



Four-Year Undergraduate Programme

Bachelor of Technology

**Computer Science & Engineering – Artificial Intelligence with
Robotics (AI-ROBO)**

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Faculty of Engineering & Technology
Bachelor of Technology in Computer Science & Engineering – Artificial Intelligence with
Robotics (AI-ROBO)

1. Vision of the Department

To be a distinct hub of education that prepares skilled professionals in the field of Computer Science and Engineering.

2. Mission of the Department

M1 Enhance academic performance by adopting industry-oriented curriculum focusing on the thrust area of computer education through integrated learning in collaboration with prominent industries.

M2 Preparing students to face challenges of the real world through internships and project-based learning.

M3 Foster a research culture that results in a sound knowledge base, high-quality publications, new products and IPR.

M4 Inculcate ethical consciousness in students so that they can achieve success in their professional endeavours and can become responsible citizens.

3. Program Educational Objectives

The statements below indicate the career and professional achievements that the B.Tech. Computer Science engineering curriculum enables graduates to attain.

PEO 1	To develop technical skills (critical investigation, communication, analytical and computer) and human relations skills (group dynamics, team building, organization and delegation) to enable students to transform the acquired knowledge into action.
PEO 2	To inculcate critical analysis and communication skills into students to effectively present their views, both in writing and through oral presentations.
PEO 3	To provide an environment for exploring the Research & Development attitude, to help the students in the Research and Development field.

4. Program Learning Outcomes

Program Learning outcomes are statements conveying the intent of a program of study.

PLO 1	Engineering knowledge:	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PLO 2	Problem analysis:	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.

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

5. Program Specific Learning Outcomes

PSO 1	Demand as per recent development	An ability to analyse, design, verify, validate, code and maintain the solution of given problem to derive execution of software system
PSO 2	Software skill	An ability to understand, apply and work with one or more domain using knowledge of mathematical techniques and principles with relevant areas of computer science

6. Credit Framework

Semester wise Credit distribution of the programme	
Semester-1	17
Semester-2	20
Semester-3	23
Semester-4	22
Semester-5	20
Semester-6	24
Semester-7	27
Semester-8	14
Total Credits:	167

Category wise Credit distribution of the programme	
Category	Credit
Major Core	74
Minor Stream	0
Multidisciplinary	24
Ability Enhancement Course	9
Skill Enhancement Courses	9
Value added Courses	26
Summer Internship	16
Research Project/Dissertation	9
Total Credits:	167

7. Program Curriculum

Semester 1						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	303192102	Engineering Physics	4	3	2	0
2	303191101	Mathematics-I	4	4	0	0
3	303109120	Engineering Graphics	3	2	2	0
4	303193103	Communication Skills	2	0	0	2
5	303105104	Computational Thinking for Structured Design 1	4	3	2	0

6	303104105	Environmental Science	AUDIT	1	0	0
Total			17	13	6	2
Semester 2						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
7	303105151	Computational Thinking for Structured Design 2	4	3	2	0
8	303104155	Mechanics of Solids	4	3	2	0
9	303100101	Workshop (Mechanical + Electronics)	2	0	4	0
10	303191151	Mathematics-II	4	4	0	0
11	303193152	Advanced Communication & Technical Writing	2	0	0	2
12	303106103	Electrical and Electronics Engineering	4	3	2	0
Total			20	13	10	2
Semester 3						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
13	303105201	Design of Data Structures	3	3	0	0
14	303105202	Data Structure & Algorithms Laboratory	2	0	4	0
15	303105203	Database Management System	3	3	0	0
16	303105204	Database Management System Laboratory	1	0	2	0
17	303105205	Object Oriented Programming with JAVA	2	2	0	0
18	303105206	Object Oriented Programming with JAVA Laboratory	1	0	2	0
19	T303105333	Analog and Digital Electronics	4	4	0	0
20	T303105334	Analog and Digital Electronics Laboratory	1	0	2	0
21	303191202	Discrete Mathematics	4	4	0	0
22	303193203	Professional Communication Skills	2	0	0	2
Total			23	16	10	2
Semester 4						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
23	303105251	Operating System	3	3	0	0
24	303105252	Operating System Laboratory	1	0	2	0
25	T303105335	Sensors and Transducers	2	2	0	0
26	T303105336	Sensors and Transducers Laboratory	1	0	2	0

27	T303105337	Communication Protocols	2	2	0	0
28	T303105338	Communication Protocols Laboratory	1	0	2	0
29	303105257	Programming in Python with Full Stack Development	3	3	0	0
30	303105258	Programming in Python with Full Stack Development Laboratory	1	0	2	0
31	303191258	Probability, Statistics and Numerical Methods	4	4	0	0
32	303193252	Professional Grooming and Personality Development	1	0	0	1
33	T303105339	Materials Engineering	2	2	0	0
34	T303105340	Materials Engineering Laboratory	1	0	2	0
Total			22	16	10	1
Semester 5						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
35	303105218	Design and Analysis of Algorithms	3	3	0	0
36	303105219	Design and Analysis of Algorithms Laboratory	2	0	4	0
37	T303105341	Microcontrollers and Interfacing	3	3	0	0
38	T303105342	Microcontrollers and Interfacing Laboratory	1	0	2	0
39	T303105343	Fundamentals of Robotics and Robot Kinematics	3	3	0	0
40	T303105344	Fundamentals of Robotics and Robot Kinematics Laboratory	1	0	2	0
41	303193304	Professionalism & Corporate Ethics	1	1	0	0
42	T303105345	Manufacturing Technology	3	3	0	0
43	T303105346	Manufacturing Technology Laboratory	1	0	2	0
44		Open Elective 01 (Compulsory Subjects :1)	2	2	0	0
Total			20	15	10	0
Open Elective 01						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	303101331	Basic Aircraft Science	2	1	2	0
2	T303105332	Disaster Preparedness and Planning	2	1	2	0
3	303105304	Cyber Security	2	1	2	0

4	303105305	Internet of Things	2	1	2	0
5	303107346	Fundamentals of Communication Engineering	2	1	2	0
6	T303105333	Azure Fundamentals	2	1	2	0
Semester 6						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
45	T303105336	Project – 1	3	0	0	0
46	T303105352	Artificial Intelligence	3	3	0	0
47	T303105353	Artificial Intelligence Laboratory	1	0	2	0
48	T303105354	Robot Dynamics	3	3	0	0
49	T303105355	Robot Dynamics Laboratory	1	0	2	0
50	T303105356	Computer Aided Design	3	3	0	0
51	T303105358	Computer Aided Design Laboratory	1	0	2	0
52		PEC 01(Compulsory Subjects: 1)	3	3	0	0
53		PEC 01 – Labs-(Compulsory Subjects: 1)	1	0	2	0
54		PEC 02 (Compulsory Subjects: 2)	3	3	0	0
55		PEC 02 – Labs-(Compulsory Subjects: 2)	1	0	2	0
56	303193353	Employability Skills	1	0	0	1
Total			24	15	10	1
PEC 01						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105344	Data Analytics and Visualization	3	3	0	0
2	303105341	Cyber Security	3	3	0	0
3	303105379	Mobile Application Development	3	3	0	0
PEC 01-LAB						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105345	Data Analytics and Visualization Laboratory	1	0	2	0
2	303105342	Cyber security Laboratory	1	0	2	0
3	303105380	Mobile Application Development Laboratory	1	0	2	0
PEC 02						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105370	Computer Integrated Manufacturing	3	3	0	0

2	T303105372	Finite Element Analysis	3	3	0	0
3	T303105374	Hydraulic and Pneumatic Systems	3	3	0	0
PEC 02-LAB						
1	T303105371	Computer Integrated Manufacturing Laboratory	1	0	2	0
2	T303105373	Finite Element Analysis Laboratory	1	0	2	0
3	T303105375	Hydraulic and Pneumatic Systems Laboratory	1	0	2	0
Semester 7						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
57	T303105431	Summer Internship	2	0	0	0
58	T303105377	Field and Service Robots	3	3	0	0
59	T303105378	Field and Service Robots Laboratory	1	0	2	0
60	T303105433	Project – II	6	0	0	0
61	T303105380	Machine Learning	3	3	0	0
62	T303105381	Machine Learning Laboratory	1	0	2	0
63		PEC 03 (Compulsory Subjects: 1)	3	3	0	0
64		PEC 03 – Labs-(Compulsory Subjects: 1)	1	0	2	0
65		PEC 04 (Compulsory Subjects: 1)	3	3	0	0
66		PEC 04 – Labs-(Compulsory Subjects: 1)	1	0	2	0
67		Open Elective-2	3	3	0	0
Total			27	15	8	0
Open Elective II						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105448	Remote Sensing and Geo Informatics	3	3	0	0
2	T303105449	Real Time Systems	3	3	0	0
3	T303105450	Cyber Physical Systems	3	3	0	0
4	T303105451	Computational Number Theory	3	3	0	0
5	T303105452	VLSI System Design	3	3	0	0
PEC 03						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105386	Augmented and Virtual Reality	3	3	0	0
2	T303105388	Modern Networks	3	3	0	0
3	T303105390	Image Processing	3	3	0	0

PEC 03-LAB						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105387	Augmented and Virtual Reality Laboratory	1	0	2	0
2	T303105389	Modern Networks Laboratory	1	0	2	0
3	T303105391	Image Processing Laboratory	1	0	2	0
PEC 04						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105392	Real Time Embedded Systems	3	3	0	0
2	T303105393	Robot Operating systems	3	3	0	0
3	T303105394	Micro Electro Mechanical Systems	3	3	0	0
PEC 04-LAB						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
1	T303105395	Real Time Embedded Systems Laboratory	1	0	2	0
2	T303105396	Robot Operating systems Laboratory	1	0	2	0
3	T303105397	Micro Electro Mechanical Systems Laboratory	1	0	2	0
Semester 8						
Sr. No.	Subject Code	Subject Name	Credit	Lect	Lab	Tut
68	T303105453	Internship	14	0	28	0
Total			14	0	28	0
Total Credits			167			

8. Detailed Syllabus

Semester 1 - 1

- a. **Course Name:** Engineering Physics
- b. **Course Code:** 303192102
- c. **Prerequisite:** Knowledge of Physics and some basic concepts in Mathematics like differentiation, integration, limit, differential equation, vector calculus up to 12th science level.
- d. **Rationale:** Knowledge of physics is essential for all Engineering branches because physics is the foundation subject of all the branches of engineering and it develops the scientific temperament and analytical capability of engineering students.
- e. **Course Learning Objectives:**

CLOBJ 1	Understand the basics of quantum mechanics, including Schrödinger's equations and the physical significance of wave functions.
CLOBJ 2	Apply the Schrödinger equation to analyze particles in one-dimensional potential boxes, emphasizing practical implications and tunneling effects.
CLOBJ 3	Master concepts of energy bands, semiconductor classification, E-k diagrams, and semiconductor device analysis including P-N junction diodes.
CLOBJ 4	Comprehensively understand material classification, focusing on magnetic materials, nanomaterials, and analyzing physical, thermal, electrical, optical, and magnetic properties.
CLOBJ 5	Gain expertise in laser principles, types, and applications, as well as fiber optics principles and applications. Understand optoelectronic devices, their functionalities, and practical applications.

f. Course Learning Outcomes:

CLO 1	Understand the basics of quantum mechanics, including Schrödinger's equations and the physical significance of wave functions.
CLO 2	Apply the Schrödinger equation to analyze particles in one-dimensional potential boxes, emphasizing practical implications and tunneling effects.
CLO 3	Master concepts of energy bands, semiconductor classification, E-k diagrams, and semiconductor device analysis including P-N junction diodes.
CLO 4	Comprehensively understand material classification, focusing on magnetic materials, nanomaterials, and analyzing physical, thermal, electrical, optical, and magnetic properties.
CLO 5	Gain expertise in laser principles, types, and applications, as well as fiber optics principles and applications. Understand optoelectronic devices, their functionalities, and practical 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.	Topics	Weightage	Teaching Hours
1	UNIT-I: Modern Physics Introduction about quantum Mechanics, Schrödinger's equations, Time dependent and Time Independent Wave Equation, Physical Significance of the wave Function, Application of Schrödinger equation in particles in One Dimensional Potential Box and Tunneling effects.	20%	9

2	UNIT-II: Band Theory of Semiconductors Energy bands in solids, Classification of Materials into Semiconductors & Insulators, Density of state, E-k diagram, Kronig-Penny model (to introduce origin of band gap), and Effective mass. Direct and indirect band gap. Carrier Concentration in semiconductors, Fermi Level in Intrinsic and Extrinsic Semiconductors, P-N junction diode, Ohmic and Schottky Junction.	20%	9
3	UNIT-III: Materials Classification of materials: Magnetic materials, Nanomaterials based on semiconductors and metal oxides, Basic characteristic properties of nanomaterials, Novel Materials. Physical, Thermal, Electrical, Optical and Magnetic properties of materials.	20%	9
4	UNIT-IV: Laser and Fiber Optics Lasers: Interaction of radiation with Matter, Absorption, Spontaneous and Stimulated emission, Characteristics of Lasers, Types of Lasers: Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers. Fiber Optics: Principle and Structure of Optical Fiber, Numerical Aperture of fiber, Types of Optical Fibers, Attenuation in Optical Fibers, Applications of Optical Fibers.	20%	9
5	UNIT-V: Devices Optoelectronic Devices: Photoconductive cell, photovoltaic cell, Photodiode, Phototransistor, LED, IR emitters, Opto coupler, X-ray diffractometer, Quantum devices and their applications.	20%	9

i. Text Books:

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995)
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007)
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008)
4. Engineering Physics — HK Malek and A. K. Singh- McGraw Hill Publication
5. Semiconductor Optoelectronic Devices- P. Bhattacharya-Prentice Hall of India
6. Fundamentals of Physics- Halliday, Resnick and Walker

j. List of Practicals:

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 R_H and carrier concentration in a semiconductor.
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. Moment of Inertia of a flywheel.
11. Measurement of power loss in an optical fibre.
12. B-H Curve tracing.
13. Determination of Young's modulus.
14. Determination of thermal conductivity. (Searle's method or Lee's method)

Semester 1 - 2

a. **Course Name:** Mathematics-I

b. **Course Code:** 303191101

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 Objectives:**

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	Analyze the convergence and divergence of sequences and series, employing tests such as the Alternating Series Test and Ratio Test.
CLOBJ 4	Analyze 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	Develop understanding of fundamental mathematical concepts.
CLO 2	Formulate and solve mathematical models for real-world engineering problems.
CLO 3	Integrate knowledge from different mathematical topics to analyze and solve complex engineering problems.
CLO 4	Critically analyze mathematical results, interpret their engineering significance, and make informed decisions based on mathematical outcomes, fostering a deeper understanding of the subject.
CLO 5	Clearly and effectively communicate mathematical ideas, solutions, and reasoning, both in written and oral formats, demonstrating effective communication skills.

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.	Topics	Weightage	Teaching Hours
1	UNIT 1: Improper Integral & Application of Definite Integral Evaluation of definite and improper integrals, Beta and Gamma functions and their properties. Area bounded by curves in Cartesian and Polar form, Area of a region bounded by function, Area of a region bounded by curves in Parametric form, Volume by slicing, Volume of solid by revolution.	8%	5
2	UNIT 2: First Order Ordinary Differential Equation Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Applications.	15%	9
3	UNIT 3: Matrices Matrices & Determinants with Properties, Linear Independence, Rank of Matrix, System of Linear Equations, Consistency of System, Solution of system of Linear Equations by Gauss Jordan and Gauss-Elimination Method, Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and orthogonal Matrices, Eigenbases, Diagonalization, Cayley Hamilton Theorem and its Applications, Diagonalization, Orthogonal Transformation, Quadratic form.	25%	15

4	UNIT 4: Sequences and Series Basics of Sequences, Bounded and Monotonic Sequences, Series, Convergence of sequence and series, Geometric series, P-series, Cauchy's Integral Test, Comparison Test, Alternating Series, Absolute and Conditional convergence, Ratio test, Cauchy's Root Test, Power series, Taylor's and Maclaurin's series.	17%	10
5	UNIT 5: Fourier Series Fourier Series of 2 periodic functions, Dirichlet's conditions for representation by a Fourier series, Fourier Series of a function of period 2, Fourier Series of even and odd functions, Half range series.	10%	6
6	UNIT 6: Multivariable Calculus (Differentiation) Functions of Several Variables, Limit, Continuity, Partial Derivatives, Homogeneous function, Euler's Theorem for homogeneous function, Modified Euler's Theorem, Chain Rule, Implicit function, Jacobian, Tangent plane and Normal line, Maximum and Minimum Values, Lagrange's Multiplier, Taylor's and Maclaurin's Series for functions of two variables.	25%	15

i. Text Book and Reference Book:

1. Calculus and Analytic Geometry (TextBook)
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 (Text Book)
By Erwin Kreyszig — Willey India Education
6. A textbook of Engineering Mathematics
By N.P. Bali and Manish Goyal — Laxmi Publications

Semester 1 - 3

- a. **Course Name:** Engineering Graphics
- b. **Course Code:** 303109120
- 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 Objectives:**

CLOBJ 1	Drawing Instruments.
CLOBJ 2	Identify the Drawing Symbols, Conventions used in Engineering Drawing.
CLOBJ 3	Identify the Drawing Symbols, Conventions used in Engineering Drawing.
CLOBJ 4	Solve Engineering Problems Involving Points, Lines, Planes and Solids.
CLOBJ 5	Recognize the need of Advanced Computer Aided Tools and Software.

- f. **Course Learning Outcomes:**

CLO 1	Demonstrate the use of Drawing Instruments.
CLO 2	Identify the Drawing Symbols, Conventions used in Engineering Drawing.
CLO 3	Interpret Engineering Drawings.
CLO 4	Construct the Different types of Engineering Curves.
CLO 5	Apply Descriptive Geometry Principles to Solve Engineering Problems Involving Points, Lines, Planes and Solids.
CLO 6	Recognize the need of Advanced Computer Aided Tools and Software.

- g. **Teaching & Examination Scheme:**

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

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

h. Course Content:

Sr. No.	Topics	Weightage	Teaching Hours
1	UNIT-I: INTRODUCTION TO ENGINEERING GRAPHICS Scope of Engineering Drawing in all Branches of Engineering, Uses of Drawing Instruments and Accessories, Introduction to Drawing Standards BIS-SP-46, Representative Fraction, Types of Scales (Plain and Diagonal Scale), Dimensioning Terms and Notations, Types of Arrowheads, Lines, Lettering, Numbering and Dimensioning. .	5%	3
2	UNIT-II: ENGINEERING CURVES Classification of Engineering Curves, Application of Engineering Curves, Constructions of Engineering Curves - Conics, Spirals, Involute and Cycloids with Tangents and Normal.	10%	3
3	UNIT-III: PRINCIPLES OF PROJECTIONS Types of Projections - Oblique, Perspective, Orthographic and Isometric Projections; Introduction to Principal Planes of Projections, Projections of Points located in all four Quadrants; Projections of lines inclined to one of the Reference Plane and inclined to two Reference Planes.	10%	3
4	UNIT-IV: 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%	3
5	UNIT-V: PROJECTIONS OF SOLIDS AND SECTIONS OF SOLIDS Classifications of basic Solids, Projections of Solids - Right Regular Prism, Pyramid, Cone, Cylinder, Tetrahedron and Cube inclined to one of the Reference Plane and inclined to two Reference Planes; Frustum of Prism, Pyramid and Cone inclined to one of the Reference Plane; Types of Cutting Planes - Auxiliary Inclined Plane, Auxiliary Vertical Plane, Horizontal Cutting Plane, Profile Cutting Plane; Sections of Solids resting on H.P/V.P and Inclined to only one of the Reference Planes; Sectional Views, True Shape of the Sections.	20%	3
6	UNIT-VI: 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.	10%	3

7	UNIT-VII: ORTHOGRAPHIC PROJECTIONS Projections on Principal Planes from Front, Top and Sides of the Pictorial view of an Object, First Angle Projection and Third Angle Projection method; Full Sectional Orthographic Views – Side and Front, Offset Cutting views.	15%	4
8	UNIT-V: ISOMETRIC VIEW/DRAWING AND ISOMETRIC PROJECTIONS Conversion of Orthographic Views into Isometric Projection, View or Drawing; Isometric Scale.	15%	4
9	UNIT-IX: OVERVIEW OF COMPUTER AIDED DRAFTING TOOLS Introduction to Computer Aided Drafting Software; Preparation of Orthographic Projections and Isometric Views Using Drafting Software.	5%	4

i. Text Books:

1. Engineering Drawing (TextBook) By N.D. Bhatt & V.M. Panchal — Charotar Publishing House
2. Engineering Graphics By P. J. Shah — S. Chand & Co., New Delhi Publications.
3. Graphic Science and Design By French, T.E. Vierck, C.J & Foster — Tata McGraw Hill Publications.
4. Fundamentals of Engineering Drawing By Luzadder — W. J & Duff Prentice Hall Publications.

j. List of Practicals:

1. Introduction to Engineering Graphics: Types of lines, Letterings, Drawing Symbols, Numberings, Dimensioning Terms and Notations, Title Block, Geometric Constructions etc.
2. Drawing Sheet on Engineering Curves.
3. Drawing Sheet on Projections of Points and Lines.
4. Drawing Sheet on Projections of Planes.
5. Drawing Sheet on Projections of Solids and Sections of Solids.
6. Drawing Sheet on Development of Surfaces.
7. Drawing Sheet on Orthographic Projections.
8. Drawing Sheet on Isometric Projection/View or Drawing.
9. Prepare 2D Drawings using AutoCAD.
10. Prepare Isometric Views using AutoCAD.

Semester 1-4

- a. **Course Name:** Communication Skill
- b. **Course Code:** 303193103
- c. **Prerequisite:** Knowledge of English Language studied till 12th standard
- d. **Rationale:** Basic Communication Skills are essential for all Engineers.
- e. **Course Learning Objectives:**

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 Switchgear, Fuse, MCB, ELCB etc.

- f. **Course Learning Outcomes:**

CLO 1	Understand the importance of creative and critical thinking.
CLO 2	Expand vocabulary with proper pronunciation.
CLO 3	Comprehend the basics of English grammar.
CLO 4	Read & write effectively for a variety of contexts.
CLO 5	Develop confidence in speaking skills.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
0	2	0	2	0	100	0	0	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.	Topics	Weightage	Teaching Hours
1	UNIT-I: Crazy Scientist: The students will be taught the importance of invention and innovation using some examples that changed the world the way it worked.	5%	2
2	UNIT-II: Phonetics IPA Introduction (listening racks), Phonic Sounds Pronunciation Practice including transcription.	10%	4
3	UNIT-III: Vocabulary Building & Word Formation Process Compounding, clipping, blending, derivation, creative respelling, coining and borrowing Prefixes & suffixes, synonyms & antonyms, standard abbreviations (related activities will be provided) .	10%	2
4	UNIT-IV: Speaking Activity: Role play on Critical Thinking (Life boat) This activity topic gears towards making students do role play based on various scenarios. It involves giving them a scenario and asking them to further develop the idea in a very interesting manner, then going on to enact it. It aims to improve students' convincing skills.	10%	4
5	UNIT-V: Picture Description & Picture Connector Enable students to use vocabulary and useful expression to describe the picture. In this class the students will be trained to form logical connections between a set of pictures which will be shared with them. This geared towards building creativity and presentation skills.	15%	2
6	UNIT-VI: Mine Activity: Usage of Preposition: Students will learn to use proper propositions by active participation in the activity.	8%	2

7	UNIT-VII: Worksheets on Identifying Common Errors in Writing: Sentence structure, Punctuations, Subject-Verb Agreement, Noun-Pronoun Agreement	12%	2
8	UNIT-V: Reading Skills The art of effective reading and its various strategies to be taught to the learners and practice exercises be given on reading comprehension.	10%	2
9	UNIT-IX: Speech and spoken Exchanges; Extempore: Students will learn the correct usage of spoken language as different from the written form. It will help the students in extempore speech. This will be done by making the students give variety of impromptu speeches in front of the class: 1 minute talk on simple topics. To change the average speakers in the class to some of the best Orator.	10%	4
10	UNIT-X: Book Review The learners will identify the central idea of the book, author's style and approach towards the book. This will enable the learners to express their point of view and hone their creativity and writing skills.	10%	4
11	UNIT-V: Activity Session This will enhance the creative thinking among students. To develop their interpersonal communication skills.	0%	2

***Continuous Evaluation:**It consists of Assignments/Seminars/Presentations/Quizzes/ Surprise Tests (Summative/MCQ) etc.

i. Text Books:

1. Understanding and Using English Grammar Betty Azar & Stacy Hagen; Pearson Education.
2. Business Correspondence and Report Writing SHARMA, R. AND MOHAN, K.
3. Communication Skills Kumar S and Lata P; New Delhi Oxford University Press.
4. Technical Communication: Principles and Practice, Sangeetha Sharma, Meenakshi Raman; Oxford University Press.
5. Practical English Usage MICHAEL SWAN.
6. A Remedial English Grammar for Foreign Student F.T. WOOD.
7. On Writing Well, William Zinsser; Harper Paperbacks, 2006; 30th anniversary edition.
8. Oxford Practice Grammar, John Eastwood; Oxford University Press.

Semester 1-5

a. **Course Name:** Computational Thinking for Structured Design-1

b. **Course Code:** 303105104

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 Objectives:**

CLOBJ 1	Programming basics and the fundamentals of C.
CLOBJ 2	Data types in C.
CLOBJ 3	Mathematical and logical operations.
CLOBJ 4	Using if statement and loops.
CLOBJ 5	Arranging data in arrays.
CLOBJ 6	Implementing pointers.

f. **Course Learning Outcomes:**

CLO 1	Able to understand the basic knowledge of Computer fundamental and its application in computers.
CLO 2	Able to understand the basic concepts of C programming language.
CLO 3	Able to design and develop various programming problems using C programming concepts.
CLO 4	Able to Implement advance C programming concepts like function, pointer, structure and union etc.
CLO 5	Able to understand the file handling using C Programming 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	UNIT-I: Introduction to C language History of C language, Program Development Steps, Structure of C program	10%	3
2	UNIT-II: Data Types, User I/O and Operators Data Types Extended and Derived Data types, Variables User I/O : Formatted, predefined Functions of stdio.h header file Operators: Types of operators, Precedence, Associativity.	10%	6
3	UNIT-III: Conditional Flow Statements: Iterative Statements, Jumping Statements and Pointers: Conditional Flow Statements: Simple if, ifelse, else-if ladder, switch case Decision Making using conditional statements Iterative Statements: Control Entry and Control Exit Loops Jumping Statements: break, continue, forward and backward goto. Pointers: Typed: single double, triple..wild, NULL, Const, untyped, void.	15%	9
4	UNIT-IV: Functions: Functions : Call by value, call by references, Types of Functions. Pointer Functions: Calling A function through function pointer, Passing A function's address as an Argument to other function, Types of Pointer function Creation. Recursion : Types of Recursions : Direct Recursion, Indirect Recursion, Tail Recursion, No tail/Head Recursion, Tree Recursion, Nested Recursion. Storage classes : Auto, register, static and Extern.	30%	10
5	UNIT-V: Arrays: Arrays: Types of arrays, Declaration and Defining an array Pointer and Arrays: Types of Accessing Array elements Subscripting pointer variables Pointer to an array, Array of pointers, Pointers and two dimensional arrays Subscripting pointer To an array, Array of Functions : Strings: Strings v/s character arrays, Initializing strings, Reading and Displaying string Types of string format Specifiers. puts() functions, Multi Line string Input String pointers, Two-dimensional character arrays or array of string Array of pointers to strings, String handling functions.	35%	14

i. Text Books:

1. C Programming by Bala Guru Swamy (TextBook)
2. C for all by s.Thammarai Selvi ,R Murugesan, Anuradha Publications.
3. Programming in C Ajay Mittal, Pearson.

j. List of Practicals:

1. Installation C IDE, Basic Structure of C program. Format Specifiers, Escape Character. Run time input/Output Programs.
2. Write a c program to calculate Area of Rectangle, Perimeter of a Rectangle and Diagonal of a Rectangle.
3. The total distance traveled by vehicle in 't seconds is given by distance $s = ut + \frac{1}{2}at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec²). Write a C program to find the distance traveled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
4. Write a C program to find the sum of individual digits of a positive integer.
5. A Fibonacci sequence is defined as follows: the first and second terms in the
6. Write a C program to find the roots of a quadratic equation.
7. Write C programs that use both recursive and non-recursive functions. 1. To find the factorial of a given integer.
8. To find the GCD (greatest common divisor) of two given integers.
9. Write a C program to find the largest integer in a list of integers,
10. Write a C program that displays the position or index in the string S where the string T begins, or -1 if S doesn't contain T
11. Write a C program to generate Pascal's triangle.
12. Write a C program to convert a Roman numeral to its decimal Equivalent.
13. Write a c program to take multiline string input and print individual string length .
14. Write a c program to reverse the individual word of a given string Explanation: input : Welcome To Bytexl output: emocleW oT lxetyB.

Semester 1-6

- a. **Course Name:** Environmental Science
- b. **Course Code:** 303104105
- 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 Objectives:**

CLOBJ 1	Apply systems thinking to analyze 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	Analyze the causes, effects, and control measures of population explosion.

- f. **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.

- 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.	Topics	Weightage	Teaching Hours
1	UNIT-I: 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 pyramids, Pyramid of number, Pyramid of energy and pyramid of biomass.	25%	7
2	UNIT-II: 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	UNIT-III: 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 Modeling (BIM) and City Finance Approach to Climate-Stabilizing Targets (C- FACT), Life Cycle Assessment, Bioinformatics and Optimization tools for sustainable development.	25%	7

4	UNIT-IV: 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, 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, HyperCat, 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.	30%	10
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i. Text Books:

1. Textbook of Environmental Studies For Undergraduate Courses (Text Book) 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 M N Rao , H .V N Rao — McGraw Hill Publishing Company Limited, New Delhi.

Semester 2 - 1

- a. **Course Name:** Computational Thinking for Structured Design-2
- b. **Course Code:** 303105151
- c. **Prerequisite:** A foundational understanding of logic and problem-solving is a prerequisite for computational thinking in structured design.
- d. **Rationale:** Computational thinking is integral for structured design as it fosters a systematic approach to problem-solving, breaking down complex issues into manageable components. By applying computational thinking principles, individuals can create well-organized and efficient structured designs, promoting clarity, maintainability, and scalability in software development. This methodology aligns with the logical and step-by-step nature of structured design, enhancing the overall effectiveness of the development process.
- e. **Course Learning Objectives:**

CLOBJ 1	Develop a deep understanding of foundational computational thinking concepts and their application in problem-solving.
CLOBJ 2	Demonstrate proficiency in creating structured designs using appropriate programming constructs and methodologies.
CLOBJ 3	Apply algorithmic thinking to decompose complex problems into manageable components, enhancing systematic problem-solving abilities.
CLOBJ 4	Evaluate and refine structured designs through critical analysis, promoting clarity, efficiency, and scalability in software solutions.

- f. **Course Learning Outcomes:**

CLO 1	Develop proficiency in breaking down complex problems into manageable components, demonstrating a mastery of foundational computational thinking concepts.
CLO 2	Apply structured design principles to create efficient and well-organized algorithms, fostering a systematic approach to problem-solving in various domains.
CLO 3	Demonstrate the ability to design and implement structured programs using appropriate programming languages, showcasing practical skills in translating algorithms into executable code.
CLO 4	Cultivate a problem-solving mindset, emphasizing analytical thinking, algorithmic reasoning, and code optimization for developing scalable and maintainable software solutions.

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	UNIT-I Dynamic Memory Allocation: malloc, calloc, realloc and free, Array of pointers, Programming Applications, Dangling Pointer	10%	6
2	UNIT-II Preprocessor Directives: File Inclusion, Macros, Conditional Compilation and Pragmas.	10%	6
3	UNIT-III: Enumerators, Structures, Unions: Enumerators: Enumerator Types Structures: Declaration Initialization Accessing Structures, Complex Structures, Structure and Functions Array of structures Arrays within structures Anonymous structures Nested structures pointers in structures Self-referential structures Structure Padding Unions: Bit fields Typedef	15%	15
4	UNIT-IV: Searching and Sorting: Selection sort, Bubble Sort, Insertion sort, Quick sort and Merge Sort Linear and Binary Searching Techniques	30%	3
5	UNIT-V: Data Structures: List- Linear List: : Singly Linked List - CRUD operations Double Linked List -CRUD operations Circular Linked List- CRUD operations	35%	15

i. Text Books:

1. Fundamentals of Data Structures in C, 2ND eDITION, E.Horowitz, S.,Sahni and Susan Anderson- Freed, Universities Press (TextBook)
2. Computer Programming & Data Structures - E. Balaguruswamy,4th Edition TMH
3. C & Data Structures - P . Padmanabham,Third Edition,B.S Publications
4. Classic Data Structures - D.samanta

j. List of Practicals:

1. Write a c program to increase or decrease the existing size of an 1D array. 2. Write a c program on 2D array to Increase & Decrease i) No of subarrays ii) elements in the subarrays.
2. Write a to display present date and time using c language. 2. Write a c program to demonstrate pre-processor directives i) Macros ii) Conditional Compilation.
3. Write a C program that uses functions to perform the following Operations. i) Reading a complex number ii) Writing a complex number iii) Addition of two complex numbers iv) Multiplication of two complex numbers 2. Write a c program to store records of n students based on roll_no, name, gender and 5 subject marks i) Calculate percentage each student using 5 subjects. ii) Display the student list according to their percentages.
4. Write a C program to store n employee records based on EMP_ID,EMP_NAME,EMP_DEPTID,EMP_PHNO,EMP_SALARY and display all the details of employees using EMP_NAME in sorted order.
5. Write a c program to implement selection Sort & Bubble sort 2. Write a C program to reverse the elements within a given range in a sorted list. Example : input : 10 9 1 2 4 3 4 6 7 8 10 3 8 output: 1 2 8 7 6 4 4 3 9 10 the sorted list of given array elements is 1 2 3 4 4 6 7 8 9 10 , after reversing the elements with in the range 3 and 8 is 1 2 8 7 6 4 4 3 9 10.
6. Write a c program to implement Insertion sort & Quick sort
7. Write a c program to sort the given n integers and perform following operations i) Find the products of every two odd position elements ii) Find the sum of every two even position elements Explanation: Input : 9 1 9 8 3 5 4 7 2 6 Output: 3 15 35 63 6 10 14 The sorted list of given input is 1 2 3 4 5 6 7 8 9, the product of alternative odd position elements is $1*3 = 3, 3*5=15, 5*7=35...$ and the sum of two even position elements $2+4 =6, 4+6=10$.
8. Write a C Program to implement Merge Sort.
9. Write a c program to sort in ascending order and reverse the individual row elements of an mxn matrix.
10. Write a c program to perform linear Search. 2. Write a c program to perform binary search.
11. Write a c program to Create a single Linked list and perform Following Operations A. Insertion At Beginning B. Insertion At End C. Insertion After a particular node D. Insertion Before a particular node E. Insertion at specific position F. Search a particular node G. Return a particular node H. Deletion at the beginning I. Deletion at the end J. Deletion after a particular node K. Deletion before a particular node L. Delete a particular node M. Deletion at a specific position.
12. Write a program to Reverse a singly Linked list. 2. Write a c program to check whether the created linked list is palindrome or not.
13. Write a c program to Create a Circular Linked list and perform Following Operations A. Insertion At Beginning B. Insertion At End C. Insertion After

a particular node. D. Insertion Before a particular node E. Insertion at specific position F. Search a particular node G. Return a particular node H. Deletion at the beginning I. Deletion at the end J. Deletion after a particular node K. Deletion before a particular node L. Delete a particular node M. Deletion at a specific position

14. Write a c program to Create a Circular single Linked list and perform Following Operations A. Insertion After a particular node B. Insertion Before a particular node C. Search a particular node D. Return a particular node E. Deletion before a particular node F. Delete a particular node.
15. Write a c program to Create a Circular Double Linked list and perform Following Operations A. Insertion After a particular node B. Insertion Before a particular node C. Search a particular node D. Return a particular node E. Deletion before a particular node F. Delete a particular node.

Semester 2 - 2

a. **Course Name:** Mechanics of Solids

b. **Course Code:** 303104155

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 Objectives:**

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.

f. **Course Learning Outcomes:**

CLO 1	Apply fundamental principles of mechanics & principles of equilibrium to simple and practical problems of Engineering.
CLO 2	Determine centroid and moment of inertia of a different geometrical shape and able to understand its importance.
CLO 3	Apply principles of statics to determine reactions & internal forces in statically determinate beams.
CLO 4	Know basics of friction and its importance through simple applications.
CLO 5	Understand behaviour & properties of engineering materials.

g. Teaching & Examination Scheme:

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

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

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	INTRODUCTION: Forces/Equilibrium of Rigid body, Scalar and vectors, system of forces, resultant force, Statics of particles. Free-body diagrams. Equilibrium of particle in two dimensions, Resultants of three or more concurrent forces, Resolution of a force into components. Rectangular components of a force. Resultants by rectangular 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, Equilibrium, Non-coplanar Non-concurrent Forces.	15%	8
2	CENTROID MOMENT OF INERTIA CENTROID MOMENT OF INERTIA: Distributed forces: Centroid and centre of gravity. Determination of centroid of lines and areas using integral technique, Determination of centroid of composite wires and areas, 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%	8
3	BEAMS Definitions, types of beams, types of loading, types of supports. Determination of reactions for simply, Supported and overhanging beams. Relation between distributed load, Shear force and Bending Moment, Shear force and Bending moment in beams with diagrams	20%	10
4	FRICTION The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Analysis of systems involving dry frictions such as ladders spheres etc., Belt Friction, Analysis of flat and v-belt.	25%	8

5	SIMPLE STRESSES & STRAINS Basics of stress and strain: 3-D state of stress (Concept only), Normal/axial stresses: Tensile & compressive Stresses: Shear and complementary shear Strains, Linear, shear, lateral, thermal and volumetric. Hooke's law, Elastic Constants: Modulus of elasticity, Poisson's ratio.	25%	11
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i. Text Books:

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 Signals and Systems" by Simon Haykin and Barry Van Veen.

j. List of Practicals:

1. Equilibrium of Coplanar-Concurrent force system (Law of Parallelogram of forces) by analytical method.
2. Equilibrium of Coplanar-Concurrent force system (Law of Parallelogram of forces) by graphical method.
3. Equilibrium of Coplanar-Concurrent force system (Law of Polygon of forces) by analytical method.
4. Equilibrium of Coplanar-Concurrent force system (Law of Polygon of forces) by graphical method.
5. Equilibrium of Coplanar non-concurrent forces (theory).
6. Equilibrium of Coplanar non-concurrent forces (performance).
7. Theorem Equilibrium of parallel force system - Simply Supported Beam.
8. Verification of principle of the moment: Bell crank lever.
9. Determination Coefficient of static friction (theory).
10. Determination Coefficient of static friction (performance).
11. Brinell Hardness test.
12. Izod impact test.
13. Compression test on timber.
14. Transverse test on Timber.
15. Tensile test on mild steel.

Semester 2 - 3

a. **Course Name:** Workshop

b. **Course Code:** 303100101

c. **Prerequisite:** Zeal to learn the subject.

d. **Rationale:** T: The workshop practice is the backbone of the real industrial trades which helps to develop and enhance relevant technical hands-on experience of using various tools and instruments related to various trades. The use of workshop practices in day to day industrial as well domestic life helps to solve the problems. Further, it also deals with basic introduction of system components of electrical and electronic systems, and provides hands on practice in assembling, interconnecting, testing, and repairing such system by making use of various tools used in electrical and electronic workshop. Electronic systems are built on printed circuit board (PCB) and breadboard. One need to use source instruments (power sources and signal sources), and appropriate measuring instruments to study behaviour of a system.

e. **Course Learning Objectives:**

CLOBJ 1	Provide an overview of the principles, scope, and importance of mechanical engineering, including its various sub-disciplines and applications.
CLOBJ 2	Emphasize and enforce safety protocols, practices, and procedures to ensure a safe working environment within a mechanical workshop.
CLOBJ 3	Measurement Techniques and Instruments: Familiarize students with various measurement techniques and instruments used in mechanical engineering, emphasizing precision and accuracy in measurements.
CLOBJ 4	Introduce students to basic manufacturing processes such as machining, casting, forming, and welding, providing insights into how different materials are shaped and manipulated.
CLOBJ 5	Hands-on Experience with Tools and Equipment: Familiarize students with basic tools, machines, and equipment commonly used in mechanical engineering through hands-on activities and demonstrations in a workshop setting.

f. Course Learning Outcomes:

CLO 1	Comprehend the safety measures required to be taken while working in workshop.
CLO 2	Select the appropriate tools required for specific operation.
CLO 3	Understand the different manufacturing technique for production out of the given raw material.
CLO 4	Understand applications of machine tools, hand tools and power tools.
CLO 5	Understand the importance of the safety measures to be taken while working in the laboratory and safety standards
CLO 6	Understand working principle of various electrical & electronics measurement equipment. Also, the safety measures to be taken while working in the laboratory and safety standards.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
0	-	4	2	0	20	20	0	60	100

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

h. Text Book

1. Electronic Principles by Albert Paul Malvino — TMH
2. Electronic Devices by Thomas L. Floyd — Pearson, Prentice Hall "Linear Systems and Signals" by B.P. Lathi.
3. Electronic Devices and Circuits by David A. Bell — Oxford Publication
4. Electronic Devices and Circuits by Jacob Millman and Halkias — Tata McGraw Hill Publication New Delhi.
5. Shop Theory by Anderson James & Earl E. Tatro — Macmillan/McGraw-Hill School.
6. Workshop Technology by Bava H. S. — Tata McGraw Hill Publishing Co. Ltd.
7. Elements of Workshop Technology Vol. I By Hajra Chaudhary S.K. — Asia Publishing House.

8. Workshop Technology by Chapman, W.A.J. ELBS Low Price Text — Edward Donald Pub. Ltd.
9. Basic Machine Shop Practice Vol. I & II By Tejawani, V.K. — Tata McGraw Hill Pub. Co.
10. Workshop Technology Vol. I & II By Arora, B.D. — Satya Prakashan, New Delhi” Signals and Systems” by Simon Haykin and Barry Van Veen.

i. List of Practiclas:

1. Study of Digital Multi meter and Measurement of voltage, current, frequency, phase difference, power, power factor for single phase supply using Digital Millimeter.
2. To study about safety, Electric shock, First aid for electric shock and other Hazards of electrical Laboratories and Safety rules.
3. Identification and symbolic representation of basic passive components
4. Understanding of working and specifications of CRO and Function generator
5. Identification, symbolic representation and testing of various electronics components (including SMD).
6. To understand working and specifications of DC regulated Power supply.
7. Understanding soldering techniques and practicing proper soldering and de-soldering.
8. Overview of PCB layout designing and fabrication.
9. Study of different types of cables, wires, probes, connectors
10. To understand series & parallel type of connections and to perform Bulb wiring, Fan wiring, Tube-light wiring
11. To perform staircase wiring, double stair case wiring, and Go-down wiring.
12. Demonstration of Fuse, MCB along its operation and study of ELCB. Prepare installation diagram for a newly built room, Simple room wiring with one fan, one tube-light and one bulb with switch board
13. Introduction to Workshop Layout and Its Importance
14. Introduction to Industrial Safety
15. Introduction to Measuring Instruments
16. Fitting and Drilling Practice
17. Carpentry Practice
18. Sheet Metal Practice
19. Smithy Practice
20. Metal Joining Processes: Welding and Soldering Practice
21. Plumbing Practice
22. Metal Cutting on Lathe machine.

Semester 2 - 4

a. **Course Name:** Mathematics-II

b. **Course Code:** 303191151

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 Objectives:**

CLOBJ 1	Define and identify ordinary differential equations of higher order. Classify ODEs based on homogeneity and linearity. Solve homogeneous linear ODEs of higher order with constant coefficients, and variable coefficients.
CLOBJ 2	Solve homogeneous linear ODEs of higher order with constant coefficients, variable coefficients
CLOBJ 3	Apply the Method of Undetermined Coefficients to solve nonhomogeneous ODEs. Utilize the Solution by Variation of Parameters for solving nonhomogeneous ODEs. Explore applications of ODEs in real-world scenarios.
CLOBJ 4	Understand power series solutions for ordinary points and regular singular points. Explore properties and applications of Legendre polynomials and Bessel functions.
CLOBJ 5	Define Laplace transform and its inverse. Understand the linearity property of Laplace transforms. Solve ordinary differential equations using Laplace transforms.

f. **Course Learning Outcomes:**

CLO 1	Demonstrate the ability to translate physical or engineering problems into mathematical equations and solve them.
CLO 2	Develop analytical and critical thinking skills through the process of solving complex mathematical problems.
CLO 3	Understand and interpret mathematical solutions in the context of the given problems.
CLO 4	Communicate mathematical concepts and solutions clearly and effectively, both in written and verbal forms.
CLO 5	Present mathematical arguments and solutions in a logical and organized manner.

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.	Topics	Weightage	Teaching Hours
1	UNIT 1: Higher order ordinary differential equations: Ordinary differential equations of higher orders, Homogeneous Linear ODEs of Higher Order, Homogeneous Linear ODEs with Constant Coefficients, Euler–Cauchy equations, Nonhomogeneous ODEs, Method of Undetermined Coefficients, Solution by Variation of Parameters, Applications	8%	5
2	UNIT 2 Power Series: Power series solutions at ordinary point and regular singular point; Legendre polynomials, Bessel functions of the first kind and their property	15%	9
3	UNIT 3 Laplace Transform: UNIT 3 Laplace Transform: Laplace Transform and inverse Laplace transform, Linearity, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals, ODEs, UNIT Step Function (Heaviside Function), Second Shifting Theorem (t-Shifting), Laplace transform of periodic functions, Short Impulses, Dirac's Delta Function, Convolution, Integral Equations, Differentiation and Integration of Transforms, Solution of ordinary differential equation by Laplace transform	25%	15
4	UNIT 4 Fourier Integral : Fourier Integral, Fourier Cosine Integral and Fourier Sine Integral	17%	10
5	UNIT 5 Vector Calculus: Gradient of scalar field, Directional Derivative, Divergence and curl of Vector field, Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	10%	6

6	UNIT 6 Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Triple integrals (Cartesian)	25%	15
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i. Text Books:

1. Advanced Engineering Mathematics (TextBook) By Erwin Kreyszig — Willey India Education
2. Calculus with early transcendental functions By James Stewart — Cengage Learning
3. Higher Engineering Mathematics By B. S. Grewal — Khanna Publications
4. Calculus and Analytic Geometry (TextBook) By G.B. Thomas and R.L. Finney — Addison Wesley A text book of Engineering Mathematics By N.P. Bali and Manish Goyal — Laxmi Publications

Semester 2 - 5

- a. **Course Name:** Advanced Communication & Technical Writing
- b. **Course Code:** 303193152
- c. **Prerequisite:** Knowledge of English Language studied till 12th standard
- d. **Rationale:** Communication confidence laced with knowledge of English grammar is essential for all engineers.
- e. **Course Learning Objectives:**

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 Switchgear, Fuse, MCB, ELCB etc.

- f. **Course Learning Outcomes:**

CLO 1	Develop four basic skills
CLO 2	Construct grammatically correct sentences.
CLO 3	Develop and deliver professional presentation skills.
CLO 4	Develop the skills of critical thinking.
CLO 5	Compare different types of written communication.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
0	2	0	2	0	100	0	0	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.	Topics	Weightage	Teaching Hours
1	UNIT-I: Developing Effective Listening Skills: To help students understand the meaning and importance of good listening skills, learning the traits of being a good listener through activity and listening audio tracks..	10%	2
2	UNIT-II: Error analysis: To provide insights into the complicated processes of language development as well as a systematic way for identifying, describing and explaining errors. (Tenses, Voices, Reported speech)	10%	4
3	UNIT-III: Delivering different types of speeches: Students will understand and use the different patterns for structuring speeches, Welcome / Introductory speech Vote of Thanks speeches, Farwell speeches .	10%	2
4	UNIT-IV: Professional Presentations : Students will learn Combating stage fright, Preparing power point presentation Delivering PPT.	10%	5
5	UNIT-V: Essay writing : Students will overcome the common pitfalls in the task of essay writing by understanding, Basics of Paragraph development and paragraph jumble, Types of essays, Characteristic features of essays, Guiding Principles.	10%	4
6	UNIT-VI: Reading Comprehension: : Employing Different Reading Skills, Activity, Practice	10%	2
7	UNIT-VII: Project Proposal: To equip students with the various elements required to prepare a winning proposal.	5%	2
8	UNIT-V: Misplaced Modifiers Students will understand how to place the improperly separated word, phrase or clause from the word it describes.	5%	1

9	UNIT-IX: Movie Review: A movie show followed by writing a review. To provide an exposure to students how to express their opinions about some film or documentary with unbiased and objective approach.	10%	2
10	UNIT-X: Narrative Writing: Narrative writing helps them explore different characters and settings. To help students clarify their thinking, and teach them to express that in writing in an organized way.	5%	2
11	UNIT-XI: Activity Session Process of writing, Order of writing, Final draft & checklist for reports, Sample reports, Memorandum, Letter report	10%	2
12	UNIT-XII: Critical Thinking Need, relevance and Significance of Critical Thinking, Logic in problem solving and decision making (activities), Moral Reasoning (Case Studies)	5%	1
13	UNIT-XIII: Activity Session (Presentation) An activity where the scene of a press conference is created in the class. Students are encouraged to ask sharp questions and in turn are invited to assume roles of famous personalities, thus answering the questions posed.	0%	1

***Continuous Evaluation:** It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Text Books:

1. Business Correspondence and Report Writing SHARMA, R. AND MOHAN, K.
2. Communication Skills Kumar S and Lata P; New Delhi Oxford University Press Practical English Usage MICHAEL SWAN
3. A Remedial English Grammar for Foreign Student F.T. WOOD\
4. On Writing Well William Zinsser; Harper Paperbacks, 2006; 30th anniversary edition
5. Oxford Practice Grammar, John Eastwood; Oxford University Press Technical Communication : Principles And Practice Sangeetha Sharma, Meenakshi Raman; Oxford University Press

Semester 2 - 6

- a. **Course Name:** Electrical and Electronics Engineering
- b. **Course Code:** 303106103
- c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12th science level.
- d. **Rationale:** The course provides introductory treatment of the field of Electrical Engineering to the students of various branches of engineering.
- e. **Course Learning Objectives:**

CLOBJ 1	Master analysis techniques including Kirchhoff's laws, simplification methods, superposition, Thevenin's, and Norton's theorems for effective DC circuit analysis.
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	Understand different single phase and three phase circuits.
CLOBJ 4	Learn diode behaviours, rectification techniques, and transistor functions as switches and amplifiers in electronic circuits.
CLOBJ 5	Understand sensors and transducers, their applications, and differentiate between their types and functionalities in electronic systems.

- f. **Course Learning Outcomes:**

CLO 1	UTo Illustrate basic concepts of various laws, principles and theorems associated with DC circuits for networks analysis.
CLO 2	To apply concepts of sinusoidal voltages, power relationships and showcasing knowledge of AC circuit theory using numerical and graphical representation.
CLO 3	To Compare and apply diode and transistor fundamentals, including characteristics, operation, and applications, demonstrating awareness of electronics principles.
CLO 4	To design, and implement various types of voltage regulator circuits, and understanding of power supply concepts and practical applications.
CLO 5	To adept, classify, and apply various electronic sensors and transducers, for understanding of their principles and real-world 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.	Topics	Weightage	Teaching Hours
1	UNIT-I: 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..	10%	5
2	UNIT-II: AC Circuits 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, 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, the concept of active, reactive and apparent power and power factor,. Voltages, currents and power relations three-phase have balanced star-connected loads and delta-connected loads along with phasor diagrams.	30%	15

3	UNIT-III: Diode and Transistors Introduction to Ideal Diode, Effect of temperature Ideal diodes, unbiased diode and Forward and reverse bias of Diode. PIV, surge current, Diode as Uncontrolled switch. Rectifiers: Half wave, Full wave, and bridge wave. Ripple factor, PIV rating. Choke and Capacitor input filter rectifiers, Clipper and Clamper circuits, Voltage multiplier: Construction and working of BJT, Characteristics & specifications of BJT (PNP & NPN transistors), Biased and unbiased BJT, Configuration of the transistor, the concept of gain & BW, Operation of BJT in the cut-off, saturation & active regions (DC analysis), BJT as a switch, Transistor as an amplifier, Voltage divider bias and analysis, VDB load line and Q point.	30%	15
4	UNIT-IV: Voltage Regulator Lasers: Interaction of radiation with Matter, Absorption, Spontaneous and Stimulated emission, Characteristics of Lasers, Types of Lasers: Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers. Fiber Optics: Principle and Structure of Optical Fiber, Numerical Aperture of fiber, Types of Optical Fibers, Attenuation in Optical Fibers, Applications of Optical Fibers.	15%	5
5	UNIT-V: Sensors and Transducers Introduction to sensors and Transducers, Comparison between sensors and Transducers, Applications of Sensors and Transducers, Types of Electronic sensors, Types of Transducers.	15%	5

i. Text Books:

1. A text book of Electrical technology Vol2, By B.L.Theraja — S. Chand Publication.
2. Electrical Engineering Fundamentals (TextBook), By V. D. Toro — Prentice Hall India — 2, Pub. Year 1989.
3. Electrical and Electronics Technology , By E. Hughes — Pearson — 10, Pub. Year 2010.
4. Basic Electrical Engineering , By D. P. Kothari and I. J. Nagrath, — Tata McGraw Hill — 3, Pub. Year 2010.
5. Basic Electrical Engineering, By D. C. Kulshreshtha — McGraw Hill — 1, Pub. Year 2009.
6. Fundamentals of Electrical Engineering, By Leonard S. Bobrow — Oxford University Press — 2, Pub. Year 1996.

j. List of Practicals:

1. To Study about Various Electrical and Electronics Symbols and demonstrate various measuring instruments used in Basic electrical Engineering laboratory.
2. To Perform and Solve Electrical Networks with Series and Parallel Combinations of Resistors Using Kirchhoff's Laws.
3. To Obtain Inductance, Power and Power Factor of the Series RL Circuit With AC Supply Using Phasor Diagram.
4. To Obtain Capacitance, Power and Power Factor of the Series RC Circuit With AC Supply Using Phasor Diagram.
5. To Obtain Inductance, Capacitance, Power and Power Factor of the Series R-L-C Circuit With AC Supply Using Phasor Diagram.
6. Verification of superposition theorem with dc source.
7. Verification of Thevenin's theorem with dc source.
8. Verification of Norton's theorems in dc circuits.
9. Verification of Current and Voltage Relations in Three Phase Balanced Star and Delta Connected Loads.
10. To study the cut-section of a dc machine, single phase induction machine and three phase induction machine.
11. Find out the Efficiency and Voltage Regulation of Single Phase Transformer by Direct Load Test.
12. To Plot V-I characteristics Diodes. (a) PN junction diode Characteristics, (b) Zener Diode characteristics.
13. To Observe Rectifier Circuit (a) Half wave Rectifier without filter, (b) Full wave rectifier without filter, (c) Half wave
14. To Observe Response of Clipping and Clamping circuits using diodes (a) Diode Positive Clipper without and with Biased clipper, (b) Diode Negative Clipper without and with Biased clipper, (c) Biased Positive Negative Clipper (Combinational Clipper), and (d) Positive Clamper, and Negative Clamper.
15. Designing of power supply using IC regulator circuit. (a) Designing of +5 Volt DC Power Supply using 7805, (b) Designing of -5 Volt DC Power Supply using 7905, (c) Designing of +12 Volt DC Power Supply using 7812, and (d) Designing of -12 Volt DC Power Supply using 7912.
16. (a) To Plot and Study input-output characteristics of Common Base (B) configuration of the Transistor and (b) To Plot and Study input-output characteristics of common Emitter (CE) configuration of Transistor.
17. To study the Voltage divider bias circuit: (a) To observe the effect of change in base current on the Q-operating point, and (b) To set Q point for operation of a transistor amplifier in the linear region.
18. To plot characteristics of Schottky and Varactor diode.
19. Designing of Linear Adjustable Regulator using IC LM317.
20. Introduction to Sensors and Transducers.