

**PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637018**  
**(AUTONOMOUS)**  
**REGULATIONS 2019**  
**CHOICE BASED CREDIT SYSTEM**  
**B.E. - MECHANICAL ENGINEERING**  
**CURRICULUM**

*(Applicable to the candidates admitted during the academic year 2019-2020)*

**SEMESTER I**

S. No	Category	Course Code	Course Title	L	T	P	C
<b>Theory</b>							
1	HS	EN19101	English Communication Skills I <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
2	BS	MA19101	Matrices and Calculus	3	1	0	4
3	BS	PH19101	Engineering Physics <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
4	BS	CH19101	Engineering Chemistry <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
5	ES	EE19101	Basic Electrical Engineering	3	0	0	3
<b>Practical</b>							
6	ES	ME19101	Engineering Graphics Laboratory	0	0	4	2
<b>Total</b>				<b>12</b>	<b>1</b>	<b>10</b>	<b>18</b>

**SEMESTER II**

S. No	Category	Course Code	Course Title	L	T	P	C
<b>Theory</b>							
1	HS	EN19201	English Communication Skills II <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
2	BS	MA19201	Complex Variables and Differential Equations	3	1	0	4
3	BS	PH19203	Material Science <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
4	BS	CH19202	Industrial Chemistry <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
5	ES	ME19201	Engineering Mechanics	3	0	0	3
6	ES	CS19201	Programming in Python <i>(Integrated Theory and Laboratory)</i>	2	0	2	3
<b>Practical</b>							
7	ES	GE19201	Engineering Practices Laboratory	0	0	4	2
<b>Total</b>				<b>14</b>	<b>1</b>	<b>12</b>	<b>21</b>

EN19101

ENGLISH COMMUNICATION SKILLS I

2 0 2 3

(COMMON TO ALL BRANCHES)

**COURSE OBJECTIVES**

To enable the students to

- impart knowledge about the importance of vocabulary and grammar.
- help the students of engineering and technology develop a strong base in the use of English.
- improve the reading skills of the students so as to enable them to communicate with confidence in English.
- develop their basic speaking skills in delivering impromptu talks and participating in conversations with confidence.
- enable the students to write / draft effective essays and emails for effective communication.

**UNIT I VOCABULARY AND GRAMMAR 9**

General Vocabulary - Word Formation - Prefix and suffix - Synonyms - Antonyms - Spelling – Homophones - Homonyms - Word used as Nouns and Verbs - Comparative Adjectives - Phrasal verbs - Acronyms - Abbreviations - Tenses - Cause and Effect Expressions - Subject Verb Agreement - Wh questions - Yes or No questions - Articles - Sentence Structures - Discourse Markers - Single line definition.

**UNIT II LISTENING 6**

Listening and transferring of information, listening to dialogues, listening to informal conversation- listening to short talks and answering questions- understanding the structure of conversations- telephone etiquette.

**UNIT III READING 3**

Reading - Sub-Skills of Reading - skimming-scanning – predicting - Reading Comprehension (Reading short passages and answering multiple choice and open-ended questions) - developing hints.

**UNIT IV WRITING 9**

Writing - Describing - Defining - Classifying - Providing examples or evidence - Writing Introduction and Conclusion - Use of Cohesive devices and reference words - Writing essays (issue based, compare and contrast, Description, Narrative, Persuasive, Creative writing) - E-Mails (Business Correspondence, Letter Inviting delegates, Accepting, Declining) Instructions - Note-Making - Minutes of meeting - Jumbled Sentences - Interpreting visual information - Flow Chart, Pie Chart, Bar Chart (Transcoding).

**UNIT V SPEAKING 3**

Introducing oneself - (personal information name, background, study details, areas of interest- speaking about one's hobbies, strengths and weaknesses, role model and future ambition)- Role Play- impromptu talks.

**TOTAL PERIODS: 30**

## LIST OF EXERCISES

1. Me-chart
2. Role play
3. Informal chat
4. Formal conversation
5. Narration of a story, Narrating an incident
6. JAM
7. Turn court
8. Presentation Skills

**TOTAL PERIODS: 30**

## COURSE OUTCOMES

At the end of the course, the students will be able to

- use suitable vocabulary and grammar with confidence and express their ideas both in speech and writing.
- listen and comprehend classroom lectures, short talks and conversations.
- read, interpret and analyze a given text effectively, and use cohesive devices in spoken and written English.
- understand English and converse effectively.
- write flawless sentences, essays and letters.

## TEXT BOOKS

1. N P Sudharshana, C.Savitha. English Technical Communication. Cambridge University Press India Pvt.Ltd, New Delhi.2016.
2. Mahalakshmi.S.N. English and Workbook for Engineers. V.K. Publications, Sivakasi. 2017.

## REFERENCE BOOKS

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice. Oxford University Press, New Delhi. 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
3. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi, 2001.



## SEMESTER I

MA19101

MATRICES AND CALCULUS

3 1 0 4

(COMMON TO ALL BRANCHES)

### COURSE OBJECTIVES

To enable the students to

- find the Eigenvalues and Eigenvectors of a real matrix and discuss their properties, reduce a real symmetric matrix from quadratic form to canonical form.
- acquire knowledge on single variable calculus.
- explain functions of several variables, Taylor's series expansion, Jacobians and compute the maximum & minimum values.
- acquaint the student with the concepts of basic integration and integration by parts.
- explain the double & triple integrals, discuss the change of order of integration and use multiple integrals to find the area & volume.

### UNIT I MATRICES 12

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Statement and applications of Cayley-Hamilton theorem – Diagonalisation of a real symmetric matrix by orthogonal transformation – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

### UNIT II DIFFERENTIAL CALCULUS 12

Review of Limits and Continuity, properties of limit and classification of discontinuities - Tangent problems. Differentiation – Standard forms, Successive differentiation and Leibnitz theorem. Mean value theorem – Rolle's theorem, Maxima and Minima, Concavity.

### UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

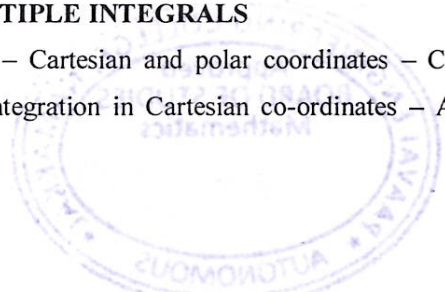
### UNIT IV INTEGRAL CALCULUS 12

Area Problem - Indefinite and definite integrals - Properties of integrals. Methods of integration – Substitution method, Integration by parts, Bernoulli's formula – Reduction formulae involving exponential and trigonometric functions.

### UNIT V MULTIPLE INTEGRALS 12

Double integration – Cartesian and polar coordinates – Change of order of integration – Change of Variables. Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

**TOTAL PERIODS: 60**



## COURSE OUTCOMES

At the end of the course, the students will be able to

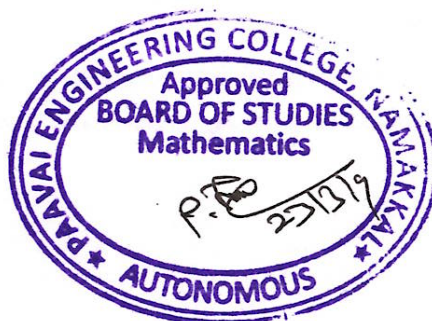
- identify the solutions of the characteristic equations and to understand the technique of diagonalizing a matrix which would render the eigen solution procedure very simple.
- understand the concepts of calculus of single variate functions.
- know the functions of more than one variable, from the points of view of their differentiation, series expansions and extreme values, which are encountered in engineering studies.
- understand the basic solving techniques of integration.
- apply the methods of single, double and triple integration, which are needed in their studies in other areas and gain confidence to handle integrals of higher orders.

## TEXT BOOKS

1. Grewal. B.S, “Higher Engineering Mathematics”, 41<sup>st</sup> Edition, Khanna Publications, Delhi,(2011).
2. Dr.P.Jayakumar, and Dr.B.Kishokkumar “Matrices and Calculus”, Global Publishers, Chennai.,(2015).
3. T. Veerarajan., “Engineering Mathematics”, 3<sup>rd</sup> Edition, Tata McGraw Hill, (2011).

## REFERENCE BOOKS

1. James Stewart, “Calculus “, 8<sup>th</sup> Edition, Cengage Learning, USA 2015 reprint.
2. Erwin Kreyszig., “Advanced Engineering Mathematics” 10<sup>th</sup> Edition, Wiley Publications.
3. Dass, H.K., and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. Chand Private Ltd.,(2011).
4. Glyn James, “Advanced Modern Engineering Mathematics”, 3<sup>rd</sup> Edition, Pearson Education,(2012).
5. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).



## (COMMON TO ALL BRANCHES)

**COURSE OBJECTIVES**

To enable the students to

- understand the basic concepts of properties of matter
- acquire the knowledge in the areas of ultrasonics and its applications
- describe the dual nature of matter and applications of Schrodinger wave equation
- categorize the types of laser and fiber optics
- identify the different types of crystal structures and crystal growth techniques

**UNIT I PROPERTIES OF MATTER 6**

**Elasticity:** Hooke's Law - Stress - Strain Diagram - Poisson's Ratio - Expressions for Poisson's ratio - Work done in stretching and twisting a wire - Twisting couple on a cylinder- Torsional pendulum - Rigidity modulus and moment of inertia.

**Viscosity:** Co-efficient of viscosity and its dimensions - Rate of flow of liquid in a capillary tube - Poiseuilles' formula - Experiment to determine co-efficient of viscosity of a liquid - Variation of viscosity of a liquid with temperature - Applications of viscosity.

**UNIT II ULTRASONICS 6**

Classification of Sound waves - Properties - Production of ultrasonic waves- Magnetostriction oscillator and piezoelectric oscillator - Determination of velocity of sound in liquid using acoustic grating - SONAR - Non destructive testing - Pulse echo system - Industrial Applications -Welding, drilling and cutting - Medical Applications - Sonogram.

**UNIT III MODERN PHYSICS 6**

Black body radiation - Planck's theory (derivation) - Compton effect (derivation) - Matter waves - de-Broglie wavelength - Wave function - Physical significance of the wave function - Schrodinger's time independent and time dependent equations - Applications: particle in one dimensional box-degenerate and non-degenerate states.

**UNIT IV APPLIED OPTICS 6**

**Laser:** Characteristics of laser - Stimulated absorption, spontaneous emission and stimulated emission - Population inversion - Pumping methods - Types of laser - Nd-YAG, CO<sub>2</sub> and semiconductor lasers (hetero junction) - Applications.

**Optical fiber:** Principle, propagation of light through optical fiber - expressions for numerical aperture and acceptance angle - Types of optical fibers - Fiber optical communication system (block diagram) - Applications.

**UNIT V CRYSTAL PHYSICS 6**

Crystalline solids and amorphous solids - Lattice - Unit cell - Crystal system - Bravais lattices - Lattice planes - Miller indices - Derivation of inter-planar spacing in cubic lattice - Calculation of number of

atoms per unit cell , atomic radius , coordination number and packing factor for SC, BCC, FCC and HCP structures. Crystal Growth Techniques - Bridgman and Czochralski techniques.

**TOTAL PERIODS: 30**

#### **LIST OF EXPERIMENTS**

1. Determination of Young's modulus by non- uniform bending method.
2. Determination of rigidity modulus - Torsion pendulum.
3. Determination of coefficient of viscosity of a liquid -Poiseuille's method.
4. Determination of velocity of sound and compressibility of liquid - Ultrasonic interferometer.
5. Determination of wavelength and particle size using Laser.
6. Determination of acceptance angle in an optical fiber.
7. Determination of lattice parameters using powder XRD.

**TOTAL PERIODS: 30**

#### **COURSE OUTCOMES**

At the end of the course, the students will be able to

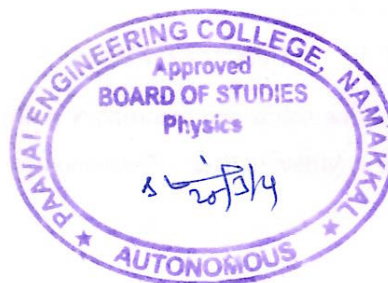
- assess the elastic properties of the materials.
- acquire the fundamental knowledge of ultrasonics.
- perceive the development of modern physics and its applications.
- recognize the uses of laser and the propagation of light through fiber optics.
- grasp the basics of crystals, its structures and different crystal growth techniques.

#### **TEXT BOOKS**

1. R.K. Gaur and Gupta. S.L, Engineering Physics, Dhanpat Rai Publishers, 2017.
2. Rajagopal, K, Engineering Physics, PHI learning Private Limited, 2015.

#### **REFERENCE BOOKS**

1. Avadhanulu M.N. & Murthy, Arun T.V.S, A Textbook of Engineering Physics, Volume-I, S.Chand and Company Limited, 2018.
2. M. Arumugam, Engineering Physics, Anuradha Publications, 2014.
3. V.Rajendran, Engineering Physics, Tata McGraw-Hill, New Delhi, 2014.
4. P K Palanisamy, Engineering Physics, 4<sup>th</sup> Edition, SciTech Publications, 2014.
5. A.Marikani, Engineering Physics, PHI, New Delhi, 2013.



**COURSE OBJECTIVES**

To enable the students to

- understand the water quality and its treatment methods.
- acquaint the students with the basics of surface chemistry, their properties and applications.
- predict the number of phases that exists in equilibrium for a system.
- evaluate the interrelation between heat and work within the confines of the laws of thermodynamics.
- identify the importance and preparation of nonmaterial recent developments.

**UNIT I WATER AND ITS TREATMENT 6**

Hardness of water –types –expression of hardness –units –estimation of hardness of water by EDTA–boiler troubles (scale and sludge, priming and foaming) –boiler feed water –Treatments-Internal treatment (phosphate and calgon conditioning) external treatment –Ion exchange process–desalination-Reverse Osmosis- Disinfection-Break point chlorination.

**UNIT II SURFACE CHEMISTRY AND CATALYSIS 6**

**Adsorption:** Types of adsorption –adsorption of gases on solids –adsorption of solute from solutions – adsorption isotherms –Freundlich’s adsorption isotherm –Langmuir’s adsorption isotherm –applications of adsorption on pollution abatement.

**Catalysis:** Catalyst –types of catalysis-Homogenous and Heterogeneous –autocatalysis –catalytic poisoning and catalytic promoters –enzyme catalysis–Michaelis –Menten equation.

**UNIT III PHASE RULE AND ALLOYS 6**

Phase rule: Introduction, and explanation of terms with examples, One Component System: Water System- Reduced phase rule- Two Component Systems- Lead- Silver system. Alloys: Introduction – Definition – properties of Alloys- Functions - Ferrous alloys- Nichrome and Stainless Steel- Heat treatment of steel: Non Ferrous alloys; Brass and Bronze.

**UNIT IV CHEMICAL THERMODYNAMICS 6**

Terminology of thermodynamics-First law- Second law: Entropy- Entropy change for a reversible and irreversible process; Free energy and work function: Helmholtz and Gibbs free energy functions- Criteria of spontaneity: Derivation of - Gibbs Helmholtz Equation -Maxwell Relations- Derivation of Vant Hoff Isotherm and Isochore.

**UNIT V NANOMATERIALS 6**

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoscale materials properties and uses of nanocluster, rods, tubes (CNT) and wires. Preparation of nanoparticles- thermolysis, hydrothermal, solvothermal, Preparation of Carbon nanotube by chemical vapour deposition, laser ablation; applications of nanomaterials.

**TOTAL PERIODS: 30**



## LIST OF EXPERIMENTS

1. Determination of DO content of water sample by Winkler's method.
2. Determination of Calcium and Magnesium in water sample by a titration method.
3. Determination of strength of given hydrochloric acid by using pH meter.
4. Determination of strength of acids in a mixture using conductivity meter.
5. Conductometric titration of strong acid Vs Strong base.

**TOTAL PERIODS: 30**

## COURSE OUTCOMES

At the end of the course, the students will be able to

- gain practical experience in chemical process of water treatments.
- identify the particle size, and the application of surface chemistry in various fields
- classify the states in a equilibrium in a heterogeneous system.
- know the basic concepts of internal energy, enthalpy, entropy, free energy and chemical potential.
- get exposure in the recent trend in the nanofields.

## TEXT BOOKS

1. Jain P.C. and Jain. M., Engineering Chemistry, 17/e, 2014 Dhanpat Rai Publishing Company, New Delhi, Reprint 2017.
2. B.K. Sharma – “Industrial Chemistry”, 11th ed., (2015), Goel Publication, Meerut.

## REFERENCE BOOKS

1. Puri B.R., Sharma L.R., Pathania, M.S. Principles of physical chemistry, 15/e 2015, Vishal Publishing Co., Meerut, Reprint 2017.
2. Atkins, P. and de Paula, J., Atkin's Physical Chemistry, 9th ed., Oxford Univ. Press, New Delhi. 2014.
3. Dara S.S. and Umare S.S., A text book of Engineering Chemistry, 12/e, 2014 S.Chand and Company Limited, New Delhi, Reprint 2016.
4. Engineering Chemistry, Wiley India Editorial Team, Wiley Eastern Pub, New Delhi 2018.
5. M.Mohan and G.Raja, Engineering Chemistry - I, 2<sup>nd</sup> edition Jai Tech Publication, Chennai (2017).
6. R,Ravikrishnan, Engineering Chemistry -I, 6<sup>th</sup> edition, Revised Sri Krishna Publication, Chennai (2018).



**COURSE OBJECTIVES**

To enable the students to

- analyze the various DC circuits and find the circuit parameters.
- introduce the AC fundamentals and three phase circuits
- familiarize the various electrical machines and measuring instruments
- study the basics of electrical wiring.
- learn the basics of electrical safety

**UNIT I DC CIRCUITS 9**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation - Superposition, Thevenin and Norton Theorems

**UNIT II AC CIRCUITS 9**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III FUNDAMENTALS OF ELECTRICAL MACHINES AND MEASURING INSTRUMENTS 9**

Construction, Principle of Operation, characteristic and Application of, Single phase Transformer, Single phase Induction motor, and DC Motor.

Types of electrical measurement –Construction and Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters

**UNIT IV ELECTRICAL INSTALLATIONS AND WIRING 9**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Types of Wires and Cables, Systems of distribution of electrical energy, Systems of Wiring, Choice of wiring systems, Earthing. Batteries: Lead Acid, Li-Ion.

**UNIT V ELECTRICAL SAFETY PRACTICES AND STANDARDS 9**

Indian electricity act and rules- general safety requirements as per IE rules- electrical safety equipment's- electrical installation: ground clearance, section clearance, – earthing, specifications, earth resistance, earth pit maintenance.

**TOTAL PERIODS 45**

## COURSE OUTCOMES

At the end this course, students will be able to

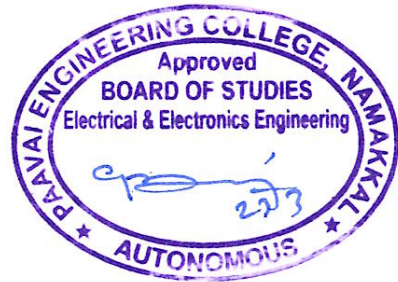
- get the basic knowledge about DC Electric circuits.
- acquire knowledge of AC fundamentals and AC circuits.
- understand the operation of electrical machines and measuring instruments and their usage
- analyse various electrical components and perform electrical wiring
- know the Indian electricity rules and apply in electrical installations

## TEXT BOOKS

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering” , Tata McGraw Hill, 2011.
2. J.B.Gupta, “Basic Electrical Engineering”, S.K.Kataria & Sons, 2015

## REFERENCES

1. V.K.Mehta and Rohit Mehta, “Principles of Electrical Engineering and Electronics”, S.Chand, 2014.
2. R.Muthusubramanian and S.Salivahanan, “Basic Electrical and Electronics Engineering Fundamentals”, Tata McGraw Hill, 2010.
3. G.Nagarajan, “ Basics of Electrical Electronics and Computer Engineering”, A.R.Publications, 2001.
4. B.L.Theraja and A.K.Theraja, “Electrical Technology Volume 1”, S.Chand, 2010
5. “The Electricity Rules”, Universal’s Law Publishing, 2011.



## (COMMON TO ALL BRANCHES)

**COURSE OBJECTIVES**

To enable the students to

- introduce concepts like dimensioning, conventions and standards related to Engineering drawing and imbibe knowledge on plane curves and projection of points
- impart knowledge on projection of lines and plane surfaces
- develop the visualization skills for understanding the projection of solids
- illustrate on development of surfaces for simple solids
- understand the orthographic projection and isometric view

**Concepts and Conventions (Not for Examination) 2**

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 AND PROJECTION OF POINTS 10**

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. Applications of above cited curves. Orthographic projection – Principles-Principal Planes - Projection of points in four quadrants.

**UNIT II PROJECTION OF LINES AND PLANES 12**

Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by Change of Position method. Projection of Planes (Square, Pentagon, Hexagon and Circle) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 12**

Projection of simple solids like Square Prism, Pentagonal Prism, Hexagonal Prism, Triangular Prism. Square Pyramid, Pentagonal Pyramid, Hexagonal Pyramid, Cylinder and Cone when the axis is inclined to one of the principal planes (either horizontal or vertical plane).

**UNIT IV DEVELOPMENT OF SURFACES 12**

Development of lateral surfaces in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Prisms, pyramids cylinders and cones.

**UNIT V ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS 12**

Representation of Three-dimensional objects – Introduction of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through multiple views from pictorial views of objects Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - Conversion of Isometric view to orthographic projection.

**TOTAL PERIODS: 60**

## COURSE OUTCOMES

At the end of the course, the students will be able to

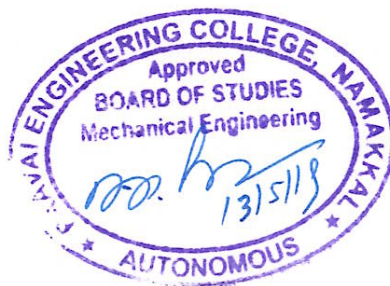
- perform sketching of basic curves and projection of points in four quadrants
- draw the projections of straight lines and plane surfaces in given quadrant
- comprehend the projection of solids in various positions in first quadrant
- draw the development of surfaces.
- prepare orthographic and isometric projection of simple solids.

## TEXT BOOKS

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Prabhakaran. S, Makesh. M, Subburam. V, “Engineering Graphics”, Maruthi Publishers, Chennai, 2016

## REFERENCE BOOKS

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.
5. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008



**(COMMON TO ALL BRANCHES)****COURSE OBJECTIVES**

To help the students of engineering and technology to

- enhance their ability to listen, read, write and speak English.
- comprehend and write essays and prepare short project reports related to their branches of specialization.
- enhance their ability to read and comprehend technical texts.
- make effective presentations on topics in engineering and technology.
- participate successfully in Group Discussions.

**UNIT I VOCABULARY AND GRAMMAR 9**

General Vocabulary - Prefixes & Suffixes - One word substitutions - Active Voice and Passive Voice - Collocations - Fixed expressions (adhere to, on the part of etc.) - Idioms and Phrases - Compound Nouns - Numerical Expression - Preposition - Direct into Indirect Speech - If Conditionals - Purpose expression - Editing - Extended Definitions - Simple, Compound and Complex Sentences.

**UNIT II LISTENING 3**

Listening to news and announcements, listening to a telephone conversation- Listening to model interviews - TED Talks.

**UNIT III READING 6**

Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading - Critical reading- Reading articles in newspapers, journals.

**UNIT IV WRITING 9**

Check list – Recommendation - Writing a job application - Resume (E-mail format) - Technical Report-Writing (Industrial Visit report, Accident report, Feasibility report, Survey report, Mini project proposal) - Paragraph Writing - Advertisement writing - Designing poster - Film Book review.

**UNIT V SPEAKING 3**

Syllable - Stress - Intonation - Silent Letters - Presentations on a given topic - Mini presentation in small groups - Group discussion - Interview Techniques - mock interviews.

**TOTAL PERIODS: 30**

**LIST OF EXERCISES**

1. Ship Wreck
2. Introducing a product (Spot Light)
3. Vocabulary Building games

4. Description of an event / Competition
5. Master of Ceremony (MC, Welcome Address, Vote of thanks, prize distribution)
6. MC (Introducing a Guest, Feed back of the participant)
7. GD
8. Mock Interview

**TOTAL PERIODS: 30**

### **COURSE OUTCOMES**

At the end of the course, the students will be able to

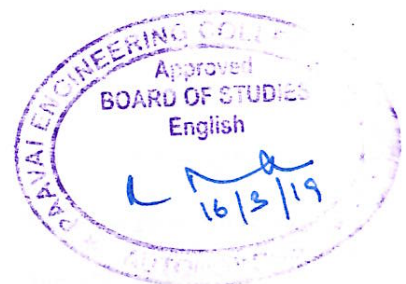
- speak with clarity and confidence.
- read, interpret and analyse a given text.
- write comprehensive reports, job applications and draft effective e-mails.
- make effective presentations using power point.
- participate successfully in Group Discussions.

### **TEXT BOOKS**

1. N P Sudharshana, C.Savitha. English Technical Communication. Cambridge University Press India Pvt.Ltd, New Delhi.2016.
2. Mahalakshmi.S.N. English and Workbook for Engineers. V.K. Publications, Sivakasi. 2017.

### **REFERENCE BOOKS**

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice. Oxford University Press, New Delhi. 2011.
2. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
3. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi, 2001.







## COURSE OUTCOMES

At the end of the course, the students will be able to

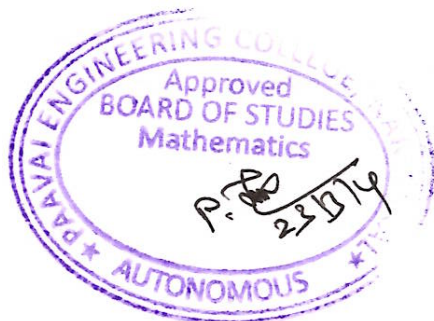
- study the basics of vector calculus comprising of gradient, divergence and curl and line, surface and volume integrals and the classical theorems.
- know the concept of analytic functions and its properties and apply it in conformal mapping.
- gain knowledge in the basics of complex integration and the concept of contour integration which is an important tool for evaluation of certain real integrals.
- solve differential equations.
- gain sufficient exposure to find solution of certain linear differential equations by Laplace transform.

## TEXT BOOKS

1. Grewal. B.S, “Higher Engineering Mathematics”, 41<sup>st</sup> Edition, Khanna Publications, Delhi,(2011).
2. Dr.P.Jayakumar, and Dr.B.Kishokkumar, “Differential Equations and Complex Analysis”, Global Publishers, Chennai.,(2015).
3. Erwin Kreyszig., “Advanced Engineering Mathematics” 10<sup>th</sup> Edition, Wiley Publications.

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1. Dass, H.K., and Er. Rajnish Verma, “Higher Engineering Mathematics”, S. Chand Private Ltd.,(2011).
2. T. Veerarajan., “Engineering Mathematics”, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2011.
3. Peter V. O’Neil, “Advanced Engineering Mathematics”, 7<sup>th</sup> Edition, Cengage learning, (2012).
4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).



## (COMMON TO AERO/AGRI/CIVIL/MECH/MCT)

**COURSE OBJECTIVES**

To enable the students to

- develop knowledge about the conduction properties of metals
- correlate better understanding on carrier concentration and its variation with temperature in an intrinsic semiconductors
- identify the different types of magnetic materials, superconductivity materials and its applications
- recognize properties of nanoparticles and its uses
- learn common characterization methods for the determination of structure and composition of solids

**UNIT I CONDUCTING MATERIALS 6**

Conductors - Types of conducting materials - Classical free electron theory of metals: Postulates - Derivation of electrical conductivity and thermal conductivity - Wiedemann-Franz law and its verifications - Lorentz number - Merits and demerits of classical free electron theory - Quantum free electron theory: Fermi-Dirac distribution function - Effect of temperature on Fermi function - Density of energy states-Carrier concentration in metals.

**UNIT II SEMICONDUCTING MATERIALS 6**

Types of semiconductors - elemental and compound semiconductor - Intrinsic semiconductor: Expressions for density of electrons, holes and carrier concentration - Fermi level -Variation of Fermi level with temperature - Electrical conductivity - Band gap determination - Extrinsic semiconductors: n-type and p-type semiconductors (Qualitative) - Hall effect - Determination of Hall coefficient - Applications.

**UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 6**

**Magnetic Materials:** Domain theory of ferromagnetism - Hysteresis - Soft and hard magnetic materials - Ferrites - Applications.

**Superconductivity:** properties - Types of super conductors - BCS theory of superconductivity - Applications - SQUID, cryotron, magnetic levitation.

**UNIT IV MODERN ENGINEERING MATERIALS 6**

**Metallic glasses:** preparation, properties - Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA- applications.

**Nanomaterials:** Classification of nanomaterials-properties of nanomaterials- Top-down and bottom up process-synthesis- Ball Milling - Co-precipitation and Electrodeposition - Applications.

**UNIT V MATERIALS CHARACTERIZATION 6**

Introduction: Thermogravimetric Analysis (TGA) - Differential Thermal Analysis (DTA) - Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM)-Scanning Tunneling Microscope (STM).

**TOTAL PERIODS: 30**

### LIST OF EXPERIMENTS

1. Determination of Hall coefficient of semiconductor material
2. Determination of band gap of a semiconductor.
3. Determination of Hysteresis losses in a Ferromagnetic material.
4. Determination of thermal conductivity of a bad conductor - Lee's Disc method.
5. To study AFM image analysis of nanostructured material.
6. To analyze surface Morphological features of the given sample using SEM image.

**TOTAL PERIODS: 30**

### COURSE OUTCOMES

At the end of the course, the students will be able to

- select the metals required for specific applications in the field of engineering and technology.
- acquire the knowledge of an intrinsic semiconductors and determinations of hall co-efficient.
- obtain knowledge of ferro magnetic materials and superconductivity properties of materials.
- grasp the process involved in material synthesis and its applications.
- explore and contrast among the basic elements of electron microscopy.

### TEXT BOOKS

1. A.Marikani, Material Science, PHI, New Delhi, 2017.
2. Verma, N.K, Physics for Engineers, PHI learning Private Limited, 2017.

### REFERENCE BOOKS

1. Gopala Rangarajan, Materials Science, Tata McGraw-Hill Publishing Private Company Limited, 2006.
2. Umesh K Mishra & Jasprit Singh, Semiconductor Device Physics and Design, Springer,2008.
3. P K Palanisamy, Engineering Physics II, SciTech Publications, 2009.
4. Charles Kittel, Paul McEuen, Introduction to Solid State Physics, John Wiley & Sons, Limited, 2018.
5. S.O.Pillai, Solid State Physics. New Academic Science, Publishers, 2018.



## (COMMON TO AERO/CIVIL/CHEM/MECH)

## COURSE OBJECTIVES

To enable the students to

- make conversant with combustion and calorific values of fuels.
- assess the interrelation between glass, ceramics and cements its usage.
- identify the importance and preparation of fertilizers and sugars for public.
- notify the students with the basics of dyes and colour formation.
- understand the preparation and properties of oils, fats and lubricants.

**UNIT I FUELS AND COMBUSTION**

6

**Fuels:** Introduction -classification of fuels -coal -analysis of coal (proximate and ultimate) -carbonization - manufacture of metallurgical coke (Otto Hoffmann method) -petroleum -knocking -octane number -diesel oil -cetane number -natural gas -compressed natural gas (CNG) -liquefied petroleum gases (LPG) -power alcohol. **Combustion of fuels:** Introduction -calorific value -higher and lower calorific values-theoretical calculation of calorific value-flue gas analysis (ORSAT Method).

**UNIT II GLASS, CERAMICS, LIME AND CEMENT**

6

**Glass:** Definition – types and uses of glass – raw materials – Manufacture of glass-Glazing-Methods of glazing.

**Ceramics:** Introduction-clay, silica, feldspar-Methods of fabrication of ceramic ware(soft mud, stiff mud, dry pressing, hot pressing, slip casting, drying, firing)-White wares-manufacture of white pottery.

**Lime:** Introduction – Lime- Types and uses –properties-Manufacture of lime-Gypsum plaster.

**Cement:** Classification-properties-Manufacture of portland cement-Dry and wet process-Chemical constitution-setting and hardening.

**UNIT III FERTILIZERS AND SUGARS**

6

**Fertilizers:** Definition – manufactures of Ammonium sulphate, urea, calcium super phosphate and mixed fertilizers (NPK) – Fertilizer industries in India.

**Sugar Industry:** Manufacture of sugar from molasses and beetroot – sugar industries in India.

**Fermentation:** Manufacture of spirits and wines. **Distillation:** Manufacture of vinegar and ethyl alcohol.

**UNIT IV DYES**

6

Introduction, Definition-.Classification- acid, base, azo, vat and reactive dyes. -Theory of colour and constitution - Preparation and uses of 1) Azo dye-methyl orange 2) Triphenyl methane dye -Malachite green 3) Phthalein dye -phenolphthalein 4) Vat dye –Indigo 5) Anthraquinone dye –Alizarin.

**UNIT V OILS, FATS AND LUBRICANTS**

6

Definitions-oils-Chemical analysis of oils and fats – acid, saponification and iodine values- Definition-Lubricants-mechanism of lubrication, desirable characteristics – viscosity, viscosity index, flash and fire points, cloud and pour points, aniline point. Semisolid lubricant – greases, preparation of sodium, lithium

and calcium greases and uses, Solid lubricants – graphite and molybdenum disulphide structure, property and uses.

**TOTAL PERIODS: 30**

#### **LIST OF EXPERIMENTS**

1. Determination of CaO in cement by a rapid method.
2. Estimation of Free Fatty acid in oils by permanganate titration method.
3. Estimation of corrosion rate in mild steel by weight loss method.
4. Estimation of iron content of the given solution using potentiometer.
5. Determination of saponification value of oil.

**TOTAL PERIODS: 30**

#### **COURSE OUTCOMES**

At the end of the course, the students will be able to

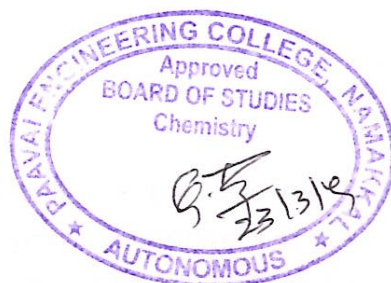
- estimate the high calorific value of fuels and its usage
- evaluate the cement and lime importance on constructions.
- gain practical experience in chemical fertilizers uses.
- identify the constituents, applied in the dyes field.
- exposure to the fatty acids and lubricants formation.

#### **TEXT BOOKS**

1. Jain P.C. and Jain. M., Engineering Chemistry, 17th Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2017.
2. Dara S.S. and Umare S.S., A text book of Engineering Chemistry, 12/e S.Chand and Company Limited, New Delhi, 2016.

#### **REFERENCE BOOKS**

1. B.K. Sharma – “Industrial Chemistry”, 11th ed., (2015), Goel Publication, Meerut.
2. B.N. Charabarthi – “Industrial Chemistry”, 8th ed., 2016 Oxford and IBH Publishing. New Delhi.
3. P.L. Soni – “Text Book of Organic Chemistry”, 26<sup>th</sup> Ed., (2017), S. Chand & Co, New Delhi.
4. Arun Bahl and B.S. Bahl – “Text Book of Organic Chemistry”, 18<sup>th</sup> Ed., (2016), S.Chand, New Delhi.
5. R.Chatwal., -“Book of Dye Chemistry,” 6<sup>th</sup> edition,(2013) Himalayan publication House , New Delhi.



## (COMMON TO AERO/AGRI/CIVIL/ MECH/MCT)

**COURSE OBJECTIVES**

To enable the students to

- learn the basic concepts of mechanics, resolution and Vector representation of forces.
- gain knowledge in the concepts involved in equilibrium of rigid bodies.
- impart analytical skills to solve problems in moments of surfaces and solids
- develop knowledge in the dynamics of particles due to force.
- understand the rigid body problems subjected to friction and elements.

**UNIT I BASICS & STATICS OF PARTICLES 9**

Introduction - Units and Dimensions - Laws of Mechanics - Lamé's theorem, Parallelogram and triangular Law of forces - Resolution and Composition of forces- Vectors - Vector operations: additions, subtraction, dot product, cross product - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility.

**UNIT II EQUILIBRIUM OF RIGID BODIES 9**

Free body diagram – stable equilibrium – action and reaction forces - moment of a force about a point - Varignon's theorem- moment and couple –equivalent force couple system – equilibrium of rigid body in two dimensions - Support reactions of beams.

**UNIT III PROPERTIES OF SURFACES 9**

Determination of Areas and Volumes - Centroid of sections - T section, I section, Angle section, Hollow section by using standard formula – Moment of inertia - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia.

**UNIT IV DYNAMICS OF PARTICLES 9**

Displacements, Velocity and acceleration, their relationship – Rectilinear motion: horizontal motion- vertical downward and vertical upward motion –curvilinear motion: projectile motion - Newton's law - D'Alemberts principle- motion of lift – motion of inclined surfaces – motion of connected bodies.

**UNIT V FRICTION 9**

Friction and its types – limiting friction – coefficient of friction and angle of friction – coulomb's laws of dry Friction –impending motion – angle of repose - friction in simple contact surfaces - friction of a body lying on an inclined plane, ladder friction.

**TOTAL PERIODS: 45**

**COURSE OUTCOMES**

At the end of the course, the students will be able to

- apply the differential principles to solve engineering problems.

- gain in-depth knowledge in the equilibrium of rigid bodies.
- identify and calculate the various properties of surfaces and solids
- categorize the various forces analysis in structures.
- solve rigid body problems subjected to dynamic forces.

#### TEXT BOOKS

1. Dr.N.Kottiswaran., "Engineering Mechanics"10th Edition, Sri Balaji Publications2010.
2. Palanichamy, M.S., Nagam, S., "Engineering Mechanics - Statics & Dynamics", Tata McGraw-Hill, (2001).

#### REFERENCE BOOKS

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition,(1997).
2. Hibbeler, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd.,
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran, S. Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd.,(2000)



**COURSE OBJECTIVES**

To enable the students to

- understand the basics of computer and basic elements of python programming.
- study various looping statements, control statements and functions in python.
- analyze different string operations and lists.
- learn how to use tuples and dictionaries in python program.
- study the exception handling mechanism and file handling.

**UNIT I BASICS OF COMPUTER AND PYTHON PROGRAMMING 6**

**Introduction to Computers:** Generation and classification of computers – basic organization of computer – Number Systems (Binary, Decimal, Octal and Hexadecimal) – Algorithm – Flowchart – Pseudo code.

**Introduction to Python:** Python Interpreter-Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, multiple assignments, comments.

**UNIT II CONTROL STATEMENTS AND FUNCTIONS IN PYTHON 6**

**Conditional and looping Statements:** Conditional (if), alternative (if-else), chained conditional (if-else-if)- Iteration-while, for, break, continue, pass.

**Functions:** Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.

**UNIT III STRINGS AND LISTS 6**

**Strings:** String slices, immutability, string methods and operations.

**Lists:** creating lists, list operations, list methods, mutability, aliasing, cloning lists

**UNIT IV TUPLES AND DICTIONARIES 6**

**Tuples:** Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value.

**Dictionaries:** operations and methods, Nested Dictionaries.

**UNIT V FILES AND MODULES 6**

**Files:** Text files, reading and writing files(read number of characters, lines and words in a file) , format Operator , command line arguments – errors and exceptions.

**Modules:** Python Modules - Creating own Python Modules.

**TOTAL PERIODS 30**

**LIST OF EXPERIMENTS**

1. Implement various control statements in python.
2. Create python programs to implement looping statements.
3. Implement user defined functions using python.
4. Develop python programs to perform various string operations.
5. Develop python programs to perform operations on list.



6. Develop python programs to work with Tuples.
7. Create python program to implement dictionary.
8. Implement python program to perform file operations.
9. Implement python programs using modules.
10. Create python program to handle exceptions.

**TOTAL PERIODS 30**

### **COURSE OUTCOMES**

At the end of this course, students will be able to

- classify and make use of python programming elements to solve and debug simple logical problems
- experiment various control statements, looping statements and functions in python.
- develop python programs using strings and lists.
- implement tuples and dictionaries in python program.
- create python programs to work with files and handling exceptions.

### **TEXT BOOKS**

1. Ashok NamdevKamthane, Amit Ashok Kamthane, “Programming and Problem Solving with Python”, Mc-Graw Hill Education,2018.

### **REFERENCES**

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff / O’Reilly Publishers, 2016.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd,” Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
5. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem Solving Focus”, Wiley India Edition, 2013.



**(COMMON TO ALL BRANCHES)****COURSE OBJECTIVES**

To provide exposure to the students with hands on experience in various basic engineering practices such as Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP A (CIVIL AND MECHANICAL)****I CIVIL ENGINEERING PRACTICE****BUILDINGS**

- Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

**PLUMBING WORKS**

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing line sketches for water supply and sewage works.
- Hands-on-exercise:
- Basic pipe connections –Mixed pipematerial connection –Pipe connections with different joining components. (e) Demonstration of plumbing requirements of high-rise buildings.

**CARPENTRY USING POWER TOOLS ONLY**

- a) Study of the joints in roofs, doors, windows and furniture.
- b) Hands-on-exercise:  
Wood work, joints by sawing, planing and cutting.

**II MECHANICAL ENGINEERING PRACTICE****WELDING**

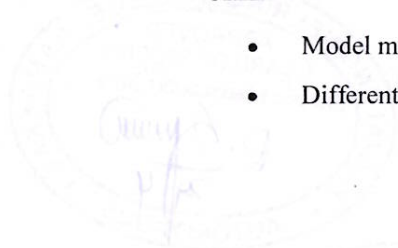
- Preparation of arc welding of butt joints, lap joints and tee joints.
- Gas welding practice

**BASIC MACHINING**

- Simple Turning, Facing, Thread cutting and Taper turning
- Drilling Practice

**SHEET METAL WORK**

- Model making – Trays, funnels, etc.
- Different type of joints.



## FITTING

- Square fitting
- Vee- fitting models

## DEMONSTRATION

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise –  
Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.

TOTALPERIODS: 30

## GROUP B (ELECTRICAL AND ELECTRONICS)

### III ELECTRICAL ENGINEERING PRACTICE

1. Study of electrical tools and safety measures.
2. Basic wiring practices - Stair-case wiring, Fluorescent lamp wiring and Residential house wiring.
3. Measurement of electrical parameters such as voltage, current, power & power factor in RLC Circuit.
4. Measurement of energy using single phase energy meter.
5. Earthing Practices & Measurement of earth resistance using megger.
6. Study of electrical equipments such as iron box, induction heater.

### IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments– Resistor, color coding measurement of AC signal parameter (Peak-Peak, RMS, Period, and Frequency) using CRO.
2. Study of logic gates AND, OR, Ex-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR.
6. Construction and verification of half adder circuit.
7. Construction and verification of half subtractor circuit.
8. Study of Telephone, F.M Radio and Cell Phone.

TOTALPERIODS: 30

## COURSE OUTCOMES

At the end of this course, the students will be able to

- use tools and equipment for fitting, carpentry, sheet metal, welding, electrical wiring and plumbing
- prepare the models by fitting operation & carpentry operation.
- construct electrical wiring circuit and demonstrate practically.

