First Year Curriculum

Admission Year 2026-27

Bachelor of Technology
Biomedical Engineering

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

SEMESTER 1

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	To develop a fundamental understanding of matrices, determinants, vector spaces, and systems of linear equations used in engineering and scientific applications.
CLOBJ 2	To provide knowledge of differential and integral calculus for analyzing mathematical models and engineering problems.
CLOBJ 3	To enable students to apply concepts of multivariable calculus, vector calculus, and differential equations in solving real-world problems.
CLOBJ 4	To enhance analytical and problem-solving skills through mathematical techniques relevant to engineering, biomedical, and technological applications.

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

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

h. Course Content:

Sr. NO.	Topics	W (%)	T
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** 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** 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** Double integration, change of order, change into polar form, triple integrations Applications: Area, Volume	20%	12
	Total:	100%	60

i. Text Book and Reference Book:

a. Advanced Engineering Mathematics (TextBook)
By Erwin Kreyszig | Willey India Education

b. Elementary Linear Algebra
By Howard Anton, Chris Rorres | Willy India Edition | 9th Edition

c. Calculus with early transcendental functions
By James Stewart | Cengage Learning

d. Thomas' Calculus
By Maurice D. Weir, Joel Hass, Frank R. Giordano | Pearson Education

a. **Course Name:** Biology for Engineers
b. **Course Code:** 03011101PC01
c. **Prerequisite:** Knowledge of General Biology up to 10th or 12th class.
d. **Rationale**: To provide a foundational biological knowledge to support engineering applications in biomedical field.

e. **Course Learning Objective:**

CLOBJ 1	Identify the basic organization of organisms and their subsequent building into a living being.
CLOBJ 2	Develop micro and macro level understanding of molecules, molecular structure, and their functions.
CLOBJ 3	Understand the cellular level organization of human structure.
CLOBJ 4	Impart an understanding of cell function mechanisms responsible for various daily activities.
CLOBJ 5	Classify the different blood group systems, their components, and clotting and bleeding factors.

f. **Course Learning Outcomes:**

CLO 1	Identify the basic organization of organisms and subsequent building to a living being.
CLO 2	Develop the micro and macro level understanding of molecules, molecular structure and their functions.
CLO 3	Understand the cellular level organization of human structure.
CLO 4	Impart an understanding about the mechanism of the cell functions that is ultimately responsible for various daily activities.
CLO 5	Classify the different blood group system, their components and Clotting and bleeding factor.

g. **Teaching & Examination Scheme:**

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

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

h. Course Content:

Sr. No.	Topics	W(%)	T
1	**Biological Molecules & Proteins Amino acids:** classification, peptides, protein structure, globular proteins (Hemoglobin) & fibrous protein (Keratin), structure of proteins, types of bonds contributing to protein structure, Enzymes. Carbohydrates: Structure, chemical & physical properties of monosaccharides, disaccharides (maltose, sucrose, lactose), polysaccharides (starch, glycogen & cellulose). Lipids: Classification of lipids (simple, derived & complex with one example each). Nucleic acids: Nomenclature of nucleotides & nucleosides, structure of nucleic acids, the structure of DNA itself to its function as hereditary molecule. Vitamins, Hormones, Electrolyte: Important diseases related to macromolecules.	30	14
2	**Cell** Cell Membrane: Membrane models Membrane junctions – Tight, gap, septate, desmosomes. Membrane Transport – Diffusion, osmosis, passive & active transport. Endocytosis & Exocytosis. Cytoplasm: Ribosomes, Endoplasmic Reticulum– Structure and role in protein synthesis. Golgi apparatus: Structure, origin & relationship to endoplasmic reticulum. Lysosomes, Mitochondria: Structure of inner, outer membranes & the matrix. Cytoskeletal elements, Microfilaments: Structure & function in striated muscle fibers, Microtubules: Structure as in cilia/flagella, mechanism in movement Nucleus: Structure of Inter phase nucleus – nuclear membrane, nucleolus, nucleosome model. Genetic material: DNA and RNA their structure function and type. Cell cycle & cell division, Cell cycle. Mitosis, meiosis & their significance.	35	17
3	**Tissue** Introduction, Types of Tissues. Epithelial Tissue: Types, Structure and Functions of Epithelial Tissue. Connective Tissue: Types, Cells and Functions of Connective Tissue. Muscle Tissue: Types, Function. Nervous Tissue: Types, cell, Structure, Functions.	15	11
4	**Blood** Introduction, Importance, Composition of Blood-Blood cells and their functions, Hemostasis, Blood group System, Blood transfusion, RH Blood Group.	10	9
5	**Special Senses** Structure, function and physiology of vision, hearing, taste & smell and their disorders. Mechanism of vision, color vision, mechanism of hearing, tests of hearing	10	9
	Total:	100%	60

i. Reference Books:

1. Anatomy and physiology in Health and Illness By Ross and Wilson, Churchill Livingstone | Elsevier
2. Guyton and Hall textbook of medical Physiology By John E Hall | 14th Edition, Pub. Year 2020

3. Lehninger Principles of Biochemistry Author: David L. Nelson and Michael M. Cox
4. Cell and Molecular Biology By De Robertis, E.D.P | Lippincott Williams and Williams(eighth Edition)
5. The Cell: a Molecular Approach By Cooper, G. M., & Hausman, R. E. | Washington: ASM; Sunderland, Pub. Year 2009

a. **Course Name:** Physics of Semiconductors
b. **Course Code:** 03019201BS01
c. **Prerequisite:** Knowledge of Physics and some basic concepts in Mathematics like differentiation, integration, limit, differential equation, vector calculus up to 12thscience 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	Conceptualize semiconducting materials on the basis of band theory.
CLOBJ 2	Get familiar with optical fibres and semiconductor-based optoelectronic devices useful in fibre optic systems.
CLOBJ 3	Conceptualize the foundational principles of quantum physics and their role in quantum computing.
CLOBJ 4	Formulate and conceptualize various theoretical aspects and physical phenomena at the low dimensional (nano) level.

f. **Course Learning Outcomes:**

CLO 1	To conceptualize semiconducting materials on the basis of band theory.
CLO 2	To get familiar with optical fibres and semiconductor based optoelectronic devices useful in fibre optic system.
CLO 3	To conceptualize the foundational principles of quantum Physics and their role in quantum computing.
CLO 4	Formulate and conceptualize various theoretical aspects and the physical phenomena at Low dimensional level (nano)

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**0**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

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

h. Course Content:

Sr. No.	Topics	W(%)	T
1	**Band theory& Semiconductors** Band structure of solid materials, E-k diagram, Direct and Indirect band gap, Effective mass, Concept of Fermi Energy, Density of state, Fermi Level in Intrinsic and Extrinsic Semiconductors, Ohmic and Schottky Junction	**25**	**11**
2	**Optoelectronics** Interaction of radiation with Matter, Absorption, Spontaneous and Stimulated emission, Characteristics of Lasers, Diode Laser, LED, Photodiode and their applications. Principle and Structure of Optical Fiber, Numerical Aperture of fiber, Types of Optical Fibers, Attenuation in Optical Fibers, Applications of Optical Fibers.	**25**	**11**
3	**Quantum Mechanics & Quantum Computing** Quantum postulates, wave function, Schrodinger's equation time dependent, independent (No derivation), One dimensional potential well, quantum tunneling and its application in soft computing Key Principles of Quantum Computing, Difference between classical and quantum computing, Quantum Computing advantages Challenges and Application	**30**	**13**
4	**Low Dimensional Materials** Basic characteristic including synthesis, properties, quantum confinement, classification: Quantum Dot, Quantum well , Quantum Wire and their applications, Novel Materials and their applications	**20**	**10**
Total:		**100%**	**45**

i. Reference Books:

1. Physics of Semiconductor Devices (TextBook) By S. M. Sze and K. N. Kwok | John Wiley & Sons
2. Semiconductor Optoelectronic Devices By P. Bhattacharya | Prentice Hall of India, Pub. Year 1997
3. Engineering Physics (TextBook) By B.K.Pandey S Chaturvedi and M. Venkanna | - Cengage Publication
4. Semiconductor Optoelectronics (TextBook) By J. Singh | McGraw-Hill Inc, Pub. Year 1995

j. List of Experiments:

Sr. NO.	Experiment List
1	I-V characteristics of light emitting diode in forward bias.
2	I-V characteristics of Zener diode in reverse bias.
3	Determination of Velocity of ultrasonic waves in water
4	Determination of Dielectric constants of Dielectric samples.

5	Measurement of Band gap of semiconductor material.
6	Measurement of Hall coefficient and carrier concentration in semiconductor material.
7	Measurement of Planck's constant using LED.
8	Measurement of wavelength of laser light using diffraction grating
9	Measurement of Numerical aperture of an optical Fiber.
10	Determination of the size of lycopodium powder particles.
11	Measurement of power loss in an optical fibre
12	Moment of Inertia of a flywheel.
13	Young's Modulus by bending of beam.

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	Apply essential grammar rules for accurate and effective communication.
CLOBJ 2	Construct clear and coherent sentences and paragraphs using varied sentence structures.
CLOBJ 3	Enhance reading and listening comprehension through identification of main ideas, details, and contextual meanings.
CLOBJ 4	Build confidence in everyday communication using appropriate greetings, expressions, and speaking skills.
CLOBJ 5	Encourage creative and logical thinking through picture perception and extempore activities.

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**
				T	**CE**	**P**	**Theory**	**P**	
0	**0**	**2**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

L: Lectures**; T-** Tutorial**; P-**Practical**; C-** Credit**; MSE-** Mid-Semester Evaluation**,**
CE- Continues 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	**TensesTypes:** Present, Past, Future Forms and correct usage Common tense errors	8%	2
3	P**hrase 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	7%	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
	Total:	100 %	30

i. Text Book and Reference Book:

1. English Grammar in Use (TextBook) By Murphy, Raymond | Cambridge University Press, Pub. Year 2019
2. A Practical English Grammar (TextBook) By Thomson & Martinet | Oxford University Press, Pub. Year 1986
3. The St. Martin's Guide to Writing By Rise B. Axelrod & Charles R. | Cooper, Bedford/St. Martin's, Pub. Year 2021
4. Tactics for Listening (Basic) By Jack C. Richards | Oxford University Press, Pub. Year 2011
5. Active Skills for Reading: Book 1 By Neil J. Anderson | Cengage Learning, Pub. Year 2013

6. Speak with Impact By Allison Shapira | HarperCollins Leadership, Pub. Year 2018

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	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 program 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	Topics	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, 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..	15%	5
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%	5
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%	8
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%	9
	Total:	100 %	45

i. 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

j.List of Experiments:

Sr. NO.	Experiment List
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. 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.
9	Write a program to find the largest of the three nos. using Nested-If-Else statement.
10	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.
11	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.
12	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.
13	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 35-59 Second Class
14	Write a program to read marks of a student from keyboard whether the student id pass (if).

15	Write a program to find the sum of first N odd numbers.
16	Write a program using while loop construct which finds the factorial of a given integer number.
17	Write a C program using do«while and for loop constructs to reverse the digits of the number.
18	Write a program to demonstrate use of Switch- Break Statement.
19	Write a program to find out all the numbers divisible by 5 and 7 between 1 to 100.
20	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
21	Write a program to print the output of bellow series. 1!+2!+3!+4!+..... n!
22	Write a program to print the following outputs using for Loop. 1 * 12 ** 123 ***
23	Write a program to print the following outputs using for Loop. (a) 1 (b) 321 21 21 321 1
24	Write a program which sorts 10 numbers into ascending order.
25	Write a program to find maximum element from 1-D array.
26	Write a program to find number of odd and even elements from the 1-D array.
27	Write a program add two 2x2 matrices.
28	Write a program to count number of positive, negative and zero elements from 3x3 matrix.
29	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.
30	Write a program to count vowels from a entered String.
31	Write a program which finds whether a string is a palindrome or not.
32	Write a program to find factorial of a number using recursion.
33	Write a program that used user defined function Swap ( ) and interchange the value of two variable.
34	Write a function to return 1 if the number is prime otherwise return 0.
35	Define a structure type, personal that would contain person name, date of joining and salary.
36	Define a structure called cricket that will describe the following information: Player name Team name Batting average

37	Write a program to add two numbers using pointers.
38	Write a program to swap two numbers using pointer
39	Write a program to illustrate reading files contents.
40	Write a program to illustrate the use of fgets( )

a. **Course Name:** Electrical and Electronics Engineering
b. **Course Code:** 03010601ES02
c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12th science level
d. **Rationale:** Electrical and Electronics 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	Gain familiarity with electrical current, potential difference, power and energy, sources of electrical energy and elements of electrical circuit.
CLOBJ 2	Solve problems related to Alternating current, alternating voltage, etc., Demonstrate a clear understanding of Pure R, L C circuit and combination of RLC, Series and Parallel combination of R, L and C, etc.
CLOBJ 3	Acquire knowledge of the resistor, capacitor, and inductor and their performance characteristics for series and parallel connections.
CLOBJ 4	Understand different single phase and three phase circuits.
CLOBJ 5	Demonstrate a clear understanding of the basic concepts, working principles and applications of transformer, DC machines and AC machines.
CLOBJ 6	Study the use of LT Switch Gear, Fuse, MCB, ELCB etc.

f. **Course Learning Outcomes:**

CLO 1	Understand electrical current, potential difference, power and energy, sources of electrical energy and elements of electrical circuit.
CLO 2	Solve basic electrical circuit problems using various laws and theorems
CLO 3	Understand the role of resistor, capacitor and inductor and their performance characteristics for series and parallel connections.
CLO 4	Discuss three phase-balanced circuits.
CLO 5	Understanding the basic concepts and working principles of transformers, DC machines and AC machines.
CLO 6	Acquire knowledge about electrical installations

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** Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Mesh and Node analysis, Simplifications of networks using series and parallel combinations and star-delta conversions. Superposition, Thevenin 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. Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage current phasor diagrams and waveforms. Development of the concept of reactance, the study of series R-L, R-C, R-L C circuit and resonance, 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, the concept of active, reactive and apparent power and power factor, examples based on theory. Concept of three-phase supply and phase sequence. Voltages, currents and power relations three-phase have balanced star-connected loads and delta-connected loads along with phasor diagrams, Power and power factor measurement in balanced three-phase circuits (one, two and three wattmeter methods), examples .	30%	13
3	**Diode and Transistors** Introduction to Ideal Diode, Effect of temperature	30%	12

	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.		
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**
	Total:	**100 %**	**45**

i. Text Book and Reference Book:

1. Electrical Engineering Fundamentals, By V. D. Toro, Prentice Hall India, Pub. Year 1989
2. Basic Electrical Engineering, By D. C. Kulshreshtha, McGraw Hill
3. Fundamentals of Electrical Engineering, By Leonard S. Bobrow, Oxford University Press, Pub. Year 1996
4. Electrical and Electronics Technology, By E. Hughes Pearson, Pub. Year 2010 5. Basic Electrical Engineering, By D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, Pub. Year, 2010
5. A textbook of Electrical Technology Volume 1&2, By B. L. Theraja, S. Chand Publication

j. List of Experiments

S.No.	Name of experiments
1	To study about various electrical and electronics symbols and demonstrate various measuring instruments used in electrical & electronics laboratories.
2	Verification of superposition theorem with DC source.
3	Verification of Thevenin's theorem with DC source.
4	To experimentally investigate the behaviour of a series RLC circuit under AC excitation.
5	Verification of current and voltage relations in three-phase balanced star and delta-connected loads
6	To plot V-I characteristics of the P-N junction diode.
7	To perform half wave rectifier with and without filter.
8	To perform full wave rectifier with and without filter

9	To plot and study input-output characteristics of the Common Emitter (CE) configuration of the transistor
10	To perform and observe the response of voltage regulator IC 7805

SEMESTER 2

a. **Course Name:** Human Anatomy and Physiology-I
b. **Course Code:** 03011102PC01
c. **Prerequisite:** Basic knowledge of Biology and Chemistry is must
d. **Rationale:** It provides a foundational understanding of the structure and function of the human body, essential for students pursuing careers in healthcare, biomedical sciences, and related fields, enabling them to comprehend complex physiological processes and their inter relationships.

e. **Course Learning Objective:**

CLOBJ 1	Define the basic terminology, structural organization, and major systems of the human body with relevance to biomedical applications.
CLOBJ 2	Describe the anatomy and physiology of the cardiovascular system, including cardiac cycle, heart sounds, ECG, and blood flow mechanisms.
CLOBJ 3	Explain the structure and functions of various organs of the digestive system, including accessory organs and digestion mechanisms.
CLOBJ 4	Classify hormones and summarize the structure and function of endocrine glands and their secretions.
CLOBJ 5	Illustrate the anatomical structure and explain the physiology of the urinary system, including urine formation and micturition.

f. **Course Learning Outcomes:**

CLO 1	Define the basic terminology, structural organization, and major systems of the human body with relevance to biomedical applications.
CLO 2	Describe the anatomy and physiology of the cardiovascular system, including cardiac cycle, heart sounds, ECG, and blood flow mechanisms.
CLO 3	Explain the structure and functions of various organs of the digestive system, including accessory organs and digestion mechanisms.
CLO 4	Classify hormones and summarize the structure and function of endocrine glands and their secretions.
CLO 5	Illustrate the anatomical structure and explain the physiology of the urinary system, including urine formation and micturition.
CLO 6	Correlate the interrelationship among various body systems (cardiovascular, digestive, endocrine, urinary) in maintaining homeostasis.

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 Human Anatomy and Physiology** Definition of anatomy and physiology, Terms related to anatomy and physiology, Anatomical planes and positions, Organs and systems. Structural Organization, Cavities of the body, Outline of the following systems: Cardiovascular System, Respiratory System, Alimentary System, Nervous System, Reproductive System, Urinary System, Skeletal System, Muscular System, Lymphatic System, Endocrine System, Integumentary system (Skin Study).	**15%**	**6**
2	**Cardiovascular System** Anatomy of the heart, Heart-position and function, Properties of Cardiac muscle, Origin of the heart beat and electrical activity of the heart. Anatomy and Physiology of Arteries, capillaries and veins. Cardiac cycle, Types of Circulation, Blood pressure, heart rate and their regulation, Cardiac output, Pulse Pressure, Heart sound, ECG.	**25%**	**15**
3	**Digestive System** Digestive system-Introduction. Various parts of digestive system, their structure and functions. Accessory digestive organs, Mechanisms of Digestion.	**20%**	**8**
4	**Endocrine System** Introduction, Hormones, Classification of Hormones, Principal Endocrine glands and their functions, Other glands and their functions, Mixed Glands, Secretions of all glands.	**20%**	**8**
5	**Urinary System** Various parts of excretory/Urinary system, their structure and functions: Kidneys, Ureters, Urinary Bladder, Urethra; Structure of Nephron, Physiology of urine formation And physiology of micturition.	**20%**	**8**
	Total:	**100 %**	**45**

i. Reference Book:

1. Anatomy and physiology in Health and illness, 11th edition By ROSS AND WILSON
2. Human anatomy and physiology made easy By Dr.Padma Sanghani | Akshat,2010
3. Text book of Medical Physiology By Guyton and Hall
4. Principles of Anatomy & Physiology By Gerard J.Tortora | John Wiley & Sons, INC

j. List of Experiments:

Sr. NO.	Experiment List
1	Study of different body positions, anatomical planes, and sectional views
2	Identification and understanding of heart anatomy, blood vessels, and circulation pathways.
3	Visualization and analysis of systemic and pulmonary circulation using digital tools or mechanical models.
4	To measure blood pressure using a sphygmomanometer.
5	Observation and identification of major and accessory digestive organs.
6	Identification of digestive enzymes and their roles.
7	Demonstration of Digestive Processes Through Models or Charts.
8	Study of Hormone Production and Endocrine Regulation.
9	Measurement of Blood Glucose and Insulin Response.
10	Study of Urine Formation and Excretion Process.

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) subjects 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	Apply design thinking methodologies to identify and solve user-centered problems.
CLOBJ 2	Demonstrate creative thinking and effective ideation strategies.
CLOBJ 3	Develop low-fidelity and high-fidelity prototypes and understand fabrication challenges.
CLOBJ 4	Incorporate engineering principles into design and innovation.
CLOBJ 5	Communicate ideas visually through sketching and graphical tools.

f. Course Learning Outcomes:

CLO 1	Apply design-thinking methodologies to identify and solve user-centred 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 start-up 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**	**0**	**60**	**0**	**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%**	**13**
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**
	Total:	**100 %**	**45**

a. **Course Name:** Elements of Mechanical Engineering
b. **Course Code:** 03010901ES01
c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12th science level
d. **Rationale:** Elements of Mechanical Engineering Course Provide students with a comprehensive foundation in the fundamental principles and concepts that form the backbone of mechanical engineering for various Engineering disciplines.

e. **Course Learning Objective:**

CLOBJ 1	Identify and basic mechanical components such as gears, bearings, Pumps, Compressor, boiler, I.C Engines.
CLOBJ 2	Understand various laws and behaviour of fluid at different conditions.
CLOBJ 3	Illustrate the operational mechanisms through diagrams, models, or practical demonstrations.
CLOBJ 4	Demonstrate construction and working principles of diverse mechanical devices, such as engines, pumps, and compressors.
CLOBJ 5	Evaluate basic problems related to I.C engine, pumps, compressors and Fluids.
CLOBJ 6	Analyse and discuss the interactions and relationships between various mechanical elements within a system.

f. **Course Learning Outcomes:**

CLO 1	Describe basic terminology of mechanical systems and various conventional and non-conventional energy sources.
CLO 2	Estimate the fundamental properties of Gas and Steam.
CLO 3	Calculate the Power and efficiency of the Internal Combustion engine.
CLO 4	Explain the working principle of Steam Generators, IC engines, Refrigeration, Air Conditioning, Pumps, and Compressors.
CLO 5	Differentiate the various power transmission systems and its 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** Prime Movers, Conventional and Non-Conventional Energy Sources and their applications. **Basics of Thermodynamics:** Basic terminologies, Specific heat, Internal Energy, Enthalpy, Specific Volume. Change of State, Path, Process, Cycle, and Thermodynamic systems, Statement of Zeroth Law, First Law and Second Law of Thermodynamics.	**10%**	**5**
2	**Properties of Gases** Gas Laws, Gas Constant, and Relation between specific heat at constant pressure and constant volume, Non-flow processes.	**20%**	**8**
3	**Heat Engines** Definition and Classification of Heat Engine; Internal Combustion Engine: Classification, Otto and Diesel Cycle, Two and Four Stroke Petrol and Diesel Engine; Calculation of Power and Efficiency.	**20%**	**10**
4	**Properties of Steam** Types of Steam and Steam Formation, Specific Enthalpy, Specific Volume, Dryness Fraction of Steam, Measurement of Dryness Fraction, Calorimeters, and Steam Table.	**15%**	**7**
5	**Energy Conversion Devices** **Steam Generators:** Definition and Classification; Cochran, Lancashire, Locomotive, Babcock and Wilcox Boiler: Construction and Working; Boiler Mounting and Accessories. **Refrigeration and Air Conditioning:** Meaning of Refrigeration; Vapour Compression Refrigeration Cycle; Vapour Absorption Refrigeration Cycle; Air conditioning; Window Air Conditioning and Split Air Conditioning.	**20%**	**8**
6	**Basics of Pumps and Compressors** Definition, Classification, Applications, Working Principle and Components of Pumps and Compressors.	**10%**	**4**
7	**Motion And Power Transmission Devices** **Shaft and Axle;** Belt Drive; Chain Drive; Friction Drive; Gear Drive; Clutch, Coupling and Brake.	**5%**	**3**
	Total:	**100 %**	**45**

i. Text Book and Reference Book:

1. Elements of Mechanical Engineering
   By Sadhu Singh | S. Chand Publisher. | Revised edition, Pub. Year 2013
2. Elements of Mechanical Engineering
   By S.B.Mathur, S. Domkundwar | Dhanpat Rai & Sons Publications., Pub. Year 2013
3. Fundamental of Mechanical Engineering
   By G. S. Sawhney | PHI Publication New Delhi. | Third edition, Pub. Year 2015
4. Engineering Thermodynamics
   By P. K. Nag | Tata McGraw-Hill Education | Sixth edition, Pub. Year 2017
5. Thermal Science and Engineering
   By Dr. D. S. Kumar | S. K. Kataria and sons Publishers. | Fourth edition, Pub. Year

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j. List of Experiments:

Sr. NO.	Experiment List
1	Case study on Conventional and Non-Conventional Energy Sources.
2	Demonstration of various types of Steam Generators.
3	Demonstration of various types of mountings and accessories.
4	Demonstration of 4-stroke Petrol and Diesel Engines.
5	Demonstration of 2-stroke Petrol and Diesel Engines.
6	Determination of Power and Thermal Efficiency of an IC Engine.
7	Demonstration of Vapor Compression and Vapor Absorption refrigeration cycle.
8	Demonstration of different types of Pumps.
9	Demonstration of different types of Compressors.
10	Demonstration of various Power Transmission Devices.

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 sustainable existence
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

k. Course Learning Outcomes:

CLO 1	Understand the interrelation and interdependency of organisms and their interactions with the environment
CLO 2	Identify eco-friendly measures in engineering projects
CLO 3	Understand preventive steps for environmental protection.
CLO 4	Act as a responsible individual who is aware of efficient usage of resources and securing sustainable development

l. Teaching & Examination Scheme:

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

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

m. Course Content:

Sr. No.	**Content**	**Weightage(%)**	**Teaching Hours**
1	**ENVIRONMENTAL HEALTH, ECOLOGY AND QUALITY OF LIFE** Environmental education: Objective and scope, Impact of technology on the environment, Environmental disasters: Case studies, Global environmental awareness to mitigate stress on the environment, Structure and function of an ecosystem, Ecological	**25%**	**7**

	pyramids, Pyramid of number, Pyramid of energy and pyramid of biomass.		
2	**POLLUTION PREVENTION** Air & Noise pollution -Sources & their Effects, Case studies of Major Catastrophes, Structure and composition of the atmosphere, Water, Soil, Marine, Thermal & Marine Pollution: The story of fluoride contamination, Eutrophication of lakes, control measures, Measuring water quality: Water quality index, Waste water treatment (general) primary, secondary and tertiary stages, Municipal Solid waste management: Sources and effects of municipal waste, Biomedical waste, Hazardous waste	**20%**	**6**
3	**POPULATION GROWTH, GLOBAL ENVIRONMENTAL CHALLENGES & LATEST DEVELOPMENTS** Population Explosion - Causes, Effects and Control, an International initiative in population-related issues, Urbanization, Growth of the world's large cities, Water resources: Sources of water, Stress on water resources, Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer, Variation in concentrations of GHG gases in ambient air during last millennium, Role of Environmental Information System (ENVIS) in India and similar programs run by EPA(USA), Role of soft tools like Quantum GIS, Autodesk Building Information Modelling (BIM) and City Finance Approach to Climate-Stabilizing Targets (C- FACT), Life Cycle Assessment, Bioinformatics and Optimization tools for sustainable development.	**25%**	**7**
4	**SMART CITIES** **Introduction to smart cities -** about smart cities, what is a smart city, world urbanization, case studies of Songdo, Rio De Janeiro, what makes cities smart. **City as a system of systems –** Introduction, systems thinking, Milton Keynes Future Challenges, Rich picture as city challenges, Wicked problems, Development of **smart city approach –** core elements, open data, sustainability, privacy and ethics, development processes. **Smart Citizens –** their role, engaging citizens, IES Cities, Energy systems, Approaches for Citizen Engagement, co creating smart cities, cities unlocked, living labs, city problems, crowdsourcing ideas, redesigning cities for citizens, all age-friendly cities, mobility on demand, motion maps. **Infrastructure, Technology and Data –** urban infrastructure and its technology, future of lighting,	**30%**	**10**

	IoT, connected objects, sensing the city, NOx eating paints and air quality sensors, safest, smart citizen kit, sensing your city, Sensored City, Cyber security for data power, open, shared and closed data, satellite data, open data revolution, Smart City Project Data **Innovation –** smart innovations, smart city ecosystem, data-driven innovations for smart cities **Standards and Capacity Building –** the role of Standard, BSI smart city Standards, Hyper Cat, ITU Smart Sustainable cities, Smart City Readiness, Lessons Learnt from Amsterdam **Smart Measurements -** metrics and indicators, city indicators, WCCD data portal, value proposition, integrated reporting, smart city learning and education, urban data school.		
	Total:	**100%**	**30**

n. Text Book and Reference Book:

1. 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:** 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	Solve second and higher-order ordinary differential equations.
CLOBJ 2	Apply Laplace Transform to solve differential equations.
CLOBJ 3	Apply Fourier series techniques to approximate periodic functions in mathematical and engineering contexts.
CLOBJ 4	Compute and interpret vector differentiation concepts.
CLOBJ 5	Evaluate vector integrals.

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**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**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.	**Topics**	**Weightage (%)**	**T**
1	**Second and Higher-Order Ordinary Differential Equations** Homogeneous Linear ODE, Homogeneous constant coefficient	25%	15

	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		
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%	09
4	**Vector Calculus: Vector Differentiation:** Vector-valued functions, smooth curve, vector differentiation, scalervalued function, Gradiant of scaler valued function, Divergence and curl of vector-valued functions, Laplacian operator, Scalar potential function, Vector Integration: Line integral of scaler functions, Line integral of vector valued function, conservative vector field and independent of path, Green's theorem.	30%	18
	Total:	**100%**	**60**

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:** Engineering Graphics & Design
b. **Course Code:** 03010901ES02
c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12^{th} science level
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	Identify and name common drafting tools and their uses.
CLOBJ 2	Interpret engineering drawings and symbols.
CLOBJ 3	Demonstrate the ability to create accurate engineering drawings using industry-standard software.
CLOBJ 4	Solve engineering design problems by applying geometric and spatial concepts.
CLOBJ 5	Generate accurate and professional engineering drawings independently.
CLOBJ 6	Design and create 3D models of engineering components using computer-aided design (CAD) tools.

f. **Course Learning Outcomes:**

CLO 1	Identify and recall common drafting tools and their uses.
CLO 2	Interpret and explain engineering drawings and symbols.
CLO 3	Demonstrate the application of industry-standard software to create accurate engineering drawings.
CLO 4	Solve engineering design problems by applying geometric and spatial concepts.
CLO 5	Generate accurate and professional engineering drawings independently.
CLO 6	Design and create 3D models of engineering components using computer-aided design (CAD) tools.

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 OF PLANES:** Projections of various planes – Polygonal, Circular and Elliptical shape inclined to one of the Reference Plane and inclined to two Reference Planes; Concept of Auxiliary Plane of Projections.	10%	4
5	**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
6	**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

7	**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
	Total:	**100 %**	**30**

i. Text Book and Reference Book:

1. Engineering Drawing N.D. Bhatt & V.M. Panchal; Charotar Publishing House
2. ENGINEERING GRAPHICS P. J. Shah; S. Chand & Co., New Delhi Publications.
3. Graphic Science and Design French, T.E. Vierck, C.J & Foster; Tata McGraw HillPublications.
4. Fundamentals of Engineering Drawing Luzadder; W. J & Duff Prentice Hall Publications.
5. Engineering Drawing and Graphics Venugopal k; New Age International PrivateLimited Publishers.

j. Experiment List:

Sr. NO.	Experiment List
1	Demonstration of different drawing instruments, dimensioning systems, symbols and Engineering Scale.
2	Exercise on Projections of Points and Lines.
3	Exercise on Projections of Planes.
4	To draw a sheet involving Projections of Solids and Sections of Solids.
5	To draw a sheet involving Development of Surfaces.
6	Practice sheets on Orthographic Projections.
7	Practice sheets on Isometric Projection.
8	Demonstration of Industrial Drawings.
9	To create basic objects (2D sketches) using Computer Aided Drafting tool.
10	To create precise drawing (3D modeling), dimensions and editing using Computer Aided Drafting tool.

a. **Course Name:** Advanced Communication & 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	Demonstrate the ability to adapt writing style to different audiences and purposes.
CLOBJ 2	Create comprehensive technical documents such as reports, manuals, and proposals.
CLOBJ 3	Deliver professional presentations, incorporating effective visual aids, engaging content and confident delivery.
CLOBJ 4	Apply technical communication through various mediums (video, web content, multimedia)
CLOBJ 5	Incorporate advanced document design principles for clarity and readability.
CLOBJ 6	Deliver different types of speeches.

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**					
				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 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
	Total:	100 %	15

i. Text Book and Reference Book:

1. Technical Communication: Principles And Practice
   By Sangeetha Sharma, Meenakshi Raman | Oxford University Press | 2nd Edition
2. Personality Development and Soft Skills
   By Barun K Mitra | Oxford, 2011
3. High School English Grammar and Composition
   By Wren & Martin | S. Chand Publishing, Pub. Year 2017
4. English Grammar in Use
   By Raymond Murphy | Cambridge University Press, Pub. Year 2019
5. Communication Skills and Soft Skills
   By Suresh Kumar | Pearson Publication, 2010