputation in online communities and develop strategies to detect misinformation and enhance credibility.
CLO 3	Examine Privacy and Security Risks in OSNs – Assess the impact of privacy disclosure, phishing, and fraudulent activities in social media and propose countermeasures.
CLO 4	Apply Data Collection and Analysis Techniques – Utilize social media APIs and data processing methods to extract, clean, and analyze information from online social networks.
CLO 5	Conduct Research on Emerging OSN Topics – Engage in discussions and research on social media security, privacy, and law enforcement applications, contributing to the field through case studies and research papers.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	0	3	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to Online Social Networks: Definition and Evolution of Online Social Networks (OSNs), Data Collection from Social Networks, Challenges, Opportunities, and Pitfalls in OSNs, Social Media APIs for Data Extraction.	20%	8
2	Data Collection and Analysis in OSNs Techniques for Collecting Data from Online Social Media, Ethical Considerations in Social Media Data Collection, Data Processing and Cleaning for Analysis, Case Studies on Social Media Data Collection.	20%	8
3	Trust, Credibility, and Reputation in Social Systems: Understanding Trust and Credibility in Online Communities, Reputation Systems and Their Impact on User Behavior, Detecting Misinformation and Fake News in OSNs, Methods for Enhancing Trustworthiness in Social Media.	20%	8
4	Security, Privacy, and Fraud Detection in OSNs: Online Social Media and Its Role in Law Enforcement & Policing, Information Privacy: Disclosure, Revelation, and Its Effects, Phishing Attacks in OSNs and Their Countermeasures, Identifying Fraudulent Entities and Fake Profiles in OSNs.	20%	8
4	Research and Practical Applications: Review and Discussion of Key Topics (Refresher), Analyzing Real-World OSN Case Studies, Research Paper Discussions on Online Social Networks and Security, Future Trends in OSN Security and privacy.	20%	8

i. Text Book and Reference Book:

1. Social Media Mining: An Introduction By Reza Zafarani, Mohammad Ali Abbasi, Huan Liu: Provides a comprehensive introduction to social media data mining, including machine learning and network analysis techniques.
2. Mining the Social Web By Matthew A. Russell: Covers data collection, analysis, and visualization techniques using Python and APIs from platforms like Twitter, Facebook, and LinkedIn.
3. Security and Privacy-Preserving Techniques in Social Networks By Barbara Carminati & Elena Ferrari Explores security challenges, privacy risks, and trust management in online social networks.

- a. **Course Name:** Design, Technology and Innovation
- b. **Course Code:** 03M10002UE02
- c. **Prerequisite:** Zeal to learn the subject.
- d. **Rationale:** Design, Technology, and Innovation (DT&I) subject's lies in equipping students with the skills to be creative problem-solvers and innovators in a rapidly evolving world. These subjects foster critical thinking, creative exploration, and the ability to translate ideas into tangible solutions, preparing students for future careers and societal challenges.
- e. **Course Learning Objective:**

CLOBJ 1	Introduce students to the principles and processes of design thinking for solving user-centered problems.
CLOBJ 2	Develop creative thinking, brainstorming, and ideation skills for innovative product and system design.
CLOBJ 3	Enable students to create and evaluate low-fidelity and high-fidelity prototypes while understanding fabrication constraints.
CLOBJ 4	Apply engineering concepts and technical knowledge in design, innovation, and problem-solving activities.
CLOBJ 5	Enhance students' visual communication skills through sketching, graphical representation, and design tools.
CLOBJ 6	Familiarize students with the basics of entrepreneurship, startup development, and innovation management.

f. Course Learning Outcomes:

CLO 1	Apply design thinking methodologies to identify and solve user-centered problems
CLO 2	Demonstrate creative thinking and effective ideation strategies.
CLO 3	Develop low-fidelity and high-fidelity prototypes and understand fabrication challenges.
CLO 4	Incorporate engineering principles into design and innovation. .
CLO 5	Communicate ideas visually through sketching and graphical tools.
CLO 6	Understand the fundamentals of entrepreneurship and the startup process.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	0	3	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Design Thinking and Methodologies: Introduction to Design Thinking: Understanding the design process, user needs, and problem definition. Design Process: Exploring different design	30%	12

	methodologies, including brainstorming, sketching, and prototyping. Human and Culture Centered Design: Focusing on user needs, ergonomics, and user experience. Design for Social and Life style change. Concept Generation and Evaluation: Developing and evaluating design concepts through various techniques.		
2	Technology and its Role in Design: Technology for Design: Exploring how technology enables and enhances the design process. Specific Technologies: Relevant areas like CAD and Graphics software, 3D printing, Machining technologies, digital fabrication, and other relevant technology. Innovation in Emerging Technologies and methods like AR/VR, IOT, AI and ML, Supply Chain Management and Project Management. Technology to Solution: Understanding how technology can be leveraged to solve real-world problems. Engineering Aspect of design Electrical, Mechanical, Design, Material, Aspect, Safety and Reliability aspect, Sustainable and Eco friendly materials.	35%	16
3	Innovation and Entrepreneurship: Introduction to Innovation: Understanding the principles of innovation and its role in product development. Role of Innovation in Life and Society Grassroots Innovation: Learning from innovative solutions developed at the community level. Collaborative Innovation: Exploring how different individuals and teams can collaborate to drive innovation. Intellectual Property: Learning about patents, copyrights, and other forms of intellectual property. Business Model Development: Exploring how to develop a business model for a new product or service. Entrepreneurship: Fundamentals of starting a business and the challenges and opportunities of entrepreneurship.	35%	16

i. Text Book and Reference Book:

1. "Design Thinking for Strategic Innovation" by Idris Mootee."
2. "Product Design and Development" by Karl T. Ulrich and Steven D. Eppinger
3. "The Design of Everyday Things" by Don Norman.
4. "Sketching: Drawing Techniques for Product Designers" by Koos Eissen and Roselien Steur.
5. "Innovation and Entrepreneurship" by Peter F. Drucker.
6. "The Lean Startup" by Eric Ries.
7. "Universal Principles of Design" by William Lidwell, Kritina Holden, and Jill Butler.

- a. **Course Name:** Workshop and Manufacturing Practices
 b. **Course Code:** 03010902PC01
 c. **Prerequisite:** Basics of Physics
 d. **Rationale:** This subject provides essential skills in precision measurement, introduces key manufacturing processes, and builds a strong foundation in engineering materials. It enables students to select appropriate tools, processes, and materials for efficient and high-quality engineering applications.
 e. **Course Learning Objective:**

CLOBJ 1	Understand workshop safety rules, precautions, and safe working practices.
CLOBJ 2	Identify and select appropriate tools and equipment for various workshop operations.
CLOBJ 3	Understand different manufacturing processes and their applications for specific jobs.
CLOBJ 4	Develop practical skills for preparing jobs using different manufacturing techniques.
CLOBJ 5	Understand the properties, characteristics, and applications of engineering materials.
CLOBJ 6	Understand the properties, characteristics, and applications of engineering materials.

f. **Course Learning Outcomes:**

CLO 1	Comprehend the safety measures required to be taken while working in workshop.
CLO 2	Select the appropriate tools required for specific operation.
CLO 3	Select appropriate manufacturing process for a specific job.
CLO 4	Prepare the Job by using different manufacturing technique.
CLO 5	Comprehend the properties and characteristic of engineering materials.
CLO 6	Interface Conventional Manufacturing with Internet of Things.

g. **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	4	3			50		50	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. **Course Content:**

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to Measuring Instruments Classification of Measuring instruments, Introduction to measurement units and its standards. Demonstration of various measuring instruments viz. Scale, Vernier caliper, micrometer, filler gauge, wire gauge, slip gauge and bevel protractor.	15%	2
2	Introduction to Manufacturing Processes Classification of Manufacturing Process, Criteria for selection of	50%	8

	suitable manufacturing Process, Overview of Machining, Overview of Metal Forming, Overview of Joining, Overview of Casting Processes.		
3	Engineering Materials Classification of Engineering Materials, Engineering requirements of materials, Criterion for selection of materials for engineering applications through Structure-Properties, Performance correlation ship. Crystallography.	35%	5

i. Text Book and Reference Book:

1. Material Science and Engineering, By William D. Callister Jr; Wiley India
2. Fundamentals of machining and machine tools, By Boothroyd; CRC Publication
3. Metrology and Measurement, By Anand Bewoor & Vinay Kulkarni; McGraw-Hill
4. Engineering Metrology and Measurement, By N V Raghavendra and Krishnamurthy; Oxford University Press
5. Production Technology (Volume I & II) By O. P. Khanna & Lal; O. P. Khanna & Lal
6. Internet of Things (A Hands-on-Approach) By Vijay Madiseti and Arshdeep Bahga,; VPT