First Year Curriculum

Admission Year 2026-27

Bachelor of Technology
Civil Engineering

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 1

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 Fraction, Engineering Scales, Dimensioning Terms and Notations, Types of Lines used in Engineering. Practice recommended by BIS.	10	5
2	**Engineering Curves** Classification of Engineering Curves, Application of Engineering Curves, Constructions of Engineering Curves - Conics, Spirals, Involutes 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	20	10

	Development and Radial Line Development, Applications of Development of Surfaces.		
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:** 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	Recognize and recall fundamental principles and organizations of computers, demonstrating a foundational understanding of computer architecture and design.
CLOBJ 2	Comprehend the concepts of computer programming languages, illustrating a grasp of syntax, semantics, and the essential components of programming languages.
CLOBJ 3	Develop algorithms for solving basic engineering problems, demonstrating the ability to apply theoretical knowledge to practical problem-solving scenarios.
CLOBJ 4	Demonstrate proficiency in the practical application of C programming by writing, compiling, and debugging programs, showcasing the ability to implement and troubleshoot code effectively.
CLOBJ 5	Evaluate and analyse complex computational programs written in C, demonstrating the capacity to assess and understand intricate solutions to computational challenges.
CLOBJ 6	Develop simple projects using the C programming language, showcasing creativity and application of learned principles to produce functional and practical software solutions.

f. **Course Learning Outcomes:**

CLO 1	Demonstrate basic knowledge of computer hardware and software.
CLO 2	Describe problem-solving and logical skills in programming with C and other languages.
CLO 3	Describe decision-making and looping constructs to solve real-time problems.
CLO 4	Discuss the concept of functions for adaptive programming.
CLO 5	Use the comparisons and limitations of the various programming constructs and choose the right one for the task.

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 and formatted output functions.	10	8
2	**Constants, Variables, Data Types, Operators and Expressions:** Character Set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of Variables, Assigning values to variables, typedef, Defining symbolic constants, Introduction to operators and its types, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Operator precedence and associativity.	15	5
3	**Control Structures in C:** Decision making with If & If..Else statements, Nested If..Else ladder, Switch statement, break statement, goto statements, ternary (?:) operator, while statement, do..while loop, for loop, Jump within loops, Programs.	15	4
4	**Arrays and Strings:** Introduction to arrays, One-dimensional array, Two-dimensional array, Concept of multidimensional arrays, String declaration, storage, Built-in string functions.	20	7
5	**User-Defined Functions, Structure and Unions:** Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function, Macros, Pre-processing, Structure definition, Declaring and initializing structure variables, Accessing structure members, Copying & comparison of structures, Arrays of structures, Arrays	20	10

	within structures, Structures within structures, Structures and functions, Unions.		
6	**Pointers, Dynamic Memory Allocation and File Management in C:** Basics of pointers, Pointer to pointer, Pointer and array, Pointer to array, Array of pointers, Functions returning pointers, Introduction to dynamic memory allocation, malloc(), calloc(), free(), realloc(), Introduction and standard file handling functions.	20	8

i. List of Practical:

Sr. No.	**Content**
1	Practical Set 1 (Basics) 1. Write a program to print HELLO FRIENDS! 2. Write a program that reads two nos. from key board and gives their addition, subtraction, multiplication, division and modulo. 3. Write a program to calculate area of circle, use Ω as symbolic constants. 4. Write a program to convert days into months and days. 5. Write a program which calculates the summation of three digits from the given 3-digit number. 6. Write a program to demonstrate enumerates data type. 7. Write a program to compute Fahrenheit from centigrade. 8. Write a program to calculate simple interest. 9. Read the price of item in decimal form e.g. 12.50 and separate Rs and Paise from the given value e.g. 12 rupees and 50 paise.
2	Practical Set 2 (Control Structures) 1. Write a program to find the largest of the three nos. using Nested-If-Else statement. 2. Write a C program to enter a character and to check whether it is a small letter or it is a capital letter or it is a digit or it is a special symbol. 3. Write a program to read marks from keyboard and your program should display equivalent grade according to following table. Marks Grade 100-80 Dist 60-79 First Class 3 5-59 Second Class 0-34 Fail 1. Write a program to read marks of a student from keyboard whether the student id pass (if). 2. Write a program to find the sum of first N odd numbers. 3. Write a program using while loop construct which finds the factorial of a given integer number. 4. Write a C program using do…while and for loop constructs to reverse the digits of the number. 5. Write a program to demonstrate use of Switch- Break Statement. 6. Write a program to find out all the numbers divisible by 5 and 7 between 1 to 100. Check for Armstrong number. A number is Armstrong if sum of cube of every digit is same as the original number. E.g. 153=13+53+33=153 1. Write a program to print the output of bellow series. 1!+2!+3!+4!+. ..... n! 2. Write a program to print the following outputs using for Loop. (a) 1

	(b) * 12 ** 123 *** 1. Write a program to print the following outputs using for Loop. (a) 1 (b) 321 21 21 321 1
3	Practical Set 3 (Array & Strings) 1. Write a program which sorts 10 numbers into ascending order. 2. Write a program to find maximum element from 1-D array. 3. Write a program to find number of odd and even elements from the 1-D array. 4. Write a program add two 2x2 matrices. 5. Write a program to count number of positive, negative and zero elements from 3x3 matrix. 6. Write a function for the following operations on string: Copy one string to another Comparing two strings Adding a string to the end of another. 1. Write a program to count vowels from a entered String. 2. Write a program which finds whether a string is a palindrome or not.
4	Practical Set 4 (Functions) 1. Write a program to find factorial of a number using recursion. 2. Write a program that used user defined function Swap ( ) and interchange the value of two variable. 3. Write a function to return 1 if the number is prime otherwise return 0.
5	Practical Set 5 (Structures) 1. Define a structure type, personal that would contain person name, date of joining and salary. 2. Define a structure called cricket that will describe the following information: Player name Team name Batting average
6	Practical Set 6 (Pointers) 1. Write a program to add two numbers using pointers. 2. Write a program to swap two numbers using pointer
7	Practical Set 7 (File Management) 1. Write a program to illustrate reading files contents. 2. Write a program to illustrate the use of fgets( ).

j. Text Book and Reference Book:

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

a. **Course Name:** Linear Algebra and Calculus
b. **Course Code:** 03019101BS02
c. **Prerequisite:** Knowledge of Mathematics up to 12th science level.
d. **Rationale:** The Mathematics I syllabus integrates fundamental calculus concepts, advanced mathematical techniques, and matrix algebra, preparing students for engineering challenges with optimized problem-solving skills.
e. **Course Learning Objective:**

CLOBJ 1	Develop a comprehensive understanding of definite and improper integrals, including the application of integration techniques to find areas and volumes in both Cartesian and Polar coordinates.
CLOBJ 2	Utilize differential equations to model and solve practical scenarios, demonstrating proficiency in various solution techniques.
CLOBJ 3	Analyse the convergence and divergence of sequences and series, employing tests such as the Alternating Series Test and Ratio Test
CLOBJ 4	Analyse matrix operations and determinants, exploring their properties and applications in solving systems of linear equations.
CLOBJ 5	Apply Fourier series for representing periodic functions, verifying Dirichlet's conditions.
CLOBJ 6	Solve optimization problems using multivariable calculus concepts, such as Lagrange's multiplier.

f. **Course Learning Outcomes:**

CLO 1	Solve system of linear equations using Row-Echelon and Reduced Row Echelon form of a matrix.
CLO 2	Analyze various properties and forms of a matrix using its Eigen values and Eigen vectors.
CLO 3	Interpret the convergence of infinite sequence and series using various results and tests.
CLO 4	discuss various properties such as limit, continuity, partial differentiability and applications of multivariate functions
CLO 5	Formulate mathematical model based on first order differential equations.
CLO 6	Evaluate area and volume using definite integrals and improper integrals

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:** 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 differential equations, Integrating factor-function of x only and functions of y only, Linear and nonlinear differential equations, **Applications:** Newton's Law of cooling, Growth model and RL-Circuit and RC-Circuit	20	12
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. Calculus and Analytic Geometry (Text Book) By G.B.Thomas and R.L.Finney | Addison Wesley.
2. Calculus with early transcendental functions By James Stewart| Cengage Learning.
3. Higher Engineering Mathematics By B.S.Grewal | Khanna Publications.
4. Elementary Linear Algebra (Text Book) By Howard Anton, Chris Rorres|Willy India Edition|9th Edition.
5. Advanced Engineering Mathematics (TextBook) By Erwin Kreyszig | Willey India 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 12thscience level.
d. **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.

e. **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.

f. **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.E**. -Continuous Evaluation

g. **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	**20**	**9**

	law, Phonons, Modes of heat transfer, Specific heat of solids, Einstein and Debye Model.		
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**

h. List of Practical:

Sr. No.	Content
1	Determination of Velocity of ultrasonic waves in water.
2	Determination of Dielectric constants of Dielectric samples.
3	Measurement of Band gap of semiconductor material.
4	Measurement of Hall coefficient R_H and carrier concentration in a semiconductor.
5	Measurement of Planck's constant using LED.
6	Measurement of wavelength of laser light using diffraction grating.
7	Measurement of Numerical aperture of an optical Fiber.
8	Moment of Inertia of a flywheel.
9	Measurement of power loss in an optical fibre.
10	Determination of particle size by diffraction of light

i. Text Book and Reference Book:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Engineering Physics — HK Malek and A.K.Singh- Mc Graw Hill Publication
3. An Introduction to Mechanics — D Kleppner& R Kolenkow
4. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
5. Mechanical Vibrations — JP Den Hartog

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	Identify and explain parts of speech, punctuation marks, tenses, phrases, clauses, determiners, Quantifiers, sentence structures, and basic IPA phonetic symbols for accurate language use.
CLO 2	Demonstrate effective basic conversational exchanges and short extempore speeches using correct pronunciation, appropriate greetings, logical organization of ideas, and improved fluency.
CLO 3	Apply basic reading and listening strategies to comprehend short passages and spoken texts, recognizing appropriate pronunciation, stress, and intonation patterns.
CLO 4	Analyse personal communication performance and evaluate SMARTER goals through self-assessment and reflective practices to monitor language and pronunciation improvement.
CLO 5	Compose structured short picture-based perceptions by developing clear topic sentences, supporting details, and coherent conclusions with grammatical accuracy.

g. **Teaching & Examination Scheme:**

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

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h. Course Content:

Lab (Practical)

Sr. No.	Content	Weightage %	Teaching Hours
1	Parts of Speech, Punctuation and Tenses using time line • Overview of 8 parts of speech • Basic punctuation marks and their usage • Types: Present, Past, Future • Forms and correct usage • Common tense errors	10	4
2	Introduction to Phonetics-Symbols and Pronunciation • Introduction to Phonetics and IPA • English Speech Sounds • Stress and Intonation	10	4
3	Phrase and Clauses; Types of Sentence (Structure Wise) • Difference between phrases and clauses • Classification of Simple, Compound & Complex • Interchange of Simple to Compound, Simple to Complex, Compound to Complex	8	2
4	Picture Perception • Observing and interpreting images • Building a short story or description • Improving vocabulary and creativity	14	4
5	Determiners and Quantifiers • Types of determiners • Order of determiners in a sentence • Quantifiers with countable and uncountable nouns • Common errors in the use of determiners and Quantifiers	8	2
6	Meeting and Greeting (Initiating a conversation) • Basic conversation skill • Formal and informal greetings • Common phrases for starting interactions	10	4

7	Reading Comprehension (Level of difficulty-Basic) • Types – Skimming & Scanning • Reading short passages • Identifying main ideas and details • Answering basic questions	10	2
8	Listening Comprehension • 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	12	4
10	Goal Setting and Tracking • Setting SMARTER goals • Planning and tracking progress • Self-assessment and reflection	10	2

i. Text Book and Reference Book:

1. Murphy, Raymond. English Grammar in Use. Cambridge University Press, 2019.
2. Swan, Michael. Practical English Usage. Oxford University Press, 2016.
3. Lewis, Norman. Word Power Made Easy. Goyal Publishers, 2014.
4. Raman, Meenakshi, and Sangeeta Sharma. Communication Skills. Oxford University Press, 2017.
5. Kaul, Asha. Business Communication. PHI Learning, 2014.
6. Lucas, Stephen E. The Art of Public Speaking. McGraw-Hill Education, 2015.
7. Bailey, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2018.
8. Balasubramaniam, T. A Textbook of English Phonetics for Indian Students. Macmillan Publishers, 2012

a. **Course Name:** Surveying-I
b. **Course Code:** 03010401PC01
c. **Prerequisite:** Knowledge of basic concepts of Civil Engineering.
d. **Rationale:** Basic surveying knowledge is essential for Civil Engineers.
e. **Course Learning Objective:**

CLOBJ 1	Gain familiarity with types of survey, surveying instruments, area and levels measurements, can measure reduce levels.
CLOBJ 2	Solve problems related to compass traverse, theodolite traverse, dumpy levelling, and contouring survey, execute levelling of field.
CLOBJ 3	Acquire knowledge of the road, canal, channels curvature, establishment of center line for execute the survey by curves and elevation different methods.
CLOBJ 4	Understand different field areas and volume of field, regular irregular shape area can be measure by different methods and with planimeter like instrument.
CLOBJ 5	Demonstrate a clear understanding of the basic concepts, working principles and applications of remote sensing, GPS, GIS software and field applications.

f. **Course Learning Outcomes:**

CLO 1	Apply the principles and procedures of theodolite and control surveys for precise measurement and mapping.
CLO 2	Determine elevations for topographic analysis and construction planning using contour maps
CLO 3	Compute areas and volumes of landforms using surveying data for civil engineering applications.
CLO 4	Apply techniques for setting out horizontal curves in fieldwork.
CLO 5	Utilize GPS and remote sensing technologies in modern surveying practices and infrastructure planning.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**4**	**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:** Role of Civil Engineer in Surveying, Definition, Basic measurements, Scale and Mapping, Types of Plans, Maps and their uses, Topographical Map study, Fundamental Principles of Surveying, Classification of Surveying, Locating position and topographic detail.	15	3
2	**Conventional Instruments:** Methods of Linear measurements – Chain and Tapes, Optical Distance Measurement (ODM-only definition), Types of compass, Parts and Operation of Theodolite, Dumpy level & Auto level, Conventional symbols.	15	6
3	**Angular Measurements:** Concept of Meridian, Bearing, Declination, Dip and Direction, Compass traversing, Measurement of Horizontal & Vertical Angles, Method of Repetition, Method of Reiteration, Balancing the traverse, Gale's Traverse Table.	20	10
4	**Levelling and Contour:** Definitions, Aim & Application, Principle of levelling, Methods of levelling, About Equipment, Instrument adjustment, Different types of Levelling, Recording observations in level-book, Computing reduced levels by HI and rise & fall method, Contouring and Characteristics of the Contours of different terrains and the application of Contour maps, Methods of Contouring.	20	10
5	**Computation of Areas and Volumes:** Methods to compute the area of the traverse, Determining areas from Plans, Trapezoidal rule, Simpson's rule, Computation of Volumes, Volume from cross sections, Trapezoidal and Prismoidal formulae, Prismoidal correction, Curvature correction.	10	8
6	**Hydrographic Surveying:** Methods of Hydrographic surveying, MSL, Different gauges, Sounding, Locating of sounding, River surveying.	10	4
7	**Construction Surveying:** Horizontal and Vertical Control, Positioning of a structure, Setting out works – Building, Culverts, Bridge, Slope of earth work, Tunnel Surveys.	10	4

i. List of Practical's:

Sr. No.	Content
1	Introduction of Various Basic Conventional Surveying Equipment.
2	Study of various types of Topographical maps and Conventional symbols used in a sketch book.
3	Introduction to Total Station
4	Measurement of Horizontal angles by Total Station (Method of Repetition, Method of Reiteration)
5	Measurement of Vertical Angles by Total Station (Angle of Elevation, Angle of Depression)
6	Total station traversing by included angle method – Gales Traverse Table.
7	Introduction of Levelling Equipment - levelling with the help of Dumpy & Auto level & Staff
8	Exercise on Contouring – Contour Project
9	Introduction of Area Measuring Equipment – Plannimeter (Mechanical and Digital), Evaluation of the Area of a map with an irregular boundary

j. Text Book and Reference Book:

1. Surveying Vol.I (Text Book). By Dr. B.C. Punmia, Ashokkumar Jain, Arunkumar Jain| Laxmi Publication| 16thEdition
2. Surveying and Leveling (Text Book). By R. Subramanian | Oxford University
3. Surveying Vol.I. By S.K. Duggal | Tata McGrawHill Publication NewDelhi
4. Surveying and Levelling Vol.I. By Arora K.R| Standard Publications, Delhi

a. **Course Name:** Student Induction Program with Essence of Indian Knowledge System
b. **Course Code:** 03010001MC01
c. **Prerequisite:** Basic understanding of school-level Mathematics, Science, Communication, and Computer fundamentals
d. **Rationale:** The course is designed to support newly admitted engineering students in adapting to the academic environment of higher education while developing foundational skills in Mathematics, Communication, Computing, and Physics. It also introduces students to the Essence of Indian Knowledge System (IKS), ethical values, healthy lifestyle practices, innovation, and interdisciplinary learning to promote holistic personality development, critical thinking, and lifelong learning abilities.

e. **Course Learning Objective:**

CLOBJ 1	To develop foundational understanding of Mathematics, Communication Skills, Computer Science, and Physics through activity-based learning approaches.
CLOBJ 2	To enhance students' analytical, logical, problem-solving, and critical-thinking abilities required for engineering education.
CLOBJ 3	To improve verbal, written, listening, and interpersonal communication skills for effective academic and professional interaction.
CLOBJ 4	To introduce students to emerging technologies, computational thinking, and the contributions of the Indian Knowledge System in science and engineering.
CLOBJ 5	To cultivate ethical values, healthy lifestyle practices, teamwork, self-discipline, and lifelong learning attitude for holistic personality development.

f. **Course Learning Outcomes:**

CLO 1	Apply fundamental concepts of Mathematics and basic scientific principles to solve simple engineering-related problems.
CLO 2	Demonstrate effective communication skills through proper grammar usage, speaking, listening, and presentation activities.
CLO 3	Explain the basic architecture of computers, emerging technologies, and the significance of Indian contributions to computing and knowledge systems.
CLO 4	Perform basic experimental observations and interpret concepts related to Physics, measurements, optics, and electromagnetics.
CLO 5	Exhibit teamwork, ethical values, critical thinking, and lifelong learning attitude through interdisciplinary and activity-based learning practices.

g. **Teaching & Examination Scheme:**

Teaching Scheme	**Evaluation Scheme**

L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	0	0	0	0	0	0	50	0	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	**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 Tangrams	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 Inovations	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	25	12

	Indian Knowledge System in Context of Computing: Historical Contributions of Indian Scholars to Mathematics and Computing, Algorithms in Ancient Indian Texts, 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.		
4	**Activities of Physics** Measurement, Electrostatics, Electromegnetics, Optics, Leaser and Fiber Optics, Vedic Physics and Cosmology	**25**	**12**

i. Text Book and Reference Book:

1. Indian Knowledge System by All India Council for Technical Education
   – Recommended AICTE textbook for IKS integration in engineering education.
2. Indian Knowledge Systems by B. Mahadevan
   – Covers Indian scientific heritage, ethics, logic, and traditional knowledge systems.

Semester 2

a. **Course Name:** Surveying-II
b. **Course Code:** 03010402PC01
c. **Prerequisite:** Knowledge of basic concepts of Civil Engineering.
d. **Rationale:** Basic surveying knowledge is essential for Civil Engineers.
e. **Course Learning Objective:**

CLOBJ 1	Gain familiarity with types of survey, surveying instruments, area and levels measurements, can measure reduce levels.
CLOBJ 2	Solve problems related to compass traverse, theodolite traverse, dumpy levelling, and contouring survey, execute levelling of field.
CLOBJ 3	Acquire knowledge of the road, canal, channels curvature, establishment of center line for execute the survey by curves and elevation different methods.
CLOBJ 4	Understand different field areas and volume of field, regular irregular shape area can be measure by different methods and with planimeter like instrument.
CLOBJ 5	Demonstrate a clear understanding of the basic concepts, working principles and applications of remote sensing, GPS, GIS software and field applications.

f. **Course Learning Outcomes:**

CLO 1	Apply the principles and procedures of theodolite and control surveys for precise measurement and mapping.
CLO 2	Determine elevations for topographic analysis and construction planning using contour maps
CLO 3	Compute areas and volumes of landforms using surveying data for civil engineering applications.
CLO 4	Apply techniques for setting out horizontal curves in fieldwork.
CLO 5	Utilize GPS and remote sensing technologies in modern surveying practices and infrastructure planning.

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	**Tacheometric Survey** Purpose, Principles of Tacheometry, Different methods of Tacheometry, Various instruments, stadia constants, field work in Tacheometry, Calculation of distance and elevation for staff vertical.	**10**	**6**
2	**Control Survey** Indirect levelling, levelling on steep ground- methods, Measuring heights and distances by keeping instrument axes at the same level and instrument axes at different levels.	**15**	**6**
3	**Geodetic Surveying** Principles, Classification of triangulation systems, Selection of stations, Signals and towers, Baseline measurement and correction, Extension of base, base net, Satellite station.	**15**	**6**
4	**Curve Surveying** Introduction, classification of curves, Methods of setting out of the simple circular curves, elements of the compound and reverse curves, transition curves, types of transition curves, combined curves, and vertical curves.	**15**	**10**
5	**Photogrammetric Surveying** Introduction, principle, uses Aerial camera, aerial photographs Definitions, scale of vertical and tilted photograph Ground coordinates, ground control, examples on scale, Displacements and errors, Examples on Displacement and errors, Procedure of aerial survey, Examples on flight planning, Photomaps and mosaics—difference between Mosaic & Map, Stereoscopes, Relief displacement, Parallax bar, Photographic interpretation.	**15**	**6**
6	**Modern Surveying Instruments** Introduction to EDM & Laser Distance Meter, Digital Theodolite, Digital Automatic Level, Differential GPS, Drone Light Detection And Ranging (LIDAR) survey, Digital Planimeter, Total Station.	**15**	**4**
7	**Geospatial Technologies**	**15**	**4**

	Introduction to Global Positioning System (GPS), Geographical Information System (GIS), And Remote Sensing. Application of GPS, GIS & RS in Civil engineering.		

i. List of Practical's:

Sr. No.	Content
1	Historical study report on "The Great Triangulation Survey of India" and "The Great Arc Survey of Mt. Everest."
2	Introduction to Tacheometric survey
3	Determination Tacheometric Constant K & C.
4	Tacheometric Levelling with Theodolite Case I & II
5	Introduction to Trigonometric Levelling
6	Determination of the elevation of any object by methods of Trigonometric Levelling.
7	Setting out of circular Curve by Rankine (Deflection Angle) Method
8	Practice of Relief displacement by Stereoscope and parallax bar use in photogrammetry.
9	Demonstration of EDM and its uses
10	Demonstration of the total station and its uses
11	Demonstration of GPS and its uses
12	Demonstration on GIS and its uses
13	Demonstration on Remote Sensing and its uses

j. Text Book and Reference Book:

1. Surveying Vol.I (Text Book). By Dr. B.C. Punmia, Ashokkumar Jain, Arunkumar Jain| Laxmi Publication| 16thEdition
2. Surveying and Leveling (Text Book). By R. Subramanian | Oxford University
3. Surveying Vol.I. By S.K. Duggal | Tata McGrawHill Publication NewDelhi
4. Surveying and Levelling Vol.I. By Arora K.R| Standard Publications, Delhi

a. **Course Name:** Basics of Civil Engineering
b. **Course Code:** 03010402ES02
c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12th science level
d. **Rationale:** Basic Civil Engineering knowledge is fundamental as it provides a strong foundation for various engineering disciplines, promotes problem-solving skills, supports innovation, and opens doors to diverse career opportunities.
e. **Course Learning Objective:**

CLOBJ 1	Understand the scope and significance of Civil Engineering and explain the role of civil engineers in infrastructure development and nation building.
CLOBJ 2	Identify and describe various building components such as doors, windows, staircases, floors, and roofs along with their functions, types, and suitability in construction.
CLOBJ 3	Recognize and evaluate common civil engineering materials including cement, concrete, steel, bricks, timber, aggregates, bitumen, smart materials, and FRP based on their properties and applications.
CLOBJ 4	Explain fundamental building construction practices and building services including brick bonds, building layouts, plumbing, sanitation, water supply, electrical systems, HVAC, and drainage systems.
CLOBJ 5	Develop awareness about modern advancements in Civil Engineering such as smart cities, green buildings, rainwater harvesting, solid waste management, metro systems, watershed management, and conservation of heritage structures.
CLOBJ 6	Apply basic civil engineering concepts for sustainable infrastructure development considering environmental, societal, and technological aspects.

f. **Course Learning Outcomes:**

CLO 1	Explain the scope, branches, and importance of Civil Engineering in infrastructure development and society.
CLO 2	Identify and describe various building components such as doors, windows, staircases, floors, and roofs used in construction.
CLO 3	Illustrate the properties, types, and applications of common civil engineering materials used in building works.
CLO 4	Explain basic building construction methods, building layouts, symbols, and building services including plumbing, sanitation, water supply, drainage, and HVAC systems.
CLO 5	Discuss recent advancements and sustainable practices in Civil Engineering including smart cities, green buildings, rainwater harvesting, solid waste management, and mass transportation systems.

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 and Scope of Civil Engineering Branches of Civil Engineering, Functions and role of a Civil Engineer in society, Impact of Infrastructure Development on the Economy of a Country.	10	4
2	Building Components Doors, Windows, Stairs and Staircases, Floorings, Roofs and Roof Coverings, Types, Construction and Suitability.	30	12
3	Civil Engineering Materials Cement, Aggregate, Brick, Steel, Concrete, Stone, Soil, Mortar, Timber, Plastic, Epoxy, Fly ash, Bitumen, Pipe, Wire, Cable, Smart materials, FRP.	20	8
4	Building Construction and Building Services Types of building, Components of building, Brick bonds, Building layout, Symbols used in electrical, plumbing and sanitation works, Building services including water supply, drainage, electricity, HVAC.	20	8
5	Advancements in Civil Engineering Smart city, Solid waste management, BRTS, Metro, Rainwater harvesting, Watershed Management, River front development, Heritage conservation, Nanomaterials, Green Buildings.	20	8

i. List of Practical's:

Sr. No.	Content
1	Unit conversion exercise
2	Collection of rates and samples (field visit)
3	Components of building (field visit)

4	Chart preparation of Doors and Windows
5	Chart preparation of Stairs
6	Chart preparation of Floorings
7	Chart preparation of Roofs and Roof Coverings
8	Presentation on BRTS / mass transportation system (city bus)
9	Presentation on Heritage buildings
10	Presentation on green buildings

j. Text Book and Reference Book:

1. Basic Civil engineering By S S Bhavikatti | The New Age Concept of Intellectual Property Rights in Australia
2. Building Construction By P.C Varghese, Prentice-Hall of India
3. Elements of Civil Engineering By Dr. R.K. Jain and Dr. P.P. Lodha | McGraw Hill Education India Pvt. Ltd.

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:** Basic knowledge of the environment is essential for all human beings for a good life and sustainability.
e. **Course Learning Objective:**

CLOBJ 1	Apply systems thinking to analyse the city as a system, demonstrating application
CLOBJ 2	Evaluate the role of smart citizens and approaches for citizen engagement
CLOBJ 3	Identify sources and stressors of water resources, demonstrating understanding
CLOBJ 4	Analyse the causes, effects, and control measures of population explosion

f. **Course Learning Outcomes:**

CLO 1	Explain the relationship between environmental health, ecology, and quality of life with reference to sustainable development.
CLO 2	Evaluate methods for pollution prevention and control considering various sources of pollution.
CLO 3	Assess the impacts of population growth on natural resources and environmental sustainability.
CLO 4	Examine recent technological and policy developments addressing various global environmental challenges.
CLO 5	Discuss the concept of smart cities and use of sustainable engineering solutions for 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**	**Audit**	**-**	**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, Measurement techniques and standards for air and water quality, Pollution control devices and methods, Criteria air pollutants, Noise indices, Wastewater treatment, 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 & Control) Rules, 2000, Environmental Conventions and Agreements including 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 such as Narmada Dam and Tehri Dam, Hydro-power projects in Jammu &	15	3

	Kashmir, Water conservation, Development of watersheds, Rain water harvesting and groundwater recharge, National River Conservation Plan – Namami Gange and Yamuna Action Plan, Eutrophication and restoration of lakes, Conservation of wetlands and Ramsar sites in India, Climate change – adaptability, energy security, food security and sustainability, Wildlife conservation projects such as Project Tiger and Project Elephant, Carbon sequestration and carbon credits, Waste Management – Swachha Bharat Abhiyan, Sustainable Habitat – Green Building and GRIHA Rating Norms, Vehicular emission norms in India, Epidemiological issues including Fluorosis, Arsenocosis, Goitre and Dengue, Environmental Disasters such as Minamata Disaster, Love Canal Disaster and 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 (TextBook) By Dr Erach Bharucha | Orient BlackSwan | Second Edition, Pub. Year 2013
2. Basics of Environmental Studies By U K Khare | Tata McGraw Hill.
3. Environmental Studies By Anindita Basak | Drling Kindersley (India)Pvt. Ltd Pearson
4. Environmental Sciences By Daniel B Botkin & Edward A Keller | John Wiley & Sons
5. Air Pollution By M N Rao, H .V N Rao | McGraw Hill Publishing Company Limited, New Delhi.

a. **Course Name:** Mechanics of Solids
b. **Course Code:** 03010402ES01
c. **Prerequisite:** System of units, Laws of motion, Basic idea of force, Concept of centroid Fundamentals of stress, strain and their relationships.
d. **Rationale:** Mechanics of Solids is conceptual applications of principles of mechanics in Engineering.
e. **Course Learning Objective:**

CLOBJ 1	Comprehend the concepts of stress, strain, and deformation in solid materials under various loading conditions, and apply this understanding to analyse structural behaviour.
CLOBJ 2	Gain insight into the mechanical properties of materials such as elasticity, plasticity, and failure mechanisms, and their implications in designing resilient and safe structures.
CLOBJ 3	Analyse structural components, including beams, columns, and trusses, under different loading scenarios using principles of mechanics of solids, determining stresses, and deformations.
CLOBJ 4	Develop proficiency in constructing shear force and bending moment diagrams to understand internal forces and moments in structural elements, crucial for design and analysis.
CLOBJ 5	Calculate deflections and assess stability criteria for structural elements, recognizing critical conditions that impact structural integrity and safety.
CLOBJ 6	Apply principles of mechanics of solids to design structural elements, ensuring they meet safety standards, considering factors such as material selection, loading conditions, and design codes.

f. **Course Learning Outcomes:**

CLO 1	Explain the fundamental concepts of mechanics including force systems, equilibrium, and free-body diagrams
CLO 2	Apply the principles of centroid and moment of inertia for various geometrical sections in structural analysis.
CLO 3	Analyze shear force and bending moment in beams subjected to various loading conditions.
CLO 4	Apply the principles of friction to solve engineering problems involving ladders, wedges, and belts.
CLO 5	Calculate stresses and strains in axially loaded members using the concepts of elasticity and deformation.

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 and 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 and axes, Non-coplanar Non-concurrent forces.	15	6
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 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, Hooke'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.	30	12
4	**Beams:** Types of beam, Types of load, Types of support,	30	12

	Reactions, Shear Forces and Bending Moments and relationship between them, Shear force and bending moment diagrams, Point of contra-flexure, 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.		
5	**Friction:** Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Analysis of systems involving dry frictions such as ladders and spheres, Belt Friction, Analysis of flat and V-belt.	10	4

i. List of practical's:

Sr. No.	Content
1	Equilibrium of Coplanar-Concurrent force system (Law of Parallelogram of forces) Law of Parallelogram of forces
2	Equilibrium of Coplanar-Concurrent force system (Law of Polygon of forces) Law of Polygon of forces
3	Verification of the principle of moment by the Bell-Crank Lever Apparatus Bell-Crank Lever
4	Determination of the centre of gravity for different shapes of plates Centre of Gravity
5	Brinell and Rockwell Hardness Test Brinell and Rockwell Hardness Test
6	Compression test on timber UTM
7	Flexural test on Timber UTM
8	Tensile test on mild steel UTM
9	Equilibrium of a parallel force system - Simply Supported Beam Deflection of Beam
10	Determination of the co-efficient of static friction Friction Apparatus

j. Text Book and Reference Book:

1. Statics and Dynamics Beer, F.P. and Johnston, E.R. Vector mechanics for engineers; Tata McGraw-Hill.
2. Engineering Mechanics: Statics and Dynamics J.A Desai and B.B Mistry; Popular Prakashan.
3. Engineering Mechanics: Statics and Dynamics R.C Hibbeler; Prentice Hall of India.
4. Engineering Mechanics: Statics and Dynamics S Rajsekaran; Vikas Publication.
5. Engineering Mechanics S.S. Bhavikatti and K. G. Rajashekarappa; Wiley 'Eastern Ltd.
6. Engineering Mechanics J.L. Meriam, and L.G.Kraige; John Wiley and sons, New York

a. **Course Name:** Differential Equations and Vector Calculus
b. **Course Code:** 03019102BS02
c. **Prerequisite:** Differential Calculus, Integral Calculus, Vector Algebra, Differential Equations
d. **Rationale:** The Mathematics I syllabus integrates fundamental calculus concepts, advanced mathematical techniques, and vector calculus, preparing students for engineering challenges with optimized problem-solving skills.
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	Develop understanding of vector differentiation concepts including gradient, divergence, curl, and Laplacian operators.
CLOBJ 5	Apply vector integration techniques such as line integrals and Green's theorem in mathematical and physical problems.
CLOBJ 6	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	**-**	**-**	**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 Parameters, 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 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.	30	18
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 (TextBook) By Erwin Kreyszig | Willey India Education
2. D.A. Murray, Introductory Course in Differential Equations. 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 | Willey India Edition
5. Advanced Engineering Mathematics, By K. A. Stroud and Dexter Booth, | Macmillan Publication

a. **Course Name:** Advanced Communication and Interpersonal Skills
b. **Course Code:** 03010002HM01
c. **Prerequisite:** Knowledge of Principles of Communication Skills.
d. **Rationale:** Equips students with professional communication and collaborative teamwork skills essential for effective performance and industry readiness in the workplace.
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 rules of subject–verb agreement, reported speech, and active–passive voice to produce grammatically correct sentences in real-life contexts.
CLO 2	Understand the usage of appropriate vocabulary including synonyms, antonyms, homonyms, homophones, homographs, and idioms in spoken and written communication.
CLO 3	Apply structured essays, Paragraph, and confident self-introductions using appropriate language, logical organization, professional etiquette, and positive body language.
CLO 4	Analyse intermediate-level reading passages by identifying main ideas, supporting details, tone, and purpose.
CLO 5	Evaluate SWOT analysis and time-management techniques to plan personal goals, prioritize tasks, and improve academic and professional effectiveness.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
1	**0**	**2**	**2**	**40**	**-**	**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 Voice, 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 and 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 and conclusion, Organizing ideas logically, Using appropriate language and tone.	10	2
10	**Time Management:** Importance of managing time, Prioritization, Creating schedules.	10	1

i. List of practical's:

Sr. No.	Content
1	Subject Verb Agreement a. Fill-in-the-blank exercises b. Sentence correction tasks c. Group quiz competition d. Role-play using correct subject-verb forms

2	Reported Speech a. Dialogue conversion practice b. Pair work: narrate a conversation c. Reporting classroom news d. Role-play followed by reporting
3	Active and Passive Voice a. Transform active sentences to passive and vice versa b. Rewrite instructions in passive voice c. Classroom narration using passive structures d. Group activity: change story voice
4	Building Vocabulary a. Daily word journal b. Vocabulary flashcards and games c. Synonym-antonym match-up d. Word building through storytelling
5	Grooming and Personality Development a. Personal grooming checklist task b. Group discussion on personality traits c. Mock social interaction d. Confidence-building exercises
6	SWOT Analysis with Self Introduction a. SWOT worksheet filling b. Self-introduction in pairs or groups c. Strength-sharing circle d. Feedback on introductions
7	Reading Comprehension (Intermediate Level) a. Reading passage followed by Q&A b. Find-the-theme activity c. Vocabulary hunt from the passage d. Summarizing a short text
8	Listening Comprehension (Intermediate Level) a. Listen and answer exercises b. Listening and completing notes c. Audio based MCQs d. Paraphrasing what was heard
9	Essay Writing a. Brainstorming and outline creation b. Writing on guided topics c. Peer feedback session d. Editing and final draft submission
10	Time Management and Team Building a. Create a weekly schedule b. Prioritization task (urgent vs important) c. Reflection on time use habits

j. Text Book and Reference Book:

1. Dhanavel, S. P. English and Soft Skills. Orient Blackswan, 2010.
2. Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press, 2011.
3. Murphy, Raymond. English Grammar in Use. 5th ed., Cambridge University Press, 2019.
4. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication: Principles and Practice. Oxford University Press, 2004.
5. Wren, P. C., and H. Martin. High School English Grammar and Composition. S. Chand & Company, 1995.

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	To introduce the fundamental concepts, evolution, and applications of Online Social Networks (OSNs).
CLOBJ 2	To develop understanding of social media data collection, processing, and analysis techniques along with ethical considerations.
CLOBJ 3	To provide knowledge about trust, credibility, reputation systems, and misinformation detection in online communities.
CLOBJ 4	To familiarize students with security, privacy, phishing attacks, fraud detection, and law enforcement aspects related to OSNs.
CLOBJ 5	To expose students to practical applications, real-world case studies, and emerging research trends in online social networks and cybersecurity.

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	Analyse 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 analyse 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**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**0**	**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
5	**Research and Practical Applications** Review and Discussion of Key Topics, 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" – 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" – Matthew A. Russell: Covers data collection, analysis, and visualization techniques using Python and APIs from platforms like Twitter, Facebook, and LinkedIn.

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	To introduce students to design thinking methodologies and human-centered approaches for solving real-world problems.
CLOBJ 2	To develop understanding of concept generation, prototyping, evaluation techniques, and user-oriented product design.
CLOBJ 3	To familiarize students with modern technologies such as CAD, 3D printing, AR/VR, IoT, AI/ML, and digital fabrication used in engineering design.
CLOBJ 4	To provide knowledge about engineering, safety, sustainability, material selection, and eco-friendly aspects involved in product and system design.
CLOBJ 5	To create awareness about innovation, intellectual property rights, business models, and entrepreneurship for transforming ideas into practical solutions and ventures.

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**	**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 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.	**30**	12
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, AIand 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 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 – Tim Brown, Harper Business Publications.
2. Change by Design – Tim Brown, HarperCollins Publishers.
3. The Design of Everyday Things – Don Norman, Basic Books.
4. Product Design and Development – McGraw Hill Education.
5. Engineering Design – McGraw Hill Publications.
6. Innovation and Entrepreneurship – Harper Business Publications.
7. Entrepreneurship Development – S. Chand Publications.
8. Intellectual Property Rights – Cengage Learning.
9. CAD/CAM: Principles and Applications – McGraw Hill Education.
10. Digital Fabrications – Architectural Press.