

# **P. A. COLLEGE OF ENGINEERING AND TECHNOLOGY**

**(An Autonomous Institution, Affiliated to Anna University, Chennai)  
An ISO 9001:2015 Certified Institution - Accredited by NBA and NAAC with 'A' Grade  
Pollachi – 642 002**

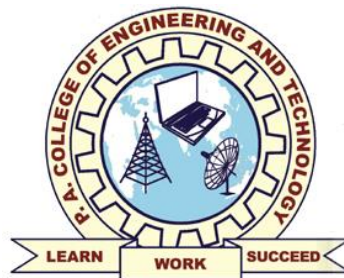


## **B.E ELECTRONICS AND COMMUNICATION ENGINEERING**

### **CURRICULA & SYLLABI**

**(I to II Semester)**

**REGULATIONS  
2022**



**SEMESTER I**

Sl.No.	COURSE CODE	COURSE TITLE	L	T	P	C
		Induction Programme	0	0	0	0
<b>THEORY</b>						
1	22CAHS101	Professional English - I	3	0	0	3
2	22CABS102	Matrices and Calculus	3	1	0	4
3	22CABS103	Engineering Physics	3	0	0	3
4	22CAES104	Engineering Graphics	1	0	4	3
5	22CAES105	C Programming	3	0	0	3
6	22ECES106	Electrical and Instrumentation Engineering	3	0	0	3
<b>PRACTICAL</b>						
7	22CAES106	Programming in C Laboratory	0	0	3	1.5
8	22CAES107	Engineering Practices Laboratory	0	0	3	1.5
<b>Total</b>			<b>16</b>	<b>1</b>	<b>10</b>	<b>22</b>

**SEMESTER II**

Sl.No.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	22CAHS201	Professional English - II	3	0	0	3
2	22CABS202	Advanced Calculus and its Applications	3	1	0	4
3	22CAES203	Python Programming	3	0	0	3
4	22ECPC204	Electronic Devices and Circuit Analysis	3	0	0	3
5	22CABS205	Physics for Electronics Engineering	3	0	0	3
6	22CABS104	Engineering Chemistry	3	0	0	3
<b>PRACTICAL</b>						
7	22CABS107	Physics and Chemistry Laboratory	0	0	3	1.5
8	22CAES206	Python Programming Laboratory	0	0	3	1.5
<b>Total</b>			<b>18</b>	<b>1</b>	<b>6</b>	<b>22</b>

**COURSE OBJECTIVES:**

- To improve the communicative competence of learners.
- To help learners use language effectively in academic /work contexts.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that is relevant to authentic contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- To use language efficiently in expressing their opinions via various media.

**UNIT-I: INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 9**

- Listening - For general information - Listening and filling a form  
 Speaking - Self Introduction  
 Reading - Brochures and social media messages relevant to technical contexts.  
 Writing -Writing emails / letters (permission, accepting, declining)  
 Grammar - Present Tense, Parts of Speech.  
 Vocabulary - One word substitution; Abbreviations & Acronyms

**UNIT-II: NARRATION AND SUMMATION 9**

- Listening -Listening Comprehension –Monologues - Dialogues.  
 Speaking -Narrating personal experiences /oral presentation  
 Reading -Reading biographies, newspaper reports, Reading Comprehension  
 Writing - Paragraph writing, Short Report on an event (field trip etc.) - discourse markers (connectives & sequence words)  
 Grammar - Past tense; Subject-Verb Agreement.  
 Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms

**UNIT-III: DESCRIPTION OF A PROCESS / PRODUCT 9**

- Listening -Listen to a product and process descriptions and advertisements about a products.  
 Speaking -Picture description; giving instruction to use the product; advertising a product.  
 Reading -Reading advertisements, gadget reviews; user manuals.  
 Writing -Writing definitions; instructions; and Product /Process description.  
 Grammar -Degrees of comparison; Future Tense  
 Vocabulary -Homonyms; and Homophones.

**UNIT-IV: CLASSIFICATION AND RECOMMENDATIONS 9**

- Listening - Listening and transfer of information- Note-taking.  
 Speaking - Small Talk; Mini presentations and making recommendations.  
 Reading - Reading for specific information- interpreting visual materials (pictures, labels, signs, postcards).  
 Writing - Note-making / recommendations; Transferring information from non verbal (tables, chart, graph etc,) to verbal mode.  
 Grammar - wh-yes or no- tags.  
 Vocabulary - Collocations; Fixed / Semi fixed expressions.

**UNIT-V: EXPRESSION**

- Listening - Listening to speeches (experts)..  
 Speaking - Group discussion, Debate, & Role play activities  
 Reading - Cloze test, speed reading.  
 Writing - Essay Writing (Descriptive or narrative)- Cause & Effect Expressions  
 Grammar - Simple, Compound & Complex Sentences  
 Vocabulary - Idioms - Phrasal verbs.

**Contact Periods:**

**Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods**

**REFERENCES:**

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication" – Principles And Practices, Oxford Univ. Press, New Delhi 2022.
2. Dr.S. Mahalakshmi, "Professional English", VK Publications (India) Pvt. Ltd. (2022)
3. Meenakshi Raman & Sangeeta Sharma, "Professional English", Oxford Higher Education, 2018
4. Aysha Viswamohan, "English For Technical Communication" (With CD), Mcgraw Hill Education, ISBN: 0070264244.
5. Department of English, Anna University, "English for Engineers & Technologists" Orient Blackswan Private Ltd. (2020) edit.
6. Dr. S. Gunasekaran, "A Work Book of Technical English", Vishnu Prints Media, Chennai- (2020) edit.

**COURSE OUTCOMES:**

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

- CO1:** Listen and comprehend complex academic texts.  
**CO2:** Read and infer the denotative and connotative meanings of technical texts.  
**CO3:** Write definitions, descriptions, narrations and essays on various topics.  
**CO4:** Speak fluently and accurately in formal and informal communicative contexts.  
**CO5:** Express their opinions effectively in both oral and written medium of communication.

**COURSE OBJECTIVES:**

- To obtain the knowledge of Eigen values and diagonalization of a matrix.
- To be familiarize with differentiation of single variable and its applications.
- To acquire knowledge of differentiation for more than one variable and its applications.
- To obtain the knowledge of various techniques of integration.
- To acquire the knowledge of multiple integration and related applications.

**UNIT-I: MATRICES****9+3**

Eigen values and Eigenvectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigenvectors - Cayley-Hamilton theorem - Diagonalization of a matrix by orthogonal transformation - Reduction of a quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms.

**UNIT-II: DIFFERENTIAL CALCULUS****9+3**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

**UNIT-III: FUNCTIONS OF SEVERAL VARIABLES****9+3**

Partial differentiation - Homogeneous functions and Euler's theorem - Total derivative - Change of variables - Jacobians - Partial differentiation of implicit functions - Taylor's series for functions of two variables - Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers.

**UNIT-IV: INTEGRAL CALCULUS****9+3**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

**UNIT-V: MULTIPLE INTEGRALS****9+3**

Double integrals - Change of order of integration - Double integrals in polar coordinates - Area enclosed by plane curves - Triple integrals - Volume of solids - Change of variables in double and triple integrals.

**Contact Periods:**

**Lecture: 45 Periods    Tutorial: 15 Periods    Practical: 0 Periods    Total: 60 Periods**

**REFERENCES:**

1. Kreyszig E., “Advanced Engineering Mathematics”, John Wiley & Sons, 10<sup>th</sup> Edition, 2018.
2. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, 44<sup>th</sup> Edition, New Delhi, 2018.
3. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5<sup>th</sup> Edition, 2016.
4. James Stewart, “Calculus: Early Transcendentals”, Cengage Learning, 8<sup>th</sup> Edition, New Delhi, 2015.
5. Thomas G.B., Hass J. and Weir M.D., “Thomas Calculus”, Pearson Education, 14<sup>th</sup> Edition New Delhi, 2018.
6. Anton H., Bivens I. and Davis S., “Calculus”, Wiley, 10<sup>th</sup> Edition, 2016.

**COURSE OUTCOMES:**

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

- CO1:** Understand the matrix algebra techniques for solving practical problems.
- CO2:** Understand the limit definition and rules of differentiation to differentiate functions.
- CO3:** Apply differentiation to solve maxima and minima problems.
- CO4:** Apply different methods of integration in solving practical problems.
- CO5:** Apply multiple integrals ideas in solving areas and volumes.

**COURSE OBJECTIVES:**

- To make the students effectively to achieve understanding of mechanics of solids.
- To enable the students to gain knowledge of thermal conductivity of solids.
- To motivate the students towards the applications of acoustics and ultrasonics.
- To equip the students to understand the importance of quantum physics.
- To make the students to understand the basics of crystallography and its importance in studying materials properties.

**UNIT-I: MECHANICS OF SOLIDS 9**

Elasticity- Hooke's law - Types of strain - Classification of Modulus of Elasticity- Poisson's Ratio - Stress-Strain diagram - Factors affecting elasticity - Moment, Couple and Torque - Derivation of Twisting Couple on a wire - Bending moment - Depression of a cantilever - Young's modulus by Uniform Bending – Non-Uniform bending - I shaped girders.

**UNIT-II: THERMAL PROPERTIES 9**

Thermal Conductivity - Thermal Diffusivity - Specific Heat Capacity - Rectilinear Flow of Heat along a Uniform Bar - heat conduction in solids - flow of heat through compound media (parallel and perpendicular) - Determination of Thermal Conductivity of a Good Conductor by Forbe's Method: theory and experiment - Determination of Thermal Conductivity of a poor Conductor by Lee's Disc Method: theory and experiment.

**UNIT-III: ACOUSTICS AND ULTRASONICS 9**

Classification of Sound – decibel - Weber-Fechner law – Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedies. Piezoelectric crystals - Production of ultrasonics – magnetostriction and piezoelectric methods – Non Destructive testing – pulse echo system through transmission and reflection modes – Medical application – Sonogram.

**UNIT-IV: QUANTUM MECHANICS 9**

Limitations of classical Physics - Introduction to Quantum theory - Dual nature of matter and radiation - Properties of matter waves - de Broglie wavelength in terms of voltage, energy, and temperature - Heisenberg's Uncertainty principle - verification - physical significance of wave function - Schrodinger's Time independent and Time dependent wave equations - Particle in a one-dimensional potential well.

**UNIT-V: CRYSTALLOGRAPHY 9**

Crystal structures: Crystal lattice – basis - unit cell and lattice parameters – crystal systems and Bravais lattices – Structure and packing fractions of SC, BCC, FCC, diamond and NaCl structures – crystal planes, directions and Miller indices – distance between successive planes – crystalline and non-crystalline materials – imperfections in crystals.

**Contact Periods:**

**Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods**

**REFERENCES:**

1. D.Halliday, R.Resnick and J.Walker, Principles of Physics, Wiley (Indian Edition), 2015.
2. N.Garcia, A.Damask and S.Schwarz, Physics for Computer Science Students. Springer Verlag, 2012.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGrawHill (Indian Edition), 2017.
4. R.Wolfson, Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
5. Paul A. Tipler, Physics – Volume 1 & 2, CBS, (Indian Edition), 2004.
6. K.Thyagarajan and A.Ghatak, Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.

**COURSE OUTCOMES:**

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

**CO1:** Understand the importance of mechanics and their various properties.

**CO2:** Express their knowledge in thermal physics.

**CO3:** Apply acoustical and ultrasonic principles for industrial and medical applications.

**CO4:** Understand the importance of quantum physics.

**CO5:** Demonstrate a strong foundational knowledge about crystals.



L	T	P	C
1	0	4	3

**COURSE OBJECTIVES:**

The main learning objective of this course is to prepare the students for:

- Drawing various types of conical and special engineering curves.
- Drawing orthographic projection of points, lines and 3D objects.
- Drawing projection of plane surfaces and projection of solids.
- Drawing section of solids and development of solids.
- Drawing isometric projections of simple solids and sketching of 3D objects.

**CONCEPTS AND CONVENTIONS (Not for Examination)**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

**UNIT-I: PLANE CURVES****3+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

**UNIT-II: ORTHOGRAPHIC PROJECTION OF POINTS, LINES AND 3D OBJECTS****3+12**

Principal planes – First angle projection – Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces. Visualization concepts – Visualization principles – Representation of Three Dimensional objects – Layout of views – Sketching of multiple views from pictorial views of objects.

**UNIT-III: PROJECTION OF PLANE SURFACES AND SOLIDS****3+12**

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method – Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

**UNIT-IV: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES****3+12**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: Prisms, pyramids cylinders and cones.

## **UNIT – V: ISOMETRIC PROJECTIONS**

**3+12**

Principles of Isometric projection – Isometric scale – Isometric projections of simple solids and truncated solids: Prisms, pyramids, cylinders, cones – Conversion of orthographic views to pictorial views (Simple objects)

### **Contact Periods:**

**Lecture: 15 Periods    Tutorial: 0 Periods    Practical: 60 Periods    Total: 75 Periods**

### **REFERENCES:**

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill, 2<sup>nd</sup> Edition, 2019.
2. Bhatt, N.D., “Engineering Drawing”, Charotar Publishing House Pvt. Ltd., 53<sup>rd</sup> Edition, 2019.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I & II combined), Subhas Publications, Bangalore, 27<sup>th</sup> Edition, 2017.
4. Parthasarathy N. S. and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
5. Kulkarni, D.M., Rastogi, A.P. and Sarkar, A.K., “Engineering Graphics with AutoCAD”, PHI Learning, 2<sup>nd</sup> Edition, 2010.

### **COURSE OUTCOMES:**

Upon on completion of this course, the student will be able to

**CO1:** Construct the conic curves, involutes and cycloid.

**CO2:** Solve practical problems involving orthographic projection of points, lines and 3D objects.

**CO3:** Draw the projections of plane surfaces and simple solids.

**CO4:** Draw the section of solids and the development of simple solids.

**CO5:** Draw the isometric projections of simple solids and sketching of 3D objects

### **Special points applicable to End Semester Examinations on Engineering Graphics:**

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

**COURSE OBJECTIVES:**

- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions and pointers.
- To develop program in C using structures and union.
- To perform file handling operations in C and learn dynamically allocated memory techniques.

**UNIT-I: BASICS OF C PROGRAMMING 11**

Generation and Organization of Computers - Number System - Binary - Decimal - Conversion - Problems. Need for logical analysis and thinking - Algorithm - Pseudo code - Flow Chart. Introduction to programming paradigms: Structure of C program - Data Types - Constants - Keywords - Operators and Expressions - Input / Output statements.

**UNIT-II: ARRAYS AND STRINGS 9**

Decision making statements - Switch statement - Looping statements - Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays - String: String operations - String Arrays - Simple programs: Sorting - Searching - Matrix operations.

**UNIT-III: FUNCTIONS AND POINTERS 9**

Introduction to functions: Function prototype, function declaration, function definition, function call, Built-in functions (string functions, math functions) - Recursion - Pointers - Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers - Parameter passing: Pass by value, Pass by reference.

**UNIT-IV: STRUCTURES AND UNION 9**

Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

**UNIT-V: FILE PROCESSING 7**

Files: File opening modes - Types of file processing: Sequential access, Random access - Preprocessor directives - Command line arguments.

**Contact Periods:**

**Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods**

**REFERENCES:**

1. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, 2<sup>nd</sup> Edition, Pearson Education, 2015.
2. ReemaTheraja “Fundamentals of Computing and Programming in C”, 2<sup>nd</sup> Edition, Oxford University Press, 2016.
3. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2013.
4. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
5. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 16<sup>th</sup> revised edition, 2020.

**COURSE OUTCOMES:**

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

**CO1:** Develop simple applications in C using basic constructs.

**CO2:** Design and implement applications using arrays and strings.

**CO3:** Develop and implement applications in C using functions and pointers.

**CO4:** Develop applications in C using structures and union.

**CO5:** Design applications using sequential and random-access file processing.

## 22ECES106 ELECTRICAL AND INSTRUMENTATION ENGINEERING SEMESTER I

**L T P C**  
**3 0 0 3**

### **COURSE OBJECTIVES:**

- To impart knowledge in types, construction and working of transformers.
- To impart knowledge in types, construction and working of DC machines.
- To impart knowledge in types, construction and working of AC rotating machines.
- To introduce the functional elements and working of measuring instruments.
- To introduce the components of Electrical installations and energy conservation.

### **UNIT I TRANSFORMER**

**9**

Introduction - Ideal and Practical Transformer - Phasor diagram - Per Unit System - Equivalent circuit - Testing - Efficiency and Voltage Regulation - Three Phase Transformers - Applications- Auto Transformers, Advantages.

### **UNIT II DC MACHINES**

**9**

Introduction - Constructional Features - Motor and Generator mode - EMF and Torque equation - Methods of Excitation- Characteristics - Starting and Speed Control - Universal Motor - Stepper Motors - Brushless DC Motors- Applications.

### **UNIT III AC ROTATING MACHINES**

**9**

Principle of operation of three-phase induction motors - Construction –Types - Equivalent circuit - Single phase Induction motors - Construction- Types–starting methods. Alternator: Working principle - Equation of induced EMF - Voltage regulation, Synchronous motors - working principle - starting methods - Torque equation.

### **UNIT IV MEASUREMENTS AND INSTRUMENTATION**

**9**

Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers – DSO - Block diagram- Data acquisition.

### **UNIT-V ELECTRICAL INSTALLATIONS AND ENERGY CONSERVATION**

**9**

Single phase and three phase system - phase, neutral and earth, basic house wiring - basic safety measures at home and industry - Energy efficient lamps - Components of LT switchgear : Switch fuse unit, MCB, MCCB, ELCB- Types of wires and cables - Earthing - Batteries - Principle, characteristics, types and applications - safety precautions and First Aid.

### **Contact Periods:**

**Lecture: 45 Periods**

**Tutorial: 0 Periods**

**Practical: 0 Periods**

**Total: 45 Periods**

**REFERENCES:**

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. S. K, Bhattacharya, "Basic Electrical and Electronics Engineering", Second Edition, Pearson Education, 2017.
3. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, 2015.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010
5. C.L.Wadhwa, "Generation, Distribution and Utilisation of Electrical Energy", New Age International pvt.ltd.,2003.

**COURSE OUTCOMES:**

After completing this course, the students will be able to

**CO1:** Explain the working principle of transformers

**CO2:** Explain and Analyze the output characterizes of electrical machines

**CO3:** Choose the appropriate electrical machines for various applications

**CO4:** Analyze the types and operating principles of measuring instruments

**CO5:** Understand the basic Electrical Installation, Safety and Energy Conservation

**22CAES106**

**PROGRAMMING IN C LABORATORY**

**SEMESTER I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**COURSE OBJECTIVES:**

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

**LIST OF EXPERIMENTS:**

1. I/O statements, operators, expressions
2. Decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.
11. Mini project

**Contact Periods:**

**Lecture: 0 Periods      Tutorial: 0 Periods      Practical: 45 Periods      Total: 45 Periods**

**COURSE OUTCOMES:**

Upon successful completion of the course, students should be able to:

- CO1:** Develop C programs for simple applications making use of basic constructs, arrays and Strings.
- CO2:** Develop C programs involving functions, recursion, pointers, and structures.
- CO3:** Design applications using sequential and random access file processing.

**LIST OF EQUIPMENT'S AND COMPONENTS**

- Software Required – Turbo C Compiler / GNU C Compiler / Equivalent
- Operating System – Windows 7 / 8.1 / 10 / Linux
- Computers Required – 30 Nos.

**COURSE OBJECTIVES:**

The main learning objective of this course is to provide hands on training to the students in:

- Connecting various pipe fittings used in common household plumbing work, sawing, planning and making joints in wood materials used in common household wood work.
- Welding various joints in steel plates using arc welding work.
- Machining various simple processes like turning, drilling, and tapping in parts and making a tray out of metal sheet using sheet metal work.
- Wiring various electrical joints in common household electrical wire work
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

**GROUP – A (CIVIL & MECHANICAL)**  
**PART I CIVIL ENGINEERING PRACTICES**

**PLUMBING WORK:**

- a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- b) Preparing plumbing line sketches.
- c) Laying pipe connection to the pump
- d) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

- a) Sawing,
- b) Planning and
- c) Making joints like T-Joint, Cross lap Joint and Dovetail joint.

**Wood Work Study:**

- a) Studying joints in door panels and wooden furniture.
- b) Studying common industrial trusses using models.

**PART II MECHANICAL ENGINEERING PRACTICES**

**WELDING WORK:**

- a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- b) Practicing gas welding.

**BASIC MACHINING WORK:**

- a) Simple Turning.



- b) Simple Drilling.
- c) Simple Tapping.

**SHEET METAL WORK:**

- a) Making of a square tray

**FOUNDRY WORK:**

- a) Demonstrating basic foundry operations.

**Contact Periods:**

**Lecture: 0 Periods      Tutorial: 0 Periods      Practical: 24 Periods      Total: 24 Periods**

**GROUP – B (ELECTRICAL & ELECTRONICS)  
PART III ELECTRICAL ENGINEERING PRACTICES**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Measurement of voltage and current using solar panel
3. Stair case wiring
4. Assembling and Testing of Ceiling Fan
5. Study of lightning arrester

**PART IV ELECTRONIC ENGINEERING PRACTICES**

1. Study of Electronic components and equipments – Resistor, colour coding
2. Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
3. Verification of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Assembling of 15 watts LED circuit

**Contact Periods:**

**Lecture: 0 Periods      Tutorial: 0 Periods      Practical: 21 Periods      Total: 21 Periods**

**COURSE OUTCOMES:**

Upon completion of this course, the student will be able to

- CO1:** Apply the knowledge of pipeline and connecting various pipe fittings used in common household plumbing work and Use tools and equipments used in Carpentry.
- CO2:** Perform the various welding joints in steel plates using arc welding work.
- CO3:** Perform operation in a lathe machine and also fabricate parts like tray in sheet metal.
- CO4:** Wire various electrical joints in common household electrical wire work.
- CO5:** Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

**COURSE OBJECTIVES:**

- To engage learners in meaningful language activities to improve their LSRW skills.
- To enhance learners' awareness of general rules of writing for specific audiences.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

**UNIT-I: MAKING COMPARISONS 9**

- Listening - Listening to oral presentation- Listening and Gap filling  
 Speaking - Marketing a product, Mock interviews  
 Reading - Reading advertisements, Reading to identify stylistic features(syntax, lexis and sentence structures)  
 Writing - Compare and Contrast Essay, Review writing  
 Grammar - If conditions, Direct and indirect speech  
 Vocabulary - Verbal analogies

**UNIT-II: EXPRESSING CASUAL RELATIONS IN SPEAKING AND WRITING 9**

- Listening - Listening to longer technical, Listening technical information from podcasts  
 Speaking - Describing and discussing the reasons of accidents or disasters based on news reports  
 Reading - Reading and understanding technical articles  
 Writing - Writing responses to complaints  
 Grammar - Active Passive Voice transformations, Infinitive and Gerund  
 Vocabulary - Technical Jargons

**UNIT-III: PROBLEM SOVING 9**

- Listening - Listening to video clips and answering the questions, listening to different view points on an issue  
 Speaking - Picture description  
 Reading - Case studies, excerpts from literary texts, news reports etc  
 Writing - Letter to the Editor, Checklists  
 Grammar - Error correction, Numerical adjectives  
 Vocabulary - Compound Words, Sentence Completion

**UNIT-IV: REPORTING OF EVENTS AND RESEARCH 9**

- Listening - Listening comprehension based on news reports and documentaries  
 Speaking - Interviewing, Presenting an oral report, Mini presentations on select topics  
 Reading - Newspaper articles  
 Writing - Delivering welcome address, Proposing Vote of thanks, Accident Report, Survey Report  
 Grammar - Phrases and its types  
 Vocabulary - Cliches, Redundancies

**UNIT-V: THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY****9**

- Listening - Listening to TED Talks, Job interviews(analysis of the interview performance)  
Speaking - Participating in a Role play, virtual interviews, Making presentations with visual aids  
Reading - Company profiles, Statement of Purpose(SOP), an excerpt of interview with professionals  
Writing - Internship application, Cover letter & Resume, Precise writing, Summarizing  
Grammar - Subject- Verb agreement, Relative clauses  
Vocabulary - Numerical Adjectives

**Contact Periods:****Lecture: 45 Periods****Tutorial: 0 Periods****Practical: 0 Periods****Total: 45 Periods****REFERENCES:**

1. Department of English, Anna University, “English for Engineers & Technologists”, Orient Blackswan, 2020.
2. Krishna Mohan, Meera Bannerji, “Developing Communication Skills”, Macmillan India Ltd, Delhi, 2020.
3. V. N. Arora and Laxmi Chandra, “Improve Your Writing”, Oxford University Press, New Delhi, 2020.
4. J. Anbazhagan Vijay, “Communicative English”, Global Publishers, Chennai, 2019.
5. Raman, Meenakshi, Sharma. Sangeeta, “Professional English”, Oxford University Press, New Delhi, 2019.
6. Prof. R.C. Sharma & Krishna Mohan, “Business Correspondence and Report Writing”, Tata McGraw Hall & Co. Ltd, New Delhi, 2019.

**COURSE OUTCOMES:**

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

**CO1:** Compare and contrast products and ideas in technical texts.

**CO2:** Identify cause and effects in events, industrial processes through technical texts

**CO3:** Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.

**CO4:** Report events and the processes of technical and industrial nature.

**CO5:** Present their opinions in a planned and logical manner and draft effective resume in context of job search.

**COURSE OBJECTIVES:**

- To gain the knowledge of vector differentiation, integration and related applications.
- To be known about analytic functions with properties, construction of analytic function and the knowledge of conformal transformation.
- To obtain the knowledge of Cauchy's integral theorem, calculus of residues and complex integration around unit circle and semicircle.
- To gain methods to solve differential equations with constant and variable coefficients.
- To introduce the basic concepts of PDE for solving standard partial differential equations

**UNIT-I: VECTOR CALCULUS****9+3**

Gradient and directional derivative - Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields - Line integral over a plane curve - Surface integral - Volume integral - Green's, Gauss divergence and Stoke's theorems (Excluding Proofs).

**UNIT-II: ANALYTIC FUNCTIONS****9+3**

Analytic functions - Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties - Harmonic conjugates - Construction of analytic function - Conformal mapping - Mapping by functions  $w = z + c$ ,  $cz$ ,  $1/z$ ,  $z^2$  - Bilinear transformation.

**UNIT-III: COMPLEX INTEGRATION****9+3**

Line integral - Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series - Singularities - Residues - Residue theorem - Application of residue theorem for evaluation of real integrals - Use of circular contour and semicircular contour.

**UNIT-IV: ORDINARY DIFFERENTIAL EQUATIONS****9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters - Homogenous equation of Euler's and Legendre's type - System of simultaneous linear differential equations with constant coefficients.

**UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS****9+3**

Formation of partial differential equations - Singular integrals - Solutions of standard types of first order partial differential equations [ $F(p,q) = 0$  and  $z = px + qy + f(p,q)$ ] - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous types.

**Contact Periods:**

**Lecture: 45 Periods    Tutorial: 15 Periods    Practical: 0 Periods    Total: 60 Periods**

**REFERNCES:**

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44<sup>th</sup> Edition, New Delhi, 2018.
2. Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Edition,

2018.

3. Bali N.P. and Manish Goyal, "A Text book of Engineering Mathematics", Laxmi Publications Pvt. Ltd, New Delhi, 10<sup>th</sup> Edition, 2021.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5<sup>th</sup> Edition, 2016.
5. Ramana B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 11<sup>th</sup> Edition, 2018.
6. James G., "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 4<sup>th</sup> Edition, 2016.

### **COURSE OUTCOMES:**

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

- CO1:** Acquire knowledge in Gradient, divergence and curl of a vector point function and related identities.
- CO2:** Understand the properties and formation of analytic function, mappings of standard functions and Bilinear transformation.
- CO3:** Understand calculus of residues to evaluate contour integration.
- CO4:** Apply various techniques in solving differential equations.
- CO5:** Understand how to solve the given standard partial differential equations.

**COURSE OBJECTIVES:**

- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.
- To understand different Python packages and libraries.

**UNIT-I: DATA, EXPRESSIONS, STATEMENTS 9**

Python interpreter and interactive mode; values and Numeric Data types, variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Object Oriented Features; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT-II: CONTROL FLOW, FUNCTIONS 9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT-III: LISTS, TUPLES, DICTIONARIES 9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, quick sort

**UNIT-IV: FILES, MODULES, PACKAGES 9**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

**UNIT-V: DATA HANDLING AND DATA VISUALIZATION 9**

Data Handling using Pandas – Introduction to Python Libraries: Pandas, Matplotlib, Numpy – Pandas: Series and Data Frames – Descriptive Statistics – Data Frame Operations – Handling missing Values – Data Visualization – Creating Charts: Bar and Pie Charts – Customizing Plots

**Contact Periods:****Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods****REFERENCES:**

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1<sup>st</sup> Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1<sup>st</sup> Edition, Notion Press, 2021.
3. John V Guttag, “Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021
4. Wes McKinney, “Python for Data Analysis”, 2<sup>nd</sup> Edition, O’Reilly Publishers, 2017.
5. Karl Beecher, “Computational Thinking: A Beginner’s Guide to Problem Solving and Programming”, 1<sup>st</sup> Edition, BCS Learning & Development Limited, 2017.

**COURSE OUTCOMES:**

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

**CO1:** Write simple Python programs using conditionals and loops for solving problems.

**CO2:** Decompose a Python program into functions.

**CO3:** Represent compound data using Python lists, tuples, dictionaries etc.

**CO4:** Read and write data from/to files in Python programs.

**CO5:** Explore their knowledge in Python packages and libraries.

**COURSE OBJECTIVES:**

- To familiarize the application of diode.
- To learn the fundamentals of transistors.
- To introduce electric circuits and its analysis.
- To impart knowledge on solving circuits using network theorems.
- To study the phenomenon of resonance in coupled circuits and obtaining the transient response of circuits.

**UNIT-I: BASIC DIODES AND ITS APPLICATIONS 9**

Characteristics of PN junction diode and Zener diode – Rectifier circuits – Clipper and Clamper circuits – Voltage regulators.

**UNIT-II: BJT and FET 9**

NPN and PNP Transistors – Early effect – Input and output characteristics of CE configuration – Construction and operation of JFET and MOSFET.

**UNIT-III: BASIC CIRCUITS ANALYSIS 9**

Ohm's Law – Kirchhoff's laws - DC and AC Circuits - Resistors in series and parallel circuits - Mesh current and node voltage method of analysis for DC and AC circuits - Phasor diagram - Power, Power Factor and Energy.

**UNIT-IV: NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 9**

Double integrals - Change of order of integration - Double integrals in polar coordinates -Area enclosed by plane curves - Triple integrals - Volume of solids - Change of variables in double and triple integrals.

**UNIT-V: RESONANCE / COUPLED CIRCUITS AND TRANSIENT RESPONSE FOR DC CIRCUITS 9**

Series and parallel resonance - their frequency response - Quality factor and Bandwidth - Self and mutual inductance - Coefficient of coupling - Tuned circuits - Single tuned circuits. Transient response of RL, RC and RLC Circuits using Laplace transform for DC input - Characterization of two port networks in terms of Z, Y and h parameters.

**Contact Periods:**

**Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods**

**REFERENCES:**

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2016.
2. Robert L. Boylestad, Louis Nashelsky "Electronic Devices and Circuit Theory", Prentice Hall of India, Eighth Edition, 2002.
3. David A. Bell, Electronic Devices and Circuits, Prentice Hall of India Private Limited, New Delhi, 2003



4. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai& Sons, New Delhi, Seventh - Revised edition (2018).
5. Jacob. Millman, Christos C.Halkias, Electronic Devices and Circuits, Tata McGraw Hill Publishing Limited, New Delhi, 2003.
6. Joseph A. Edminister, MahmoodNahri, "Electric circuits", Schaum's series, Tata Mc Graw-Hill, New Delhi (2010).

**COURSE OUTCOMES:**

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

**CO1:** Construct electronic circuits using the PN junction diode for various applications.

**CO2:** Analyze BJT and JFET characteristics.

**CO3:** Infer the basics of electrical circuit analysis.

**CO4:** Choose the suitable network simplification method for DC circuits.

**CO5:** Inspect resonance circuits and transient response.

**COURSE OBJECTIVES:**

- To make the students to understand the basics of electromagnetism and its importance.
- To understand the properties of Laser including Einstein's theory, types and their applications.
- To instil knowledge on types of optical fibers and device applications.
- To establish a sound grasp of knowledge on conducting and semiconducting materials.
- To inculcate an idea of significance of magnetic and superconducting materials and their applications.

**UNIT-I: ELECTROMAGNETISM****9**

Physics of Divergence, Gradient and Curl, Qualitative understanding of surface and volume integral - Maxwell Equations (Qualitative) - Differential Form and Integral Form - Wave Equation – Derivation of Plane electromagnetic waves in vacuum and Homogeneous Isotropic Dielectric Medium - Electromagnetic Waves - Refractive index - Phase velocity - Group velocity, Group index, Wave guide (Qualitative) - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources.

**UNIT-II: LASER****9**

Properties of laser beams – monochromaticity - coherence - directionality and brightness - Einstein's theory of radiation and determination of A and B coefficients - amplification of light by population inversion - types of lasers - Gas laser: CO<sub>2</sub> - Solid state laser: Nd-YAG laser - dye laser - Applications of lasers in cutting, welding and materials processing.

**UNIT-III: FIBER OPTICS****9**

Introduction - Basic Principles involved in fiber optics - Total internal reflection - Structure of optical fiber - Propagation of light through optical fiber - Derivation for Numerical Aperture and acceptance angle - fractional index change - Classification of optical fiber based on materials, refractive index profile and Modes - Fiber optical communication links - Fiber optic sensors - Temperature and displacement.

**UNIT-IV: INTRODUCTION TO SOLIDS AND SEMICONDUCTORS****9**

Quantum theory - Fermi distribution function - effect of temperature - density of energy states in metals - Semiconductors - Properties - elemental and compound semiconductors - Intrinsic and extrinsic semiconductors - properties - Carrier concentration in intrinsic Semiconductor - variation of Fermi level with temperature - extrinsic semiconductors - Carrier concentration in P type and N type semiconductors - variation of Fermi level with temperature and impurity concentration.

**UNIT-V: MAGNETIC AND SUPERCONDUCTING MATERIALS****9**

Origin of magnetic moment - Bohr magneton - Dia, Para, and Ferro magnetic materials - Domain Theory of ferromagnetism - Hysteresis - Hard and Soft magnetic materials. Superconductivity - properties - Meissner effect, effect of magnetic field and heavy current- Types of superconductors - BCS theory of superconductivity (qualitative) - Applications of superconductors: Cryotron and Magnetic levitation.

**Contact Periods:**

**Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods**

**REFERENCES:**

1. David Griffith, "Introduction to Electrodynamics", 4th Edition, 2013, Pearson Education.
2. S.O. Kasap, Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
3. D.Halliday, R.Resnick and J.Walker, Principles of Physics, Wiley (Indian Edition), 2015.
4. G.W.Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition), 2009.
5. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
6. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.

**COURSE OUTCOMES:**

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

- CO1:** Acquire knowledge in basics of Electromagnetism and its importance.
- CO2:** Gain knowledge on the properties, types and applications of Laser in industries.
- CO3:** Understand clearly of optical fibers classification and their applications.
- CO4:** Understand the properties of conducting and semiconducting materials and their carrier concentration.
- CO5:** Appreciate the importance of magnetic and superconducting materials for device applications.

**COURSE OBJECTIVES:**

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on engineering applications of polymers.
- To understand the principles of electrochemistry, electrochemical cells, emf and applications of emf measurements.
- To acquire knowledge about principles of corrosion and corrosion control techniques.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

**UNIT-I: WATER AND ITS TREATMENT 9**

Water quality parameters: Significance - Alkalinity, TDS, COD and BOD (definition and significance only). Hardness- types, estimation of hardness by EDTA method - Boiler feed water troubles - Scale and sludge - Priming and foaming - Caustic embrittlement - Boiler corrosion. Softening of boiler feed water - Internal softening (colloidal, phosphate, sodium aluminate and calgon conditioning) - External softening – demineralization process - Desalination of brackish water – Electrodialysis and Reverse Osmosis. Municipal water treatment - primary treatment and disinfection (UV, Ozonation, break-point chlorination).

**UNIT-II: POLYMER CHEMISTRY 9**

Introduction: Classification of polymers – Functionality – Degree of polymerization. Types of polymerization: Addition, condensation and copolymerization. Thermal Properties of polymers: Thermoplastic and Thermosetting - Glass Transition temperature (T<sub>g</sub>) – significance - factors affecting T<sub>g</sub>, Molecular weight – weight average, number average and polydispersity index. Preparation, properties and uses of PVC, Bakelite and Epoxy resin. Conducting polymers-mechanism – application of OLED.

**UNIT-III: ELECTROCHEMISTRY 9**

Electrode potential - Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf. Emf series and its applications. Nernst equation (problems). Reference electrodes – Standard Hydrogen electrode – Calomel electrode, Ion selective electrode – glass electrode and measurement of pH. Potentiometric redox titration (Estimation of ferrous ion) – conductometric titration (Strong acid Vs Strong base).

**UNIT-IV: CORROSION AND ITS CONTROL 9**

Corrosion - chemical corrosion - mechanism, nature of oxides – Pilling - Bedworth rule. Electrochemical corrosion – mechanism. Galvanic series and importance. Factors influencing corrosion. Prevention methods - design of materials, cathodic protection techniques - sacrificial anode and impressed current method. Protective coatings – electroplating - Cr, Ni and galvanizing. Anodising of aluminium.

**UNIT-V: ENERGY SOURCES AND STORAGE DEVICES 9**

Nuclear energy: light water nuclear power plant - breeder reactor. Solar energy conversion - working principles of photovoltaic cell, organic and dye sensitized solar cell. Batteries - Types of batteries. Primary battery – Leclanche cell. Secondary battery - lead acid battery – nickel metal

hydride and Li-ion battery. Fuel cells: proton exchange membrane and solid oxide fuel cell. Supercapacitors: working principles.

**Contact Periods:**

**Lecture: 45 Periods      Tutorial: 0 Periods      Practical: 0 Periods      Total: 45 Periods**

**REFERENCES:**

1. P. C. Jain and Monica Jain, "Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 17<sup>th</sup> Edition, 2018.
2. V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, Polymer Science, New Age International Publishers, 6<sup>th</sup> Edition, 2019.
3. Sivasankar B. "Engineering Chemistry, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
4. S.S. Dara, "A Text book of Engineering Chemistry. S. Chand Publishing, 12<sup>th</sup> Edition, 2018.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2<sup>nd</sup> Edition, 2013.

**COURSE OUTCOMES:**

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

- CO1:** Understand the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
- CO2:** Acquire the basic knowledge of polymers and apply in engineering.
- CO3:** Understand the basic principles of electrochemistry and its applications.
- CO4:** Know the principles, various types of corrosion and corrosion control techniques.
- CO5:** Identify different forms of energy resources and apply them for suitable applications in energy sectors.

**PHYSICS LABORATORY:****COURSE OBJECTIVES:**

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

**LIST OF EXPERIMENTS:**

1. Cantilever bending – Determination of Young’s modulus.
2. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia.
3. Non-uniform bending - Determination of Young’s modulus.
4. Laser- a) Determination of the wave length of the laser using grating.  
b) Determination of Numerical Aperture and acceptance angle using optical fiber.
5. Air wedge - Determination of thickness of a thin sheet/wire.
6. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.

**Contact Periods:**

**Lecture: 0 Periods      Tutorial: 0 Periods      Practical: 24 Periods      Total: 24 Periods**

**COURSE OUTCOMES:**

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

**CO1:** Understand the functioning of various physics laboratory equipment.

**CO2:** Use experimental models to analyze laboratory data.

**CO3:** Use mathematical models as a medium for quantitative reasoning and describing physical reality.

**CO4:** Access, process and analyze scientific information.

**CO5:** Solve problems individually and collaboratively.

## **CHEMISTRY LABORATORY:**

### **COURSE OBJECTIVES:**

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric analysis.
- To inculcate experimental skills to understanding of water quality parameters, such as hardness, alkalinity and dissolved oxygen.
- To induce the students to familiarize with electroanalytical techniques such as conductometry and potentiometry.
- To demonstrate the analysis of strong acid and strong base by conductometry.
- To equip the students for determination of hydrochloric acid by pH measurement.

### **LIST OF EXPERIMENTS:**

1. Estimation of hardness by EDTA method.
2. Determination of types and amount of alkalinity in water sample.
3. Estimation of Dissolved Oxygen by Iodometry.
4. Determination of HCl by pH titration.
5. Conductometric titration of strong acid and strong base.
6. Estimation of iron content of the given solution using potentiometer.

### **Contact Periods:**

**Lecture: 0 Periods    Tutorial: 0 Periods    Practical: 21 Periods    Total: 21 Periods**

### **REFERENCE:**

1. J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Qualitative Chemical Analysis, 2009.

### **COURSE OUTCOMES:**

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

- CO1:** Outfit with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
- CO2:** Quantify the type and amount of alkalinity in water sample.
- CO3:** Equip with the methods and techniques involved in pH metry.
- CO4:** Apply the conductometric measurements in quantitative analysis of chemical substances.
- CO5:** Estimate the amount of ferrous ion present in solution by potentiometric titration.

**COURSE OBJECTIVES:**

- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To develop applications using python packages and libraries.

**LIST OF EXPERIMENTS:**

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
3. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Retail Store –operations of list & tuples)
4. Implementing real-time/technical applications using Sets, Dictionaries. (Student Enrolment and Mark sheet - operations of Sets & Dictionaries)
5. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
6. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
7. Implementing programs using Python Standard Libraries (pandas, numpy, Matplotlib)
8. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Create a data frame based on E Commerce data and generate descriptive statistics (Mean, Median, Mode and Variance).
10. Consider Data of your interest from an Open Source (Eg. Data.gov.in) aggregate and summarize. Then plot it using different plotting functions of Matplotlib Library.
11. Mini Project.

**Contact Periods:**

**Lecture: 0 Periods      Tutorial: 0 Periods      Practical: 45 Periods      Total: 45 Periods**

**COURSE OUTCOMES:**

Upon successful completion of the course, students should be able to:

**CO1:** Implement programs in Python using conditionals and loops for solving problems.

**CO2:** Deploy functions to decompose a Python program.

**CO3:** Utilize Python packages and libraries in developing software applications.



## **LIST OF EQUIPMENT'S AND COMPONENTS**

- Software Required – Python 3 Interpreter
- Operating System – Windows 7 / 8.1 / 10 / Linux
- Computers Required – 30 Nos.