

P. A. COLLEGE OF ENGINEERING AND TECHNOLOGY

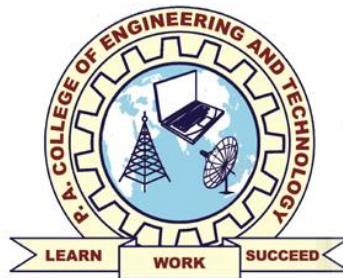
(An Autonomous Institution, Affiliated to Anna University, Chennai)
An ISO 9001:2015 Certified Institution - Accredited by NBA and NAAC with 'A' Grade
Pollachi – 642 002



B.E MECHANICAL 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
THEORY						
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
PRACTICAL						
6	22CAES106	Programming in C Laboratory	0	0	3	1.5
7	22CAES107	Engineering Practices Laboratory	0	0	3	1.5
8	22CAHS108	Communication Skills Laboratory	0	0	2	1
Total			13	1	12	20

SEMESTER II

Sl.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CAHS201	Professional English - II	3	0	0	3
2	22CABS202	Advanced Calculus and its Applications	3	1	0	4
3	22MEBS203	Material Science	3	0	0	3
4	22MEBS204	Applied Chemistry	3	0	0	3
5	22CAES205	Basics of Electrical and Electronics Engineering	3	0	0	3
6	22MEPC206	Engineering Mechanics	3	0	0	3
PRACTICAL						
7	22CABS107	Physics and Chemistry Laboratory	0	0	3	1.5
8	22MEES207	Basic Electrical and Electronics Engineering Laboratory	0	0	3	1.5
Total			18	1	6	22

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

9

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

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, 2nd Edition, 2019.
2. Bhatt, N.D., “Engineering Drawing”, Charotar Publishing House Pvt. Ltd., 53rd Edition, 2019.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I & II combined), Subhas Publications, Bangalore, 27th 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, 2nd 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”, 2nd Edition, Pearson Education, 2015
2. ReemaTheraja “Fundamentals of Computing and Programming in C”, 2nd 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, 16th 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.

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 enhance the Employability and Career Skills of students.
- To orient the students towards grooming as a professional.
- To make them Employability Graduates.
- To develop their confidence and help them in attending interviews successfully.
- To demonstrate an understanding of job applications and interviews for internship and placements.

LIST OF ACTIVITIES & EXERCISES

S.No.	Activity/Exercise
1.	Soft skills
2.	Giving & asking personal information
3.	Listening & Answering to a Lecture
4.	Small talk on everyday topics
5.	Strategies for presentation ; group/ pair presentation
6.	Job Application Letter with Resume
7.	Group Discussion
8.	Activities to improve GD skills
9.	Interview etiquette
10.	Career plan

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 30 Periods Total: 30 Periods

Recommended Software**1. Globearena****REFERENCES:**

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015.
2. Interact English Lab Manual for Undergraduate Students,. Orient BalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University

Press: Oxford, 2014.

5. S. Hariharan et al. Soft Skills. MJP Publishers: Chennai, 2010.

COURSE OUTCOMES:

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

CO1: Make effective presentations.

CO2: Participate confidently in Group Discussions.

CO3: Attend job interviews and be successful in them.

CO4: Develop adequate Soft Skills required for the workplace.

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

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, 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 Correspondance and Report Writing, Tata McGraw Hall & Co. Its, 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

REFERENCES:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2018.
2. Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition, 2018.
3. Bali N.P. and Manish Goyal, "A Text book of Engineering Mathematics", Laxmi Publications Pvt. Ltd, New Delhi, 10th Edition, 2021.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa

- Publications, New Delhi, 5th Edition, 2016.
5. Ramana B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 11th Edition, 2018.
 6. James G., "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 4th 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 instill knowledge on various phase diagrams and their applications.
- To understand about magnetic materials and superconducting materials properties.
- To make the students to understand the importance of different types of Non-destructive testing methods in industries.
- To inculcate an idea of significance of modern engineering materials and their device applications.
- To gain knowledge on vacuum physics and their types for various measurement range.

UNIT-I: PHASE DIAGRAMS**9**

Solid solutions - Hume Rothery's rules – the phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT-II: 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.

UNIT-III: NON-DESTRUCTIVE TESTING**9**

X-ray Testing - Fluorescence - Phosphorescence - Fluoroscopy - Ultrasonic Testing - Pulse echo system - LASER Testing - Liquid penetrant Testing - Magnetic Particle Testing.

UNIT-IV: MODERN ENGINEERING MATERIALS**9**

Metallic glasses- preparation of metallic glasses - properties - applications of the metallic glasses- Shape Memory Alloys (SMA) - Characteristics, properties of Ni-Ti alloy - applications of SMA - advantages and disadvantages of SMA - Nanomaterials- synthesis - chemical vapour deposition - ball milling - properties of nanoparticles and applications of nanoparticles.

UNIT-V: VACUUM SCIENCE**9**

Introduction - Importance of vacuum in industries - Pumping speed and throughput - Types of pumps - Rotary vane type Vacuum pump(oil sealed), Diffusion Pump and Turbo Molecular Pump - Measurement of High Vacuum - McLeod Gauge - Pirani Gauge - Penning Gauge.

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

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.

2. Smith, W.F, Hashemi, J. & Prakash, R. “Materials Science and Engineering”, Tata McGraw Hill Education Pvt. Ltd., 2014.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGrawHill (Indian Edition), 2017.
4. R.Balasubramaniam, Callister’s Materials Science and Engineering. Wiley (Indian Edition), 2014.
5. D.Halliday, R.Resnick and J.Walker, Principles of Physics, Wiley (Indian Edition), 2015.
6. Ben Rogers, Jesse Adams and Sumita Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2017.

COURSE OUTCOMES:

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

- CO1:** Acquire knowledge about the types of phase diagrams and their applications.
- CO2:** Gain knowledge on the properties, types and applications of magnetic and superconducting materials.
- CO3:** Understand the importance of different Non-destructive testing methods for industrial applications.
- CO4:** Appreciate the importance of advanced engineering materials and their applications.
- CO5:** Know the basics and working principles of vacuum pumps and gauges for measuring various pressure ranges.

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on polymer chemistry, engineering applications of polymers and composites.
- To understand the principles of electrochemistry, electrochemical cells, emf and applications of emf measurements.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To make the student understand the preparation, properties and applications of miscellaneous materials used in industry.

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 & 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 AND COMPOSITES 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_g) – significance - factors affecting T_g , Molecular weight – weight average, number average and polydispersity index. Preparation, properties and uses of PVC, Bakelite and Epoxy resin. Composites: definition, types of composites – polymer matrix composites (PMC) –FRP.

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 ferrous ion) – conductometric titration (Strong acid Vs Strong base).

UNIT-IV: FUELS AND COMBUSTION 9

Fuels – Classifications – Calorific value – Gross and Net calorific value (Problems using Dulong's formula). Combustion – Solid fuels – Coal-proximate and ultimate analysis – Significance. Coke – Characteristics – Manufacture by Otto Hoffman method. Liquid fuels – Petroleum processing and fractions. Knocking of internal combustion engines and diesel engines – Octane and cetane number

– Anti-knocking agents. Power alcohol – Bio diesel.

UNIT-V: MISCELLANEOUS MATERIALS

9

Refractories - Classification - properties and manufacture of silica and magnesia bricks. Abrasives - Classification, properties - manufacture of SiC. Lubricants – characteristics - mechanism of lubrication – additives for lubricants- solid lubricants (Graphite and Molybdenum sulphide). Glass - manufacture, types, properties and uses.

Contact Periods:

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

REFERENCES:

1. P. C. Jain and Monica Jain, "Engineering Chemistry, 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, Polymer Science, New Age International Publishers, 6th 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, 12th Edition, 2018.
5. Renu Bapna and Renu Gupta., "Engineering Chemistry", Macmillan India Publisher Ltd., 2010.

COURSE OUTCOMES:

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

- CO1:** Understand the quality of water from quality parameters data and propose suitable treatment methodologies to treat water.
- CO2:** Acquire the basic knowledge of polymers, composites and FRP and their significance.
- CO3:** Understand the basic principles of electrochemistry and its applications.
- CO4:** Recognize different types of fuels and its combustion characteristics.
- CO5:** Familiar with the various engineering materials used in engineering applications.

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”, Pearson Education, Second Edition, 2017.
3. Sedha R.S., “A textbook book of Applied Electronics”, S. Chand & Co., 2008
4. James A .Svoboda, Richard C. Dorf, “Dorf’s Introduction to Electric Circuits”, Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2015.
6. Thomas L. Floyd, ‘Digital Fundamentals’, 11th Edition, Pearson Education, 2017.

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Analyze the DC and AC circuits

CO2: Explore the significance of electrical machines

CO3: Analyze the characteristics of analog electronic devices

CO4: Acquire the basic concepts of digital electronics

CO5: Explain the operating principles of measuring instruments

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COURSE OBJECTIVES:

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

- To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
- To introduce the equilibrium of rigid bodies, vector methods and free body diagram.
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy;

UNIT-I: STATICS OF PARTICLES 9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT-II: EQUILIBRIUM OF RIGID BODIES 9

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force - Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT-III: DISTRIBUTED FORCES 9

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three- Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT-IV: FRICTION 9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT – V: DYNAMICS OF PARTICLES 9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's

Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

Contact Periods:

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

REFERENCES:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12thEdition, 2019
2. Vela Murali, “Engineering Mechanics-Statics and Dynamics”, Oxford University Press, 2018.
3. Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5th Edition, McGraw Hill Higher Education, 2013.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Illustrate the vector and scalar representation of forces and moments

CO2: Analyse the rigid body in equilibrium

CO3: Evaluate the properties of distributed forces

CO4: Determine the friction and the effects by the laws of friction

CO5: Calculate dynamic forces exerted in rigid body

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 train the students in conducting load tests on electrical machines
- To gain practical experience in characterizing electronic devices

LIST OF EXPERIMENTS

1. Measurement of phase difference between voltage and current.
2. Verification of ohms and Kirchhoff's Laws.
3. Load test on DC shunt motor.
4. Load test on self excited DC generator.
5. Load test on single phase transformer.
6. Load test on single phase induction motor.
7. Characteristics of PN diode.
8. Characteristics of BJT.
9. Characteristics of SCR.
10. Characteristics of MOSFET.

Contact Periods:

Lecture: 0 Periods

Tutorial: 0 Periods

Practical:45 Periods

Total: 45 Periods

COURSE OUTCOMES:

After completing this course, the students will be able to

- Use experimental methods to verify the Ohm's and Kirchhoff's Laws.
- Analyze experimentally the load characteristics of electrical machines
- Analyze the characteristics of basic electronic devices