SCHEME OF INSTRUCTION AND SYLLABI (R-26)

OF

B.E. I to VIII SEMESTERS OF FOUR-YEAR DEGREE COURSE

IN

ELECTRICAL & ELECTRONICS ENGINEERING

(In line with AICTE Model Curriculum with effect from AY 2026-27)

(R–26 Regulation)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(Autonomous)

Affiliated to OU, Approved by AICTE, Accredited by NBA, NAAC (A++)

Kokapet Village, Gandipet Mandal, Hyderabad– 500 075, Telangana

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(Autonomous)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INSTITUTE VISION AND MISSION

VISION

To be a Center of Excellence in Technical Education and Research

MISSION

To address the emerging needs through quality Technical Education and Advanced Research

DEPARTMENT VISION & MISSION

VISION

To achieve Academic and Professional Excellence in Teaching and Research in the frontier areas of Electrical and Electronics Engineering Vis-a -Vis serve as a Valuable Resource for Industry and Society.

MISSION

Empowering the Faculty and Student Rendezvous to Nurture Interest for Conceptual Keystone, Applied Multidisciplinary Research, and Inspiring Leadership and Efficacious Entrepreneurship culture, Impeccable Innovation in frontier areas to be synergetic with Environmental, Societal and Technological Developments of the National and International community for Universal Intimacy.

M1: Emphasis on providing Strong Theoretical Foundation & Engineering Leadership Eminence, infusion of Creativity and Management skills while maintaining Ethics and Moral for Sustainable Development. **(Individual development)**

M2: Enable the Faculty and Student Interactions to trigger interest in Applied Multidisciplinary Research and Entrepreneurship Culture resulting in Significant Advancement of the field of Specialization with Involvement of Industries and Collaborative Educational Networks. **(Sense of Ownership, Networking and Eco system Development)**

M3: Extend the Conducive Neighborhoods for Innovation in frontier areas to keep pace with Environmental, Societal and Technological Developments of the National and International Community to Serve Humanity. **(Service to Society, Atmanirbhar Bharat)**

PROGRAME EDUCATIONAL OBJECTIVES (PEOS):

PEO1: Graduates will Ennoble in offering Design solutions for Complex Engineering Problems using appropriate modern Software tools, with the specified need of the Industry and Protagonist in transforming the Society into a Knowledge Society.

PEO2: Graduates will Elevate Engineering Leadership and will be recognized as Experts working in in Government, Consulting firms, international organizations with their Creativity in Design of Experiments, Analysis and Interpretation of Data and Synthesis of Information.

PEO3: Graduates will Exalt in their Professional career by Persistence in Teamwork, Ethical behavior, Proactive involvement, and Effective Communication.

PEO4: Graduate will Excel by becoming Research, Professors and Entrepreneurs who will create and disseminate new knowledge in the frontier areas of Engineering, Technology and Management

PROGRAM OUTCOMES (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for and have the preparation and ability for i) Independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSOS):

PSO1: Evaluate complex Engineering Problems to meet the distinct need of Industry & Society, by utilizing knowledge of Mathematics, Science, Emerging Technologies such as AI, Block chain & IT tools.

PSO2: Exhibit Latent talent in understanding the Engineering and Administration standards at workplace as a team leader to manage Projects in the Multi-Disciplinary Environments.

PSO3: Establish Engineering Expertise in Power system, Machines and Drives Systems and Pursue Research in the Frontier areas such as Embedded systems, Renewable Energy, E-Mobility and Smart grid.

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

(In line with AICTE Model Curriculum with effect from AY 2026-27) (R26)

SEMESTER – I

S. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			SEE in Hours	Maximum Marks		
			L	T	P / D		CIE	SEE	
THEORY									
1	26MTC02	Matrix Theory and Advanced Calculus	3	1	-	3	40	60	4
2	26CYC05	Engineering Chemistry	3	-	-	3	40	60	3
3	26EEC01	Basic Electrical Engineering	3	-	-	3	40	60	3
4	26CSC01	Problem Solving and Programming using C	3	-	-	3	40	60	3
5	26ADC01	Artificial Intelligence Foundations and Applications	2	-	-	-	40	60	2
PRACTICAL									
6	26CYC06	Engineering Chemistry Lab	-	-	3	3	50	50	1.5
7	26EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	26CSC02	Problem Solving and Programming using C Lab	-	-	3	3	50	50	1.5
9	26MEC01	Robotics and Drones Lab	-	-	3	3	50	50	1.5
10	26MBC02	Community Engagement	-	-	2	-	50	-	1
TOTAL			**14**	**01**	**13**	**-**	**450**	**500**	**21.5**
Clock hours per week: 28									

L: Lecture **D: Drawing** **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/ Project Seminar/ Dissertation** **SEE: Semester End Examination**

26MTC02

MATRIX THEORY AND ADVANCED CALCULUS

(Common to ECE, EEE, MECH, CHEM, CIVIL & EVL)

Semester	1
Instruction	3 L+1T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To explain the solutions of linear equations system by Matrix Methods.
2. To explain the eigen values and eigen vectors.
3. To discuss mean value theorems.
4. To explain the Partial Derivatives and the extreme values of functions of two variables.
5. To develop a deep understanding of the concepts of improper integrals Beta, Gamma functions their applications

Course Outcomes: Upon completing this course, students will be able to

1. Apply the Matrix Methods to solve system of linear equations.
2. Determine eigen values and eigen vectors, Nature of quadratic form
3. Analyze the geometrical interpretation of Mean value theorems and curvature
4. Determine the extreme values of functions of two variables.
5. Evaluate Improper integrals using Beta, Gamma functions.

CO-PO Articulation Matrix:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	–	–	–	–	–	–	2	–	–	–
CO 2	3	3	3	3	–	–	–	–	–	–	2	–	–	–
CO 3	3	3	3	3	–	–	–	–	–	–	2	–	–	–
CO 4	3	3	3	3	–	–	–	–	–	–	2	–	–	–
CO 5	2	2	2	2	–	–	–	–	–	–	1	–	–	–

1 - Slightly; 2 - Moderately; 3 - Substantially

UNIT-I

Matrices-I: Rank of a matrix, Echelon form, consistency of linear system of equations, solution of non-homogeneous system of equations, solution of homogeneous system of equations, Linear dependence and independence of vectors. Solution of system of linear equations by Factorization method (Doolittles method).

UNIT-II

Matrices-II: Eigen values, Eigenvectors, Properties of Eigen values and Eigen vectors, Cayley Hamilton theorem, Quadratic form, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-III

Differential Calculus: Rolle's Theorem, Lagrange's Mean value theorem, Cauchy's Mean value theorem (without proofs). Curvature, Radius of curvature, Centre of curvature, Evolute and Involute (Cartesian curves). Envelopes.

UNIT-IV

Multivariable calculus: Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-V

Special functions: Definition of Gamma function, Reduction formula of $\boldsymbol{\Gamma(n)}$, derivation of value of $\boldsymbol{\Gamma\left(\frac{1}{2}\right)}$, Definition of Beta function, symmetry of Beta function, Relation between gamma and beta functions, properties, related problems. Error function, Complementary error function and its related problems.

TEXTBOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2017.
2. N.P.Bali and Dr. Manish Goyal, "A textbook of Engineering Mathematics", 9th edition, Laxmi Publications, 2017.

SUGGESTED READING:

1. B.V.Ramana., "Higher Engineering Mathematics", 11th Reprint, Tata McGraw-Hill, New Delhi, 2010.
2. R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics", 5th edition, Narosa Publications, 2016.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2016.

ONLINE RESOURCES:

Course Code	Course Name	Resource Link
26MTC02	Matrix Theory and Advanced Calculus	1.https://nptel.ac.in/courses/111107112 [(Unit-I&II: Week-1&3)] 2.https://nptel.ac.in/courses/111105160 [(Unit-III&IV: Week-2,3,4&5)] 3. https://nptel.ac.in/courses/111105122 [Unit-V: Week-3]

With effect from AY 2026-27

26CYC05

ENGINEERING CHEMISTRY
(EEE)

Instruction:	3 Hours per week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	60 Marks
Continuous Internal Evaluation:	40 Marks
Credits:	3

Course Objectives: This course aims to

1. Explore the fundamental concepts, synthesis and engineering applications of polymers.
2. Develop concepts of electrochemical principles and energy storage devices like batteries and fuel cells.
3. Integrate concepts of biomaterials, role of metal ions in biological systems and drugs.
4. Create awareness about wastewater treatment and environmental protection.
5. Discuss the applications of quantum dots and nanomaterials in engineering field.

Course Outcomes: At the end of the course, students will be able to

1. Illustrate the mechanism of electrical conduction and the engineering applications of polymers.
2. Analyze the performance and efficiency of electrochemical energy systems.
3. Assess the synthesis techniques and applications of biomaterials & drugs.
4. Evaluate water quality parameters and select appropriate industrial treatment techniques.
5. Apply fundamental concepts of quantum confinement effect & nanomaterials in modern technology.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	-	-	2	-	-	-	-	2	2	1	2
CO 2	3	2	3	-	-	2	-	-	-	-	2	2	2	2
CO 3	3	2	3	-	-	3	-	-	-	-	2	2	1	1
CO 4	3	2	3	-	-	3	-	-	-	-	2	2	2	1
CO 5	3	2	2	-	-	2	-	-	-	-	2	2	1	2

1 - Slightly; 2 - Moderately; 3 - Substantially

UNIT-I: Polymers in Electronics

Polymers: Monomer, polymer, polymerization, degree of polymerization. Synthesis, properties and applications of thermoplastic polymers (PVC and PTFE) and thermosetting polymers (Bakelite, Kevlar). Elastomers- natural rubber, vulcanization of rubber, process and applications.

Conducting polymers: Definition, classification and mechanism of conduction in (p-doped and n-doped) polyacetylene and their engineering applications.

Bio-degradable polymers: Preparation and applications of poly lactic acid and poly vinyl alcohol.

Polymers for electronics: Photo resist polymers for integrated circuit fabrication, lithography and photolithography.

UNIT-II: Energy Generation and Storage

Electrode potentials, Cell potentials, Reference electrodes – construction and working of standard hydrogen electrode and saturated calomel electrode. Electrochemical series and its applications. Nernst equation and its applications - numericals. Determination of pH using glass electrode and quinhydrone electrode.

Electroanalytical techniques: Principle, method and applications of conductometry (acid-base titration) and potentiometry (acid-base, redox titration).

Battery technology: Introduction, types, construction, working and applications of Li-MnO_2, and Li-ion batteries.

Green energy and sustainability: Priciples of green chemistry. Production, storage and applications of green hydrogen.

UNIT- III: Biomaterials in Healthcare

Biomaterials: Definition of biomaterials and their applications in healthcare, especially in medical and implants devices. Classification of biomaterials with examples. Properties and applications of metals (stainless steel, titanium alloys), ceramics (hydroxyapatite), polymers (PMMA, silicone) and composites (hydroxyapatite–polyethylene).

Role of metal ions in biological systems: Role of Na, K, Fe, Co in biological systems. Toxicity of Cd, As, Hg and Pb. Oxygen transport and storage - Structure of haemoglobin, its binding and transport of oxygen.

Drugs: Introduction, synthesis and uses of aspirin (Analgesic), paracetamol (Antipyretic) and atenolol (Antihypertensive).

UNIT–IV: Water Chemistry

Hardness of water: Types, units of hardness and disadvantages of hard water. Alkalinity of water and its estimation. Numerical problems on hardness of water and alkalinity. Boiler troubles – scales and sludge formation, causes, effects and prevention. Softening of water by ion exchange method. Desalination of water by reverse osmosis and electro dialysis method. Specifications of potable and industrial water. Disinfection of water by chlorination method, breakpoint chlorination. BOD and COD- definition, estimation (only brief procedure) and significance. Industrial wastewater treatment by using Zero Liquid Discharge (ZLD) method.

UNIT-V: Quantum dots and Nanomaterials

Nanomaterials: Introduction to nanomaterials and their classification as 0D, 1D, 2D and 3D materials. General applications of nanomaterials. Basic chemical method of preparation: sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (principles only).

Quantum dots: Definition and classification of quantum dots. Concept of quantum confinement. Size dependent optical properties (absorption and photoluminescence). Core and core shell quantum dots-surface capping and functionalization with emphasis on stability. Applications in LEDs, solar cells, bio-imaging and sensing. Raman Spectroscopy (Principle only).

Composite materials: Definition and classification of composites- Particle reinforced, fibre reinforced - glass fibre reinforced and carbon fibre reinforced composites and their applications.

TEXTBOOKS

1. P.C. Jain and M. Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company Ltd., New Delhi,17th edition (2025).
2. A Textbook of Polymer Science and Technology, Shashi Chawla ,Dhanpat Rai & Co. (2014).
3. A.K. Bajpai, Jaya Bajpai, Rajesh Kumar Saini, Priyanka Agrawal, and Atul Tiwari, “Smart Biomaterial Devices: Polymers in Biomedical Sciences, CRC Press, Taylor & Francis Group (2017).

SUGGESTED READINGS

1. B. S. Bahl, G.D. Tuli, Arun Bahl (Author), “Essentials of Physical Chemistry”, S.Chand & Co.Ltd, 28th edition (2022).
2. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, “Drugs”, Universities Press (India) Limited, Hyderabad (2016).

With effect from AY 2026-27

26EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course aims to

1. Understand the behavior of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. Comprehend the basic principle of operation of AC and DC machines
3. Infer about different types of cables, wires, safety rules, sensors and methods of Earthing,

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and their application of various theorems to get solutions of simple DC circuits.
2. Predict the steady state response of RLC circuits with AC single phase/three phase supply.
3. Infer the basics of single-phase transformers
4. Describe the construction, working principle of DC machine and 3-phase Induction motor.
5. Acquire knowledge of electrical wires, cables, earthing, and electrical safety precautions to be followed in electrical installations, including electric shock protection, energy calculations, and sensors.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	-	-	-	-	1	2	-	3	2	2	3
CO 2	3	3	2	-	-	-	-	1	2	-	3	2	2	3
CO 3	3	3	2	1	-	-	-	1	2	-	3	2	3	3
CO 4	2	1	-	-	-	-	-	1	2	-	3	2	3	3
CO 5	2	-	2	-	-	-	-	1	2	-	3	-	2	2

1 - Slightly; 2 - Moderately; 3 - Substantially

UNIT-I

DC Circuits: Electrical Circuit Elements: R, L and C, voltage and current sources, Kirchhoff current (KCL) and voltage laws (KVL), Analysis of simple circuits with DC excitation: Nodal Analysis, Mesh Analysis, Superposition, Thevenin's and Norton's Theorems.

UNIT-II

AC Circuits: Single Phase AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, series RL and RC.

Three phase balanced circuits: Introduction, Comparison of Single phase and Three Phase System, voltage and current relations in star and delta connections (Elementary treatment only)

UNIT-III

Single Phase Transformer: Construction, Working Principle, EMF Equation, Comparison of Ideal and Practical Transformer, Losses, OC and SC tests and Efficiency.

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Applications DC Motors: Principle of operation, Classification, Torque Equation, Characteristics & Speed control of DC Shunt Motor, Applications. Three Phase Induction Motors: Principle of operation, Applications

UNIT-V

Electrical Installations and Sensors: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, and first aid for electric shock.

Components of LT Switchgear: Fuse, MCB and Earthing (Elementary Treatment only), Elementary calculations for energy consumption.

Sensors: Introduction, Working Principle, Types-Temperature, Humidity, and Motion (Elementary treatment only).

TEXTBOOKS:

1. B. L. Theraja & A. K. Theraja, Electrical Technology in S.I units (Volume-1 and Volume-2), S. Chand Publishing, 2021
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2nd edition, 2019
3. Wadhwa, C L, "Basic Electrical Engineering", New Age International Publishers, 5th edition, 2023
4. Jacob Fraden," Handbook of Modern Sensors (Physics, Designs, and Applications)" Fifth Edition, 2016

SUGGESTED READING:

1. D. P. Kothari & I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,4th edition, 2019.
2. S.K.Sahdev, "Basic Electrical Engineering",Pearson Education, 2015.
3. P.V. Prasad, S. S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2012.

ONLINE RESOURCES:

S. No.	NPTEL Course Name	Instructor	Host Institute
1	Basic Electrical Circuits	Prof. Nagendra Krishnapura	IIT Madras
2	Electrical Machines	Prof. Anirban Sengupta	IIT Kanpur
3	Electric Circuits	Prof. S. C. Dutta Roy	IIT Delhi
4	Basic Electrical Technology	Prof. D. P. Kothari	IIT Delhi
5	Introduction to Electrical Engineering	Prof. S. K. Sharma	IIT Kanpur

26CSC01

PROBLEM SOLVING AND PROGRAMMING USING C

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

PREREQUISITES: Basic high school mathematics.

Course Objectives: This course aims to
1. Understanding the steps in problem solving and formulation of algorithms to problems.
2. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
3. Develop intuition to enable students to come up with creative approaches to problems.

Course Outcomes: After the completion of this course, the student will be able to
1. List and outline the steps to develop algorithmic solutions and identify flowchart symbols.
2. Illustrate programming concepts such as variables, data types, conditionals, loops, print statements, and functions.
3. Develop algorithms using recursion and iteration techniques.
4. Analyze the use of arrays, pointers, initialization, and dynamic memory allocation.
5. Evaluate and develop large-scale programs using multiple files, header files, and make utilities.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	1	1	-	1	-	-	-	-	-	1	2	1	1
CO 2	3	1	1	-	1	-	-	-	-	-	1	3	1	1
CO 3	3	1	1	-	1	-	-	-	-	-	1	3	2	1
CO 4	3	1	1	-	1	-	-	-	-	-	1	3	2	2
CO 5	3	1	1	-	1	-	-	-	-	-	1	2	3	2

1-Slightly, 2-Moderately, 3-Substantially

UNIT-I

Introduction: Introduction to Programming, Idea of Algorithm, Representation of Algorithm, Flowchart, from algorithms to programs, source code.

Basics of C: Background, Structure of a C Program, Datatypes, Tokens, Operators and Expressions- Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions, Input and Output Functions.

UNIT-II

Control Statements: Conditional Execution -Selection Statements, Conditional Operator, Switch statement. Iteration Execution - While Construct, For Construct, do-while Construct Goto Statement, Special Control Statements, Nested Loops.

Arrays: One-Dimensional Arrays-Declaration, Initialization, internal representation. Multidimensional Arrays.

UNIT–III

Strings: Strings: One-dimensional Character Arrays, Arrays of Strings: Two-dimensional Character Array.

Search and Sorting: Searching algorithms-linear, binary searching. Sorting algorithms- bubble sort, selection sort.

Functions: Concept, Uses, Prototype, Declaration, Parameter passing techniques, Passing Arrays to Functions, Storage Classes, Recursion.

UNIT-IV

Pointers: Declaring a Pointer, Initializing Pointers, Indirection Operator and Dereferencing, Arrays and Pointers, Pointers and Strings, Pointers to Pointers, Array of Pointers, Pointers to an Array, Two-dimensional Arrays and Pointers, Pointers to Functions and Dynamic Memory Allocation.

UNIT–V

User-defined Datatypes: Structures- Declaring Structures and Structure Variables, Accessing the Members of a Structure, Initialization of Structures, Typedef, Nesting of Structures, Arrays and Structures. Union, Enumeration Types.
Files: Using Files in C, Declaration of File Pointer, Working with Text Files, Character Input and Output, Working with Binary Files, Sequential Versus Random File Access, File Record.
C Preprocessor Directives.

TEXTBOOKS:

1. Pradip Dey and Manas Ghosh "Programming in C 2/e", 2nd Edition, Oxford University Press, 2012.
2. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language", 2nd Edition (Paperback), Prentice Hall India, 2018.

SUGGESTED READING:

1. B.A.Forouzan and Hassan Afyouni "A Structured Programming Approach in C", 4th Edition, Cengage Learning, 2024.
2. E. Balaguruswamy, "Programming in ANSI C", 9th Edition, Tata McGraw-Hill, 2024.
3. Paul Deitel and Harvey Deitel, "C: How to Program", 9th Edition, Pearson, 2022.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://archive.nptel.ac.in/courses/106/105/106105171/

26ADC01

ARTIFICIAL INTELLIGENCE FOUNDATIONS AND APPLICATIONS

Instruction	2 H Hours per week
Duration of Semester End Examination	3
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Prerequisite: Nil

Course Objectives: This course aims to:

1. Provide a foundational understanding of Artificial Intelligence and its evolution
2. Introducing key AI subfields and their real-world applications across industries
3. Explain the impact of AI on society, including ethical and fairness considerations
4. Study emerging trends such as Generative AI and future directions

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the basic concepts and evolution of Artificial Intelligence
2. Illustrate major AI subfields and their functionalities
3. Develop and describe applications of AI in various domains
4. Elaborate ethical issues, bias, and societal impacts of AI systems
5. Demonstrate emerging trends such as Generative AI and their future implications

CO-PO Articulation Matrix:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	-	-	-	-	-	-	-	-			
CO 2	3	3	-	-	-	-	-	-	-	-	-			
CO 3	2	3	-	-	-	2	-	-	-	-	-			
CO 4	2	2	-	-	-	2	2	3	-	-	-			
CO 5	2	2	-	-	-	2	2	2	-	-	-			

1-Slightly, 2-Moderately, 3-Substantially

UNIT - I

Introduction To Artificial Intelligence:

Evolution of Artificial Intelligence: early developments and growth of AI. Definition and scope of AI. Core components of AI: Machine Learning, Pattern Recognition, Natural Language Processing, and Computer Vision. Concept of Artificial General Intelligence (AGI)

UNIT - II

Ai Subfields And Technologies:

Introduction to AI subfields: **Computer Vision** - object detection, facial recognition, medical imaging, **Natural Language Processing** - text classification, translation, summarization, **Machine Learning** - classification, regression, clustering, recommendation systems, **Robotics**- types and components, and **Knowledge Engineering** - representation and reasoning.

UNIT - III

Applications Of Artificial Intelligence:

Applications of AI in various domains: **Healthcare** - diagnosis, drug discovery, **Finance** - risk management, trading, **Retail** - personalization, customer support, **Agriculture** -precision farming, **Education** - personalized learning, and **Transportation** -traffic management. Challenges in applying AI in real-world scenarios.

UNIT - IV

Ethics, Bias And Fairness In Ai:

Ethics in AI systems. Types of bias and fairness issues. Transparency and explain ability. Accountability of AI systems. Privacy and data protection concerns. Security risks in AI systems.

Inclusivity, sustainability, robustness, and reliability.

UNIT – V

Generative Ai and Future Directions:

AI in research and interdisciplinary domains. Introduction to Generative AI and its evolution. Emerging trends and future directions of Artificial Intelligence. Social implications and impact of AI.

TEXTBOOKS:

1. *AI for Everyone: A Beginner's Handbook for Artificial Intelligence*, First Edition, Pearson India, 2023.

SUGGESTED READING:

1 Stuart Russell, Peter Norvig, *Artificial Intelligence: A Modern Approach*, Fourth Edition, Pearson, 2021

2 Melanie Mitchell, *Artificial Intelligence: A Guide for Thinking Humans*, First Edition, Farrar, Straus and Giroux, 2019.

WEB RESOURCES:

1. Government of India, Press Information Bureau (PIB), YUVA AI for ALL Initiative Available: https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=2191334
2. FutureSkills Prime (MeitY & NASSCOM), AI Learning Platform. Available: https://futureskillsprime.in
3. India AI Mission (Government of India AI Initiative). Available: https://indiaai.gov.in

26CYC06

ENGINEERING CHEMISTRY LAB
(Common to ECE, EEE & EVL)

Instruction:	3 Hours per week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	50 Marks
Continuous Internal Evaluation:	50 Marks
Credits:	1.5

Course Objectives: This course aims to

1. Impart fundamental knowledge in handling the equipment/glassware and chemicals in chemistry laboratory.
2. Provide knowledge in qualitative chemical analysis of organic compounds.
3. Get familiarized with the volumetric principles for quantitative analysis.
4. Understand and apply the various instrumental methods to analyse the chemical compounds
5. Interpret the theoretical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes: At the end of the course, students will be able to

1. Identify the basic chemical methods to analyze the substances quantitatively and qualitatively.
2. Develop analytical thinking and problem-solving skills in identifying unknown samples.
3. Estimate the number of chemical substances by volumetric analysis.
4. Calculate the concentration and number of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	-	2	-	-	-	-	2	2	1	-
CO 2	3	3	2	2	-	2	-	-	-	-	2	2	1	-
CO 3	3	2	3	2	-	2	-	-	-	-	2	2	1	-
CO 4	3	2	2	2	-	2	-	-	-	-	2	2	1	1
CO 5	3	2	3	2	-	2	-	-	-	-	2	2	1	1

1-Slightly, 2-Moderately, 3-Substantially

List of Laboratory Experiments:

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Determination of rate constant for the reaction of hydrolysis of methyl acetate (first order).
3. Estimation of temporary, permanent and total hardness of water using EDTA solution.
4. Determination of alkalinity in the given water sample.
5. Determination of concentration of given $KMnO_4$ solution by colorimetric method
6. Determination of concentration of given $K_2Cr_2O_7$ solution by colorimetric method.
7. Estimation of amount of HCl conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH is present in the given mixture of acids conductometrically using NaOH solution.
9. Estimation of amount of HCl potentiometrically using NaOH solution.
10. Estimation of amount of Fe^{+2} potentiometrically using $KMnO_4$ solution.
11. Preparation of Zinc Oxide Nanoparticles
12. Synthesis of Aspirin and Paracetamol drugs.
13. Synthesis of phenol formaldehyde resin.

TEXTBOOKS

1. J. Mendham and Thomas, “Vogel’s textbook of quantitative chemical analysis”, Pearson education Pvt. Ltd. New Delhi ,6th edition. 2017.
2. Senior practical physical chemistry by B. D. Khosla, V. C. Garg & A. Gulati, R. Chand & Co., New Delhi (2011).

SUGGESTED READINGS

1. Dr. Subdharani, “Laboratory Manual on Engineering Chemistry”, Dhanpat Rai Publishing, 2020.
2. S.S. Dara, “A Textbook on experiment and calculation in engineering chemistry”, S. Chand and Company, 9th revised edition, 2015.

26EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: This course aims to

1. To acquire to verify the basic electrical circuit laws and theorems.
2. Explore the concept of single-phase AC and Three phase AC concepts
3. To find the characteristics of Transformers, DC, AC Machines and switch gear components

Course Outcomes: After the completion of this course, the student will be able to

1. Comprehend circuit analysis techniques using various circuital laws and theorems.
2. Determine the different parameters related to Single Phase AC and 3 Phase AC Circuits
3. Determine the turns ration/performance parameters of single-phase transformer
4. Infer the characteristics of the DC shunt motor subjected to different tests.
5. Illustrate different parts of Machines, Protection equipment and Sensors.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	1	1	-	-	-	-	-	-	3	1	1
CO 2	3	2	-	1	1	-	-	-	-	-	-	3	1	2
CO 3	3	2	1	2	1	-	-	-	-	-	-	2	2	2
CO 4	3	2	1	2	1	-	-	-	-	-	1	2	1	3
CO 5	2	1	1	-	1	1	-	-	-	-	1	2	2	3

1-Slightly, 2-Moderately, 3-Substantially

List of Laboratory Experiments/Demonstrations

1. Verification of KCL and KVL.
2. Verification of Thevenin's Theorem.
3. Verification of Superposition Theorem.
4. Verification of Norton’s Theorem
5. Determination of parameters of a choke or coil by Wattmeter Method
6. Active and Reactive Power measurement of a single-phase system using 3-Ammeter method
7. Active and Reactive Power measurement of a single-phase system using 3-Voltmeter method
8. Measurement of 3-Phase Power in a Balanced system
9. Measurement of Energy Using a Single-Phase Energy Meter
10. Verification of Turns/voltage ratio of Single-Phase Transformer.
11. Open Circuit and Short Circuit tests on a Single-Phase Transformer.
12. Brake Test on DC Shunt Motor
13. Speed Control of DC Shunt Motor
14. Demonstration of Fuse & MCB
15. Demonstration of Sensors
16. Study of cut-out section of Electrical Machines

Note: At least 10 experiments need to be conducted

26CSC02

PROBLEM SOLVING AND PROGRAMMING USING C LAB

Instruction	3 P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

PREREQUISITES: Basic high school mathematics.

Course Objectives: This course aims to
1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.

Course Outcomes: After the completion of this course, the student will be able to
1. Identify and set up program development environment.
2. Implement the algorithms using C programming language constructs.
3. Analyze programs using arrays, structures and pointers.
4. Evaluate problems in a modular approach using functions.
5. Develop file operations with simple text data.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	-	1	1	1	-	-	-	-	-	1	-	2	1	1
CO 2	3	2	1	2	-	-	-	-	-	-	-	3	1	2
CO 3	3	2	1	2	-	-	-	-	-	-	-	3	2	2
CO 4	3	2	1	2	-	-	-	-	-	-	-	2	3	1
CO 5	3	1	-	1	-	-	-	-	-	-	-	3	2	2

1-Slightly, 2-Moderately, 3-Substantially

LABORATORY / PRACTICAL EXPERIMENTS

1. Introducing to IDE Eg: Visual Editor, Turbo C, DevC++, Visual Studio etc.,
2. Implement programs using arithmetic, relational, bitwise, conditional, logical, and ternary operators.
3. Implement programs using control statements (sequential, selection and iteration).
4. Implement programs using user defined functions and Recursion.
5. Implement Programs using one-dimensional arrays.
6. Implement programs on two-dimensional arrays with and without using functions.
7. Implement programs on String manipulation (with and without using string library functions).
8. Implement programs on sorting and searching using iteration and recursion. (Bubble Sort, Selection Sort, Linear Search, Binary Search)
9. Implement programs using pointers and dynamic memory allocation.
10. Implement programs using Structures.
11. Implement file handling programs (Modes, Operations, Access).

TEXTBOOKS:

1. Pradip Dey and Manas Ghosh “Programming in C 2/e”, 2nd Edition Oxford University Press, 2012.
2. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language”, 2nd Edition (Paperback), Prentice Hall India, 2018.

SUGGESTED READING:

1. B.A.Forouzan and Hassan Afyouni “A Structured Programming Approach in C”, 4th Edition, Cengage Learning, 2024.
2. E. Balaguruswamy, “Programming in ANSI C”, 9th Edition, Tata McGraw-Hill, 2024.
3. Paul Deitel and Harvey Deitel, “C: How to Program”, 9th Edition, Pearson. 2022.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://archive.nptel.ac.in/courses/106/105/106105171/

26MEC01

ROBOTICS AND DRONES LAB

(Common to Mechanical, Civil, ECE, EVL, EEE, Chemical & Bio Tech)

Instruction	1T+2P Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	2

Course Objectives: The objectives of this course are to

1. Develop a fundamental understanding of robotics, Arduino programming, and electronic circuit interfacing used in autonomous systems.
2. Gain practical knowledge of interfacing various sensors such as ultrasonic sensors, IR sensors, and LiDAR sensors with microcontrollers for data acquisition in robotic and drone applications.
3. Acquire proficiency in controlling different types of actuators including servo motors, stepper motors, DC motors, and BLDC motors for robotic and drone movement.
4. Understand the structure, components, and working principles of drones, and develop the ability to assemble basic quadcopter system.
5. Apply basic computer vision techniques using Python and OpenCV for image processing tasks relevant to drone-based applications.

Course Outcomes: After completion of the course, students will be able to

1. Understand the fundamentals of robotics, Arduino programming, and electronic interfacing required for autonomous systems.
2. Interface and utilize sensors such as ultrasonic, IR, and LiDAR sensors to collect and process environmental data for robotic and drone applications.
3. Demonstrate the ability to control various actuators including servo motors, stepper motors, DC motors, and BLDC motors for implementing robotic movements.
4. Assemble and understand the operation of drone systems including mechanical, electrical, and control components required for drone flight.
5. Apply Python and OpenCV techniques for basic image processing tasks such as RGB extraction, shape creation, and region of interest (ROI) extraction (or) to develop simple autonomous systems.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	2	1	–	2	2	1	2			
CO 2	2	3	2	3	2	1	–	1	1	1	2			
CO 3	2	2	3	2	2	1	–	2	1	1	2			
CO 4	2	2	3	2	2	1	1	3	2	2	2			
CO 5	2	2	2	2	3	1	–	1	2	1	3			

1-Slightly, 2-Moderately, 3-Substantially

LAB EXERCISES:

1 a. Interface Arduino with LEDs to do traffic light simulation
   b. Design and implement a system to interface an Arduino board with a seven-segment LED display to show decimal digits from 0 to 9. The Arduino should be programmed to sequentially display Each number with a fixed time delay between transitions
2 a. Interface Arduino with Electronic Devices such as Push Button to control piezo buzzer.
   b. Interface Arduino with Electronic Devices such as Potentiometer to control blinking time of LED
3 Interfacing Arduino with Ultrasonic Distance Sensor and Displaying Sensor Data on Serial Monitor.
4 Interfacing Arduino with IR Sensor and Reading Sensor Data on Serial Monitor.
5 Implement a system using Arduino to control the precise movement of a Servo Motor.
6 Control and operate a Stepper Motor using Arduino for precise and sequential motion.

7	Construct a two-wheel robot using DC motors controlled by Arduino. Program the robot to: (i) Move forward with controlled acceleration (ii) Move backward with controlled deceleration.
8	Controlling a BLDC motor of a drone using a Servo Tester.
9	Attach a propeller to a BLDC motor and measure the wind speed using an Anemometer.
10	Measure the distance between an obstacle and the drone using a TF-Mini LiDAR Range Sensor.
11	Assemble the mechanical and electrical subsystems of a quadcopter drone by integrating frame arms, BLDC motors, ESCs, power distribution system, and connectors. Verify electrical continuity and correct motor-ESC connections.
12	Integrate drone control components including flight controller, radio receiver, GPS module, battery, and propellers. Study of Drone Take-off, Flight, and Landing Basics.
13	Open CV for Image Processing in Drones: (i) Extraction of RGB values of a pixel (ii) Creation of coloured shapes and saving images (iii) Extraction of Region of Interest (ROI).
14	Open-Ended Autonomous System Project.

Note:

Students shall complete any 10 out of the 14 experiments. Experiment No. 14 (Open-Ended Project) is mandatory and carries 10 marks in CIE.

TEXTBOOKS:

1. J. M. Hughes, *Arduino: A Technical Reference: A Handbook for Technicians, Engineers, and Makers*. Sebastopol, CA: O'Reilly Media, 2016.
2. S. Monk, *Programming Arduino: Getting Started with Sketches*. New York, NY: McGraw-Hill, 2022.
3. D. McGriffy, *Make: Drones: Teach an Arduino to Fly*. San Francisco, CA: Maker Media, 2016.

SUGGESTED READING:

1. https://www.geeksforgeeks.org/robotics-introduction/
2. https://dronebotworkshop.com/

26MBC02

COMMUNITY ENGAGEMENT

Instruction	2 Hours per week
SEE	Nill
CIE	50Marks
Credits	1

Course Objectives: The main Objectives of this Course are to:
1. Develop an understanding of rural life, culture, and socio-economic conditions.
2. Expose students to rural livelihoods, local economic systems, and entrepreneurship opportunities.
3. Familiarize students with rural institutions, governance mechanisms, and development programmes in India.
4. Promote community engagement, social responsibility, and experiential learning through field-based activities.
5. Enable students to analyze community issues and contribute to sustainable rural development solutions.

Course Outcomes: After the completion of this Course, Student will be able to:
1. Understand rural society, culture, and development issues.
2. Demonstrate empathy and social responsibility towards communities.
3. Analyze rural livelihood systems and economic activities.
4. Evaluate the role of rural institutions and government programmes.
5. Participate in community-based activities and suggest improvements.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1	1	2	2	2	-	3	1	2	-	-	2
CO 2	-	1	2	2	-	2	-	2	1	-	1
CO 3	-	1	1	2	-	3	1	3	1	2	1
CO 4	2	2	3	2	-	2	1	2	2	1	-
CO 5	1	2	2	1	-	2	-	1	-	1	1

1-Slightly, 2-Moderately, 3-Substantially

Module I
Appreciation of Rural Society:
Rural lifestyle and social structure, Caste and gender relations, Rural values and traditions, Rural infrastructure.

Module II
Understanding Rural Economy and Livelihood:
Agriculture and allied activities, Rural entrepreneurship, non-farm livelihoods and artisans, Rural markets and credit systems, Farmer Producer Organizations (FPOs).

Module III
Rural Institutions:
Panchayati Raj system (Gram Sabha, Gram Panchayat), Self-Help Groups (SHGs), Role of NGOs in rural development

Module IV
Rural Development Programmes:
Overview of rural development in India, Key government schemes, Mahatma Gandhi National Rural Employment Guarantee (MGNREGA) Scheme, National Rural Livelihood Mission (NRLM), Pradhan Mantri Awas Yojana (PMAY), Swachh Bharat, Skill India, Ayushman Bharat.

TEXTBOOKS:

1. Singh, Katar, "Rural Development: Principles, Policies and Management", 3rd Edition, Sage Publications, New Delhi, 2016.
2. Desai, Vasant, "Rural Development in India", 2nd Edition, Himalaya Publishing House, 2020.
3. Chambers, R., "Rural Development: Putting the last first", 1st Edition, Routledge, 2014.
4. Helen Sheil, "Growing and Learning in Rural Communities" 2nd Edition, 2024.

SUGGESTED READINGS & JOURNALS:

1. Seth Appiah-Opoku, Usha Iyer-Raniga, "Contemporary Rural Development Programs", 1st Edition, 2025.
2. Journal of Rural development, National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad.
3. Indian Journal of Social Work, Tata Institute of Social Sciences (TISS), Mumbai.
4. Manjeet Singh Nain. (2026). Editorial. Indian Journal of Extension Education, 62(2).
5. Kurukshetra Journal, Ministry of Rural Development, Government of India.

Online Resources:

1. https://www.rural.gov.in/
2. https://nirdpr.org.in/
3. https://sdgs.un.org/goals
4. https://onlinecourses.nptel.ac.in/e-learning
5. https://idronline.org/

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
(In line with AICTE Model Curriculum with effect from AY 2026-27) (R26)

SEMESTER –II

S. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	26MTC05	Applied Vector Calculus and Ordinary Differential Equations	3	1	-	3	40	60	4
2	26PYC03	Electromagnetism and Quantum Computing	3	-	-	3	40	60	3
3	26EEC03	Electronic Devices and Circuits	3	-	-	3	40	60	3
4	26EGC01	Communicative English	2	-	-	3	40	60	2
PRACTICALS									
5	26PYC04	Electromagnetism and Quantum Computing Lab	-	-	3	3	50	50	1.5
6	26MEC03	Engineering Graphics	-	-	4	3	50	50	2
7	26CSC38	Python Programming Workshop	-	-	3	3	50	50	1.5
8	26MEC04	Engineering Workshop & 3D Printing	-	-	3	3	50	50	1.5
9	26EGC02	Communication Skills Lab	-	-	2	3	50	50	1
TOTAL			**11**	**01**	**15**	**-**	**410**	**490**	**19.5**
Clock hours per week: 27									

L: Lecture **D: Drawing** **CIE: Continuous Internal Evaluation**
T: Tutorial **P: Practical/ Project Seminar/ Dissertation** **SEE: Semester End Examination**

26MTC05

APPLIED VECTOR CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS

(Common to ECE, EEE, MECH, CHEM, CIVIL & EVL)

Semester	2
Instruction	3 L+1T Hours per week
Duration of SEE	3
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To develop skills in solving first-order differential equations using appropriate methods.
2. To extend the understanding of higher-order differential equations and their solution techniques.
3. To introduce Laplace, transform techniques and their applications in solving differential equations.
4. To develop understanding of scalar and vector functions along with their physical interpretations.
5. To introduce and apply vector calculus concepts including line, surface and volume integrals.

Course Outcomes:

Upon completing this course, students will be able to:

1. Solve first-order linear differential equations using appropriate methods.
2. Solve higher-order linear differential equations using standard techniques.
3. Apply Laplace transforms to solve differential equations effectively.
4. Apply vector differential operators to scalar and vector functions.
5. Evaluate line, surface and volume integrals using Green's, Gauss and Stoke's theorems.

CO-PO Articulation Matrix:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	-	-	-	-	-	2	3	1	2
CO 2	3	2	1	1	1	-	-	-	-	-	2	3	1	2
CO 3	3	3	2	2	2	-	-	-	-	-	2	3	1	2
CO 4	3	3	2	2	1	-	-	-	-	-	2	3	1	2
CO 5	3	3	2	2	2	-	-	-	-	-	2	3	1	2

UNIT-I: First Order Ordinary Differential Equations

Exact differential equations, Differential Equations reducible to exact equations, Linear equation, Bernoulli's equation, Clairaut's equation, Orthogonal trajectories (Cartesian and polar curves) and LR circuits.

UNIT-II: Higher Order Linear Differential Equations

Higher order linear differential equations with constant coefficients, rules for finding the Complementary function, Particular Integral and General solution. Method of variation of parameters, Solution of Cauchy's homogeneous linear equation and LCR circuits.

UNIT-III: Laplace Transforms

Laplace Transform of Elementary functions, Linearity property, First Shifting property, Change of scale property. Laplace Transform of Periodic functions, Transforms of derivatives, integral's, Multiplication by t^n and division by t. Evaluation of Integrals by Laplace Transforms. Inverse Laplace transform of elementary functions, Inverse Laplace Transform by Method of partial fractions, Convolution theorem (Without proof) and related problems, Solution of Ordinary Differential Equations by Laplace Transform method.

UNIT-IV: Vector Differential Calculus

Scalar and Vector point functions, operator Del, Del applied to scalar point function-Gradient, Directional derivative, Del applied to vector point function-Divergence, Curl, Solenoidal vectors and Irrotational vectors, Del applied twice to point functions.

UNIT-V: Vector Integral Calculus

Line integral, circulation, work done by force, Surface integral and Volume integral. Verification of Green's

theorem in a plane (without proof), verification of Stoke's theorem (without proof) and verification Gauss divergence theorem (without proof).

TEXTBOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics",44th Edition, Khanna Publishers, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

SUGGESTED READING:

1. N.P.Bali and Dr. Manish Goyal, "A text book of Engineering Mathematics", 9th edition, Laxmi Publications, 2017.
2. R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics", 5th edition, Narosa Publications, 2016.

Online Resources:

Course Code	Course Name	Resource Link
26MTC05	Applied Vector Calculus and Differential Equations	1. https://nptel.ac.in/courses/111105160 [(Unit-I,II,IV&V: Week-6,7, 9, 10,11&12)] 2.https://nptel.ac.in/courses/111106139 [(Unit-III: Week-2,3,4,&5)]

26PYC03

ELECTROMAGNETISM AND QUANTUM COMPUTING

(EEE, ECE & EVL)

Instruction	3 L Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Course Objectives: This course aims to

1. Understand interference, diffraction, and polarization phenomena as manifestations of the wave nature of light.
2. Familiarize Maxwell's equations and electromagnetic wave propagation
3. Provide fundamental understanding of lasers and fibre-optic communication.
4. Understand the fundamentals of quantum mechanics and quantum computing.
5. Acquire knowledge of band theory of solids and semiconductor physics.

Course Outcomes: Upon completion of this course, the students will be able to

1. Analyse interference and diffraction patterns and apply polarization principles in optical systems.
2. Apply Maxwell's equations to analyse electromagnetic phenomena.
3. Distinguish different lasers and analyse optical fibres.
4. Demonstrate principles of quantum mechanics and counter intuitiveness of classical and quantum computing.
5. Examine the formation of bands, classify materials, and apply semiconductor principles to devices.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	1	2	1	2	2	2	1	2	2	2	-	-	-
CO 2	3	2	2	1	1	1	1	1	1	2	2	-	-	-
CO 3	3	3	1	2	2	1	1	1	1	1	2	-	-	-
CO 4	3	2	2	2	2	1	2	2	1	2	1	-	-	-
CO 5	3	3	2	2	3	1	1	1	2	1	1	-	-	-

1-Slightly, 2-Moderately, 3-Substantially

Unit-I

Interference: Superposition principle – Types of interferences – Division of wavefront and amplitude – Interference in thin films (reflected light) – Newton's Rings.

Diffraction: Types of diffraction – Fraunhoffer diffraction – Single slit, Double slit and N-slits (grating).

Polarization: Introduction – Malus's law – Double refraction – Nicol's prism – Applications of polarization.

Unit-II

Electromagnetic Theory: Definitions of electric field and electric potential – Divergence and curl of static electric field – Poisson's and Laplace's Equations – Definitions of magnetic field and magnetic flux density – Biot-Savart's law – Divergence and curl of static magnetic field – Review of varying fields – Conduction and displacement currents – Maxwell's equations (differential and integral forms) – Electromagnetic wave propagation: Free space, conducting medium and dielectric medium – Poynting theorem.

Unit-III

Lasers: Characteristics of lasers – Population inversion – Stimulated and spontaneous emissions – Einstein's coefficients: Relation and interpretation – Ruby laser – He-Ne laser – Applications of lasers in communication engineering.

Fibre Optics: Construction – Principle – Propagation of light through an optical fibre – Determination of numerical aperture and acceptance angle – Step index and graded index fibres – Fibre optic communication system – Applications.

Unit-IV

Quantum Mechanics: Introduction – Wave-particle duality – de-Broglie's hypothesis – Born's interpretation of wave function – Heisenberg's uncertainty principle – Schrodinger wave equation (time independent and dependent) – Infinite square well potential.

Quantum Computing: Introduction – Brief review of linear algebra – Basis of quantum computer – Quantum bit –

Evolution of quantum systems – Quantum measurement – multi-qubit systems – Entanglement – Bloch sphere – Superposition – Introductory concept of quantum gates.

Unit-V

Band Theory of Solids and Semiconductors: Salient features of free electron theory of metals (classical and quantum) – Fermi-Dirac distribution – Bloch's theorem for periodic potential – Kronig-Penney model, Classification of solids: metals, semiconductors and insulators – Intrinsic and extrinsic semiconductors – Carrier generation and recombination – Charge transport: diffusion and drift – Hall Effect – Applications of semiconductors: P-N junction diode, light emitting diode, solar cell.

TEXTBOOKS:

1. Engineering Physics by R. K. Gour and S. L Gupta, DHANPAT RAI Publications.
2. A Textbook of Engineering Physics by M. N. Avadhanulu and P.G. Kshirsagar, S. Chand Publications.
3. Quantum Computation and Quantum Information by Nielsen, M. A., & Chuang, I. L., Cambridge University Press.
4. Engineering Physics by V. Rajendran, McGraw-Hill Education Publications.
5. Engineering Physics by B. K. Pandey and S. Chaturvedi, Cengage Publications, 2012.

SUGGESTED READING:

1. Laser Fundamentals by William T. Silfvast, Cambridge University Press.
2. Introduction to Classical and Quantum Computing by Thomas G. Wong, Rooted Grove.
3. V. Raghavan, Materials Science and Engineering, Prentice Hall India Learning Private Limited; 6th Revised edition,2015.
4. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics, S. Chand Publications, 2014. Introduction to Fibre Optics by Ajay Ghatak and K. Thyagarajan, Cambridge Univ. Press.
5. D. J. Griffiths, Introduction to Electrodynamics, PHI Learning 2012.
6. Introduction to Solid State Physics by Ch. Kittel. John Wiley.
7. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles by R. Eisberg and R. Resnick (John Wiley)

26EEC03

ELECTRONIC DEVICES AND CIRCUITS

Instruction	3 L Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

Prerequisite:

Students should have prior knowledge of semiconductor Physics and basics of circuit theory.

Course Objectives: This course aims to

1. Describe the fundamental concepts and operating principles of semiconductor devices.
2. Examine the characteristics and biasing of diodes, BJTs, and MOSFETs.
3. Implement semiconductor devices in basic electronic circuits for practical applications.

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the working principles and characteristics of semiconductor diodes and their applications.
2. Analyze diode circuits including rectifiers, clippers, and clampers using appropriate techniques.
3. Analyze the characteristics, h-parameters, and biasing of BJTs, and evaluate their performance in switching and amplifier applications.
4. Analyze the characteristics and biasing of MOSFETs and assess their suitability in amplifier and switching circuits.
5. Understand the working principles and characteristics of special semiconductor devices (Schottky diode, LED, Photodiode, Solar cell, SCR, UJT) and their applications.

CO PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	-	1	-	-	-	-	-	-	2	1	1
CO 2	3	3	2	2	2	-	-	-	-	-	-	3	1	2
CO 3	3	3	2	2	2	-	-	-	-	-	-	3	2	2
CO 4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO 5	3	3		1	1	-	-	-	-	-	-	2	1	2

1 - Slightly, 2 - Moderately, 3 - Substantially

UNIT - I

Semiconductor Diodes: P-N junction diode- V-I characteristics of a diode, Ideal Versus Practical, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Reverse Recovery Time, Zener Diodes- V-I Characteristics and equivalent circuit, Zener Diode as Voltage Regulator

UNIT -II

Diode Applications: Load Line Analysis, Series Diode Configurations, Parallel and Series Parallel Configurations, Clippers, Clampers. Half-wave and Full-wave rectifiers, operation, performance characteristics, Effect of C filter on rectifiers

UNIT -III

Bipolar Junction Transistor (BJT): Structure and Operation of a BJT, Modes of transistor operation, Early effect, BJT input and output characteristics of CE configuration, BJT as a switch, BJT as an amplifier, h-parameters, determination of h parameters from transistor characteristics.

DC operating point, biasing circuits- Collector to base and voltage divider, numerical problems.

UNIT -IV

Metal Oxide Field Effect Transistor (MOSFET): Enhancement & Depletion mode MOSFETs - Construction, operation, Drain and transfer characteristics, MOSFET as a switch, MOSFET as an amplifier.

MOSFET biasing - voltage divider numerical problems. Common Source amplifier

UNIT - V

Special Purpose Semi-Conductor Devices: Working Principle of Schottky diode, LED, Photodiode, Solar cell. Operation and V-I characteristics - SCR & UJT

TEXTBOOKS:

1. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 11th Edition, PHI, 2015.
2. Malvino Albert Paul, “Electronic Principles”, 7th Edition, Tata McGraw Hill, 2006.

SUGGESTED READINGS:

1. Millman and Halkias, “Electronic Devices and Circuits”, 4th Edition, McGraw Hill Publication 2015.
2. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press 2008.

NPTEL Courses:

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Analog Circuits	Prof. Jayanta Mukherjee	IIT Bombay
2.	Analog Electronic Circuits	Prof. Shouribrata	IIT Delhi
3.	https://archive.nptel.ac.in/course.html.		

26EGC01

COMMUNICATIVE ENGLISH

(BE/B.Tech - Common to all Branches)

Instruction	2Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	2

Prerequisite: Basic knowledge of English grammar and vocabulary and communicative abilities.

Course Objectives: The course is taught with the objectives of enabling the students to:

1. Improve their understanding of communication skills to apply in real life situations.
2. Equip themselves with Reading Comprehension strategies and texts and textuality
3. Enhance their writing skills through paragraphs, précis and essays by using cohesive devices for structural coherence.
4. Build tone and tonality for professional use through meaningful sentences.
5. Demonstrate knowledge of drafting formal reports to define, describe and classify the processes by following a proper structure.

Course Outcomes:

After successful completion of the course the students will be able to:

1. Create awareness of communication skills in life and use in real life situations.
2. Apply effective reading techniques through critical reading exercises to reading comprehension and to support lifelong learning.
3. Develop; independently write well-structured coherent paragraphs through précis writing.
4. Construct sentences clearly and comprehensively to write effective business letters and draft emails for better professional communication.
5. Distinguish formal and informal reports and draft formal reports.

CO PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1					1	2	2	2	3	3	3
CO 2					1	2	2	1	1	2	2
CO 3		1			-	2	2	1	1	2	1
CO 4		1			-	1	2	2	2	2	2
CO 5		1		1	1	2	2	2	2	2	2

UNIT-I: Dynamics of Communication

Introduction to communication; Process of communication; Types of communication: verbal and non-verbal; Barriers to communication; Intrapersonal, Interpersonal communication; Johari Window. Listening, Speaking, Reading, Writing, Communication, Study skills & Literary Appreciation.

Vocabulary & Grammar: The concept of Word Formation - Root words, Use of prefixes and suffixes to form derivatives, Standard abbreviations. Construction of Sentences

Reading Task I: Rene Descartes' "*I think therefore, I am*"

UNIT-II: Introduction to Reading

The Reading process, purpose, Analysis of different kinds of texts; Reading Comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions. Practice with Critical Reading passages

Vocabulary and Grammar: Use of Synonyms and Antonyms, Tenses.

Reading Task II: Bertrand Russell's *"Knowledge and Wisdom*" (Essay)

UNIT-III: Introduction to Writing Skills

Paragraph Writing. – Structure and features of a paragraph; Précis writing

Vocabulary & Grammar: Use of Discourse Markers, Cohesion and Coherence in writing

Reading Task III: Rudyard Kipling's "*If"*

UNIT-IV: Professional Writing Skills
Professional Communication: Letter Writing – Structure, format of a formal letter; Letter of Request and Response, Drafting Emails.
Vocabulary and Grammar: Phrasal verbs, Subject-verb agreement in sentences
Reading Task IV: Chetan Bhagath's "*The Cut-off*"

UNIT-V: Professional Writing Skills: Engineering Specific Input.
Report writing – Importance, structure, elements & styles of formal reports; Writing a formal report.
Vocabulary and Grammar: Words often Confused, Common Errors.
Reading Task IV: *Nightfall in the City of Hyderabad* by Sarojini Naidu

TEXTBOOKS:

1. Sanjay Kumar &PushpLata, "English Language and Communication Skills for Engineers", Oxford University Press,2018.
2. "Language and Life: A Skills Approach", Board of Editors, 2018th Edition, Orient Black Swan, 2018.

SUGGESTED READINGS:

1. Ashraf, M Rizvi, "Effective Technical Communication", Tata McGraw-Hill, 2006.
2. Michael Swan,"Practical English Usage", Oxford University Press, 4th Edition,2016.
3. Meenakshi Raman and Sangeetha Sharma, "Technical Communication: Principles and Practice" 3rd Edition, Oxford University Press, 2015.
4. Communicative English and Employability Skills, Dr. B. Vijaya, Orient Blackswan, 2026

26PYC04

ELECTROMAGNETISM AND QUANTUM COMPUTING LAB

(EEE, ECE & EVL)

Instruction	3 L Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives: This course aims to

1. Apply analytical concepts in experiments.
2. Understand the light phenomenon practically.
3. Comprehend the optical fibres losses experimentally.
4. Understand the quantization of photons through experiments.
5. Familiarize the industrial applications of semiconductors.

Course Objectives: After the completion of this course, the student will be able to

1. Analyse the data through graphical method and estimate the error.
2. Demonstrate and visualize the light phenomenon experimentally.
3. Experience the optical fibres losses experimentally.
4. Demonstrate the quantization of photons through photoelectric effect experiment.
5. Realize some applications of semiconductor-based devices.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	1	3	2	1	1	1	1	2	2	-	-	-
CO 2	3	2	1	1	1	1	1	1	1	1	1	-	-	-
CO 3	3	2	2	1	3	1	1	1	2	2	2	-	-	-
CO 4	3	3	2	1	3	1	1	1	1	1	2	-	-	-
CO 5	3	2	2	1	3	1	1	1	2	1	2	-	-	-

1-Slightly, 2-Moderately, 3-Substantially

LIST OF EXPERIMENTS

1. Error Analysis : Estimation of errors in the determination of time period of a Torsional pendulum
2. Newton's Rings : Determination of radius of curvature of a plano-convex lens
3. Single-Slit Diffraction : Determination of slit width
4. Diffraction Grating : Determination of wavelength of two yellow lines of mercury vapour lamp.
5. Malus's law : Verification of Malus's law
6. *B* vs *I* – Ampere's Law : Verification of Ampere's law and determination of free space permeability.
7. Specific charge *e/m* : Determination of specific charge of an electron *e/m*
8. LASER Wavelength : Determination of wavelength of semiconductor LASER
9. Fibre optics : Determination of numerical aperture and power losses of a given optical fibre
10. Planck's constant : Determination of Planck's constant *h*.
11. Energy Gap : Determination of energy gap a given semiconductor
12. *P-N* Junction Diode : Study of V-I characteristics and calculation of resistance of a given *P-N* Junction diode in forward and reverse bias
13. Hall Effect : Determination of Hall coefficient, carrier concentration and mobility of charge carriers of a given semiconductor
14. LED : Study of V-I characteristics and determination of threshold voltage of a given LED
15. Solar Cell : Study of V-I characteristics of a given solar cell, calculation of fill factors, efficiency and series resistance

NOTE: A minimum of TWELVE experiments should be conducted.

26MEC03

ENGINEERING GRAPHICS

(Common to Mechanical, Civil, ECE, EVL, EEE, Chemical & Bio Tech)

Instruction	1T + 3D Hours per week
Duration of SEE	3Hours
SEE	50marks
CIE	50Marks
Credits	2.5

Prerequisite: Nil

Course Objectives: This course aims to

1. Get exposure to a cad package and its utility.
2. Understand orthographic projections.
3. Visualize different solids and their sections in orthographic projection
4. Prepare the student to communicate effectively by using isometric projection.
5. Prepare the student to use the techniques, skills, and modern tools necessary for practice.

Course Outcomes: upon completion of this course, students will be able to

1. Become conversant with appropriate use of CAD software for drafting and able to draw conic sections.
2. Understand orthographic projections of points and straight lines.
3. Draw the projections of planes and solids.
4. Draw the sectional views and develop the surfaces of solids.
5. Create isometric projections and views.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	1	2	1	3	1	1	1	1	1	2	2	2	1
CO 2	3	2	2	-	2	1	1	-	1	-	1	1	2	1
CO 3	3	2	3	1	2	1	1	1	1	1	1	2	2	1
CO 4	3	2	3	1	2	1	1	1	1	1	1	2	2	1
CO 5	3	2	3	-	2	1	1	-	2	1	1	2	2	1

1-Slightly, 2-Moderately, 3-Substantially

LIST OF EXERCISES

1. Introduction to Auto CAD package: Settings, drawing, modifying tools, dimensioning, documentation and practice exercises.
2. Construction of Conic Sections by General method.
3. Orthographic projection: Principles, conventions, Projection of points.
4. Projection of straight lines in simple position, inclined to one plane & both the reference planes (without traces and mid-point).
5. Projection of perpendicular planes.
6. Projection of solids in simple position.
7. Projection of solids with axis Inclined to one plane.
8. Sections of Prisms and Pyramids are in simple position.
9. Development of the surfaces of a right regular prism and a cone in simple positions.
10. Isometric projections of regular solids.
11. Conversion of isometric views to orthographic views and vice versa.

TEXTBOOKS:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

SUGGESTED READING:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Textbook of Engineering Drawing”, Scitech Publications, 2011.

26CSC38

PYTHON PROGRAMMING WORKSHOP

(For Civil, Mechanical, EEE, ECE, ECE-EVL (VLSI), Chemical, Biotech)

Instruction	3 P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

PREREQUISITE: Basic Computer Skills, Interest in Problem Solving, Basic Mathematical Skills.

Course Objectives: This course aims to
1. Master the fundamentals of writing Python scripts.
2. Learn Python elements such as variables, flow controls structures, functions and modules.
3. Discover how to work with lists and sequence data, and files.

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Course Outcomes: After the completion of this course, the student will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs and data structures to design and build the solutions.
3. Develop solutions with modular approach using functions to enhance code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of Standard Template Libraries and modules to build file handling / Searching / sorting applications.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	1	1	-	-	-	-	-	2	1	1	1
CO 2	3	3	3	1	1	1	-	-	-	-	3	1	2	2
CO 3	3	3	3	1	2	1	-	-	-	-	3	2	2	2
CO 4	3	3	3	1	1	1	-	-	-	-	2	3	3	1
CO 5	3	3	3	1	2	1	-	-	-	-	3	2	2	2

1-Slightly, 2-Moderately, 3-Substantially

LABORATORY / PRACTICAL EXPERIMENTS

1. Explore various Python Program Development Environments. eg: Vscode, IDLE, PyCharm, anaconda etc.,
2. Design Flowcharts using raptor / draw.io tools.
3. Simple scripts to demonstrate the use of various data types and operators.
4. Demonstrate the use of control structures.
5. Experiments using Comprehensions with List, Dictionary, Set.
6. Implementation using Functions, Lambda functions and parameter passing.
7. Experimentation with Arrays using array and numpy modules.
8. Experiments using Searching and Sorting techniques.
9. Simple scripts to demonstrate the use of built-in modules. (Ex: math, random).
10. Demonstration of File Handling.

TEXTBOOKS:

1. Jeeva Jose, “Taming Python by Programming”, 2nd Edition, 2019, Khanna Book Publications.
2. Reema Thareja, “Python Programming”, 1st Edition, 2017, Oxford Press.

SUGGESTED READING:

1. Zed A. Shaw, “Learn Python3 the Hard Way”, 1st Edition, 2018, Pearson Education Inc.
2. R.S. Salaria, “Programming in Python”, 1st Edition, 2024, Khanna Publishing House.
3. Yashavant Kanetkar and Aditya Kanetkar, “Let Us Python”, 1st Edition, 2019, Edition, BPB Publications.

ONLINE RESOURCES:
1. https://onlinecourses.swayam2.ac.in/cec24_cs01/preview.
2. https://www.coursera.org/specializations/python.

3. https://www.python.org.
4. https://www.visual-paradigm.com/tutorials/decision-table-in-action.jsp.

26MEC04

ENGINEERING WORKSHOP & 3D PRINTING

(Common to Mechanical, Civil, ECE, EVL, EEE, Chemical & Bio Tech)

Instruction	3P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Prerequisite: Nil

Course Objectives: This course aims to

1. Give a feel of Engineering Practices and develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive and teamwork attitude to get things right the first time.
3. Provide basic knowledge of steel, plastic, composite, and other materials for suitable applications.
4. Study of principle and hands on techniques of fabrication, manufacturing, and allied skills.
5. Advance important, hard and pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes: Upon completion of this course, students will be able to

1. Students will be able to fabricate a square tray and perform a lap joint on mild steel using proper marking, , welding, and finishing techniques.
2. Apply house-wiring techniques to construct and verify single-point, series, parallel, and staircase circuits.
3. Apply pipe fitting techniques to thread, assemble, and verify GI pipe systems as per given diagrams.
4. Perform 3D modeling using solid works software and pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	2	1	1	-	-	1	-	-	-	1			
CO 2	1	-	1	-	-	-	-	-	-	-	1			
CO 3	1	-	1	-	-	1	-	-	-	-	1			
CO 4	1	-	1	-	-	1	-	-	-	-	1			
CO 5	2	2	2	1	3	1	1	1	2	-	2			

1-Slightly, 2-Moderately, 3-Substantially

Lab Experiments

Group 1: Workshop Practice

1. To make a square tray from the given sheet metal
2. Fabricate a funnel from the given sheet metal and join it using soldering.
3. Wiring of Single Light Point and Socket with Switches, and Series–Parallel Connection of Two Light Points with Verification.
4. Staircase wiring of one light point controlled from two different places independently using two 2way switches.
5. To make external threads for GI/uPVC pipes using die and connect the GI/uPVC pipes as per the given diagram using taps, couplings, and bends.

6. Assemble GI/uPVC pipes as per the diagram using fittings, install a shower, tap, and valves, and demonstrate operation with a water connection.

Group 2: Additive Manufacturing /3D Printing

1. Introduction to Additive manufacturing and modeling Software
2. To create a 3D CAD model (Door Bracket and Door handle) using modeling software.
3. To perform preprocessing operations and print a door bracket model using an extruder type 3D printer.
4. To create a 3D CAD model using Reverse engineering.
5. To demonstrate Engraving, Drilling and Cutting operations on printed circuit boards using CNC PCB Mate.
6. To design an innovative component using the CAD software/print the selected innovative component using a 3D printer.

TEXTBOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, Media promoters and publishers private limited, Mumbai, 2010.
2. Sabrie Soloman , "3D Printing & Design", 1st edition,khanna Publishing House,2020

SUGGESTED READING:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology.
2. Oliver Bothmann, 3D Printers: A Beginner's Guide, January 1, 2015.

26EGC02

COMMUNICATION SKILLS LAB

(BE/B.Tech - Common to all Branches)

Instruction	2P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Basic Knowledge of English Communication.

Course Objectives: This course will introduce the students

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation through computer-aided multi-media instruction.
2. To the significance and application of stress and intonation.
3. To sufficient practice in listening to English spoken by educated English speakers in different socio-cultural and professional settings.
4. To activities enabling them to overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To teamwork, role behavior while developing their ability to use language appropriately, to discuss in groups and make presentations.

Course Outcomes:

After successful completion of the course the students will be able to:

1. Define the speech sounds in English and understand the nuances of pronunciation in English.
2. Produce speech with clarity and confidence using correct word stress, and intonation.
3. Achieve improved ability to listen, understand, analyse, and respond to English spoken in various settings.
4. Determine the context and speak appropriately in various situations.
5. Design effective posters collaboratively through creative decisions, give presentations, and efficiently participate in Group discussions.

CO-PO Articulation Matrix

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1	-	-	-	-	-	-	-	1	1	-	1
CO 2	-	-	-	-	-	1	-	1	2	-	1
CO 3	-	-	-	-	-	1	1	1	2	-	1
CO 4	1	1	1	1	1	1	2	2	3	-	1
CO 5	-	1	1	1	1	2	2	2	3	1	2

Exercises

Computer-Aided Language Learning Lab

1. **Introduction to English Phonetics**: Introduction to English Phonetics and organs of speech.
2. **Sound System of English**: Speech sounds- Vowels and Consonants - Basic phonetic transcription practice.
3. **Syllable Division and Word stress**: Introduction to syllables- structure of syllables - Rules of word stress.
4. **Intonation**: Types of Intonation, Practice in Articulation – MTI – Common Errors in pronunciation.
5. **Listening Skills**: understanding Listening- types of listening- Practice in Listening comprehension texts.

Interactive Communication Skills Lab

1. **Role Play -** Practicing the nuances of situational language, simulating the real-world conversations in a designed environment.
2. **Group Discussions -** Understanding the Dynamics and techniques of a Group Discussion, and Non-Verbal Communication.
3. **Debate -** Learning speaking dynamics in a formal discourse, discussion and oral addresses.
4. **Poster Presentation –** Working on a Theme, Poster preparation and presentation.
5. **Public Speaking –** Speaking with confidence and clarity in different contexts on various issues.

TEXTBOOKS:

1. T Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan, 2nd Edition, 2017.
2. J Sethi et al., "A Practical Course in English Pronunciation (with CD)", Prentice Hall India, 2005.
3. Priyadarshi Patnaik, "Group Discussions and Interview Skills", Cambridge University Press Pvt. Ltd., 2nd Edition, 2023.
4. Aruna Koneru, "Professional Speaking Skills", Oxford University Press, 2018.

SUGGESTED READING:

1. "English Language Communication Skills – Lab Manual cum Workbook", Cengage Learning India Pvt. Ltd., 2022.
2. KN Shoba& J. Lourdes Javani Rayen. Communicative English – A workbook", Cambridge University Press, 2019.
3. Sanjay Kumar & Pushp. Lata. "Communication Skills: A Workbook. Oxford University Press", 2019.
4. Veerendra Mishra et al. "English Language Skills: A Practical Approach", Cambridge University Press, 2020.

Suggested Software:

1. K-VAN Multi-Media Language Lab
2. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
3. Digital All
4. Orell Digital Language Lab (Licensed Version).