



**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**  
**REGULATION 2020**  
**FIRST YEAR (I & II Semester) – CURRICULUM & SYLLABI**

**SEMESTER I**

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	HS1171	Communicative English	HS	3	0	0	3	3
2	MA1171	Engineering Mathematics-I	BS	3	1	0	4	4
3	PH1171	Engineering Physics	BS	3	0	0	3	3
4	CY1171	Engineering Chemistry	BS	3	0	0	3	3
5	GE1171	Fundamentals of Computing and Programming	ES	3	0	0	3	3
<b>PRACTICALS</b>								
6	BS1181	Basic Sciences Laboratory	BS	0	0	2	2	1
7	GE1181	Fundamentals of Computing and Programming Laboratory	ES	0	0	4	4	2
<b>TOTAL</b>				15	1	6	22	19

**SEMESTER II**

S.NO.	COURSE CODE	COURSE TITLE	CATE GOR Y	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDIT S
				L	T	P		
<b>THEORY</b>								
1	HS1271	Technical English	HS	3	0	0	3	3
2	MA1271	Engineering Mathematics-II	BS	3	1	0	4	4
3	PH1272	Physics for Electronics Engineering	BS	3	0	0	3	3
4	BS1271	Environmental Science and Engineering	BS	3	0	0	3	3
5	GE1271	Engineering Graphics	ES	1	0	4	5	3
6	EE1271	Circuit Theory	PC	3	0	0	3	3
<b>PRACTICALS</b>								
7	GE1281	Engineering Practices Laboratory	ES	0	0	4	4	2
8	EE1281	Electric Circuits Laboratory	PC	0	0	4	4	2
<b>TOTAL</b>				16	1	12	29	23

L	T	P	C
3	0	0	3

**OBJECTIVES:**

To enable the students to

- Develop the basic reading and writing skills of first year engineering and technology students
- Help learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications
- Help learners develop their speaking skills and speak fluently in real contexts
- Help learners develop vocabulary of a general kind by developing their reading skills

**UNIT I SHARING PERSONAL INFORMATION****9**

**Listening-** short texts- Short formal and informal conversations about current affairs. **Speaking-** introducing oneself - exchanging personal information **Reading-** Reading- short comprehension passages and fill-in the gap, Practice in skimming, scanning and predicting content and end up effectively **-Writing-** Completing sentences using connectors - Developing hints based on the true facts **-Language development-** Parts of speech- Tenses-modal verbs Language Ladders: Wh-Questions/ Yes or no questions - **Vocabulary development** -Prefixes-suffixes- Changes in meaning.

**UNIT II GENERAL READING AND FREE WRITING****9**

**Listening** -telephonic conversations. **Speaking** – sharing information of personal kind - redundancies – taking leave- **Reading** - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- Free writing-Summary writing –**Language development** – prepositions, conjunctions, articles, count/uncount nouns- **Vocabulary development**-guessing meanings of words in context.

**UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT****9**

**Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions **Reading-** short texts and longer passages (close reading) **Writing**– constructing a paragraph of their own choice- use of reference words and discourse markers-coherence-jumbled sentences . **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- meanings of root words.

**UNIT IV READING AND LANGUAGE DEVELOPMENT****9**

**Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend. **Reading-** comprehension reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email-**Language development-**Phrasal Verbs- **Vocabulary Development-** synonyms-antonyms.

**UNIT V EXTENDED WRITING****9**

**Listening** –listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Reading**- longer texts- close reading –**Writing**- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing- **Language development**- Collocations used in everyday life - **Vocabulary Development** - Fixed and Semi-Fixed Expressions used in informal situations

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES:**

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

- CO1: Comprehend articles of a general kind in magazines and newspapers.
- CO2: Apply acquired knowledge of conventions in diverse contexts by participating effectively in informal conversations
- CO3: Make use of standard English to express views coherently and explicitly in formal communication.
- CO4: Demonstrate proper grammar usage in the writing of personal letters and emails in English
- CO5: Illustrate their ability to write short essays of a general kind

### **TEXTBOOKS:**

1. Richards, C. Jack, 2015, *Interchange Students' Book-2* , CUP, New Delhi.
2. Sanjay Kumar & Pushp Lata, 2018, *Communication Skills*: Oxford University Press, Chennai.

### **REFERENCES:**

1. Shoba, KN 2019, *Communicative English – A Workbook*, Cambridge, New Delhi.
2. Bailey & Stephen 2011, *Academic Writing: A practical guide for students*. Rutledge, New York.
3. Comfort , Jeremy, [Pamela Rogerson Revell](#), [Trish Stott](#) & [Derek Utle](#)y 2011, *Speaking Effectively: Developing Speaking Skills for Business English*. Cambridge University Press, Cambridge.
4. Dutt P. Kiranmai & Rajeevan Geeta 2013, *Basic Communication Skills*, Foundation Books.
5. Means,L. Thomas & Elaine Langlois 2007, *English & Communication for Colleges*, Cengage Learning ,USA.
6. Redston, Chris & Gillies Cunningham 2005, *Face2Face (Pre-intermediate Student's Book& Workbook)*, Cambridge University Press, New Delhi.

### **WEB SOURCES:**

1. <http://learnenglish.britishcouncil.org/grammar/intermediate-to-upper-intermediate>
2. <https://www.bbc.co.uk/learningenglish/basic-grammar>

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3	1	0	4

**PREREQUISITE:** Basics of Matrices – Limit of a function – Continuity – Differentiation – Integration – Elementary calculus. (Not for Examination)

**OBJECTIVES:**

To enable the students to

- Gain knowledge in using matrix theory techniques to solve problems.
- Understand the various techniques in differential calculus to obtain the maxima and minima of a function.
- Understand the concept of evolutes and envelopes.
- Understand the concept of integration for finding Length of curves, Volumes of solid of revolution, Surface areas of revolution.
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

**UNIT I      MATRICES**

**12**

Characteristic equation – Eigen values and Eigen vectors – Properties – Cayley-Hamilton Theorem (without proof) – Applications: Inverse and powers of a matrix – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

**UNIT II    APPLICATIONS OF DIFFERENTIAL CALCULUS**

**12**

Curvature in Cartesian coordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Increasing and Decreasing functions – Maxima and Minima of functions of single variable using first derivative test.

**UNIT III    APPLICATIONS OF INTEGRAL CALCULUS**

**12**

Beta and Gamma Function– Properties– Evaluation of integrals using Beta and Gamma function– Length of curves – Surface areas of revolution.

**UNIT IV    PARTIAL DIFFERENTIATION AND ITS APPLICATIONS**

**12**

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

**UNIT V    MULTIPLE INTEGRALS AND ITS APPLICATIONS**

**12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

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

CO1:    Apply the concept of Eigen values and eigenvectors, diagonalization of a

matrix for solving Engineering problems.

CO2: Apply differentiation to solve maxima and minima problems.

CO3: Apply integration to compute Length of curves and Surface areas of revolution.

CO4: Apply Partial differentiation to compute Maxima and minima of functions of two variables.

CO5: Apply multiple integrals technique to calculate area and volume.

#### **TEXT BOOKS:**

1. Grewal, B S 2014, *Higher Engineering Mathematics*, Khanna Publishers, 43<sup>rd</sup> Edition, New Delhi.
2. Kreyszig Erwin 2016, *Advanced Engineering Mathematics*, John Wiley and Sons, 10<sup>th</sup> Edition, New Delhi.

#### **REFERENCES:**

1. Anton, H, Bivens, I & Davis, S 2016, *Calculus*, Wiley, 10<sup>th</sup> ed.
2. Jain, RK, & Iyengar, SRK 2007, *Advanced Engineering Mathematics*, Naros Publications, 3<sup>rd</sup> Edition, New Delhi.
3. Narayanan, S & Manicavachagom Pillai, T K 2007, *Calculus Volume I and II*, S. Viswanathan Publishers Pvt. Ltd., Chennai.
4. Peter V.O'Neil 2007, *Advanced Engineering Mathematics*, Cengage learning 7<sup>th</sup> Edition.
5. Weir, MD, & Joel Hass 2016, *Thomas Calculus*, Pearson Education 12<sup>th</sup> ed, India.

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**OBJECTIVES:**

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**UNIT I      ULTRASONICS****9**

Generation of ultrasonic waves –Magnetostriction generator – Piezoelectric generator - detection of ultrasonic waves - properties – cavitation - velocity measurement – acoustic grating - Industrial applications: SONAR - Non Destructive Testing - A,B and C –scan displays.

**UNIT II      LASER AND FIBER OPTICS****9**

**Lasers:** population of energy levels, Einstein's A and B coefficients– Semiconductor lasers: homo junction and heterojunction.

**Fiber optics:** principle, numerical aperture and acceptance angle - types of optical fibre (material, refractive index profile and number of modes) –sensors: pressure and displacement, optical fiber communication system, endoscope.

**UNIT III      THERMAL PHYSICS****9**

Thermal conductivity – Forbe's and Lee's disc method- conduction through compound media (series and parallel) - thermal expansion of solids and liquids – thermal insulation- Applications: heat exchangers, refrigerators, ovens and solar water heater.

**UNIT IV      QUANTUM PHYSICS****9**

Postulates of quantum mechanics - Black body radiation – Planck's theory (derivation) - wave particle duality – electron diffraction – degenerate and non-degenerate states –physical significance of wave function- Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional box - scanning tunneling microscope.

**UNIT V      CRYSTAL PHYSICS****9**

Crystalline and non-crystalline solids - unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances - coordination number and packing factor for SC, BCC, FCC and HCP - crystal defects: point defect and line defect - role of imperfections in plastic deformation - Bridgman and Czochralski crystal growth techniques.

**TOTAL: 45 Hours****COURSE OUTCOMES:**

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

- CO1: Understand the properties, generation and applications of ultrasonic waves.
- CO2: Realize the properties & principle of laser, and propagation of light in optical fibre.
- CO3: Explain the idea of heat conduction in different media and understand the real applications of heat transfer.
- CO4: Comprehend the quantum concepts in materials.
- CO5: Describe the various types of atomic arrangements and imperfections in crystal.

**TEXT BOOKS:**

- Bhattacharya, DK, & Poonam, T 2015, *Engineering Physics* Oxford University Press.

2. John Wilson, Hawkes, JFB 1998, *Optoelectronics: An Introduction*, Prentice Hall of India.
3. Gaur, RK & Gupta, SL 2012, *Engineering Physics*, Dhanpat Rai Publishers.
4. Pandey, BK & Chaturvedi, S 2012, *Engineering Physics*, Cengage Learning India.
5. Charles Kittel 2007, *Introduction to Solid State Physics*, 7<sup>th</sup> ed, Wiley India.

#### **REFERENCES:**

1. Halliday, D, Resnick, R & Walker, J 2015, *Principles of Physics*, Wiley.
2. Serway, RA. & Jewett, JW 2010, *Physics for Scientists and Engineers*, Cengage Learning, 2010.
3. Tipler, PA & Mosca, G 2007, *Physics for Scientists and Engineers, USA*.
4. Mathews, PM & Venkatesan 2010, *A Text book of Quantum Mechanics*, Tata McGraw hill.
5. William T. Silfvast 2004, *Laser Fundamentals*, 2<sup>nd</sup> ed, Cambridge University press, New York.
6. Shankar, R 2014, *Fundamentals of Physics*, Yale University Press, New Haven and London.

#### **WEB REFERENCES:**

1. <https://nptel.ac.in/courses/122/106/122106034/> (Quantum Physics)
2. <https://nptel.ac.in/courses/115/105/115105099/> (Solid state Physics)
3. <https://nptel.ac.in/courses/115/107/115107095/> (Fiber Optics)
4. <https://nptel.ac.in/courses/113/106/113106070/> (Ultrasonic testing)

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**OBJECTIVES:**

To enable the students to understand

- Water quality parameters and water treatment techniques.
- Principles and applications of electrochemistry, its processes and storage devices.
- The various energy sources and their applications
- The basic concepts of polymers, their properties and some of the important applications.
- The basic principles and preparatory methods of engineering materials and nanomaterials.

**UNIT I WATER AND ITS TREATMENT 9**

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming). Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - zeolite (permutit) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

**UNIT II ELECTROCHEMISTRY 9**

Introduction – Electrochemical cells – Reversible and irreversible cells – Concentration Cells - EMF - Measurement of EMF - Electrode potential – Single Electrode Potential – Nernst Equation (Problems) – Reference electrodes – Calomel electrode – Glass electrode – EMF Series – Significance – Applications of EMF measurements: Potentiometric Titrations. Storage Devices: Batteries and Super capacitors - Types of batteries - alkaline, lead-acid, nickel-cadmium and lithium batteries - construction, working and commercial applications. Fuel Cells – H<sub>2</sub>-O<sub>2</sub> fuel cell – Microbial Fuel Cells.

**UNIT III ENERGY SOURCES 9**

Conventional and Non Conventional Energy Sources – Conventional: Fossil Fuels - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG). Non Conventional: Solar energy – Solar Energy Conversion – Solar Cells, Wind Energy, Nuclear Energy – Nuclear fission and fusion – Nuclear chain reactions - Nuclear reactor – Nuclear Power Plant – Breeder Reactor.

**UNIT IV POLYMERS 9**

Introduction: Functionality - degree of polymerization- Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and coordination); condensation and copolymerization. Properties of polymers: T<sub>g</sub>, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Synthesis, Properties and uses of: PE, PVC, Nylon 66, Bakelite, Epoxy resins.

**UNIT V ENGINEERING MATERIALS 9**

Introduction - Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses - Glass - manufacture, types, properties and uses.

Nanomaterials - Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties – Synthesis of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, Precipitation & electrochemical deposition – General Applications.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

CO1: Identify the purity of water samples as per industry requirements.

CO2: Apply basic concepts of electrochemistry in energy storage devices

CO3: Recognize different forms of energy resources to apply them for suitable applications in energy sectors

CO4: Illustrate the structure and properties of polymeric molecules.

CO5: Identify the properties of various materials used in engineering and technology applications

**TEXT BOOKS:**

1. Jain, PC & Monica Jain 2015, *Engineering Chemistry*, 16<sup>th</sup> ed, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
2. Sivasankar B 2010, *Engineering Chemistry*, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
3. Dara, SS & Umare, SS 2015, *A text book of Engineering Chemistry*, 2<sup>nd</sup> ed, Chand & Company Ltd, New Delhi.

**REFERENCES:**

1. Schdeva, MV 2017, *Basics of Nano Chemistry*, Anmol Publications Pvt Ltd.
2. Sivasankar, B 2012, *Instrumental Methods of Analysis*, Oxford University Press.
3. Friedrich Emich 2017, *Engineering Chemistry*, Scientific International Ltd.
4. Gowariker, VR, Viswanathan, NV & Jayadev Sreedhar 2019, *Polymer Science*, 6<sup>th</sup> ed, New Age International Publishers.

L	T	P	C
3	0	0	3

**OBJECTIVES:**

To enable the students to:

- Provide the basics of computational problem solving
- Develop simple C Programs using basic programming constructs
- Develop simple C programs to work on arrays and strings
- Develop simple applications in C using functions and pointers
- Develop basic applications in C using structure and files

**UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 7**

Fundamentals of Computing – Basic computer organization – Generation of Computers – Evolution of programming languages – Need for logical analysis and thinking – Number System – Algorithms – Pseudocodes – Flowcharts.

**SUGGESTED TOOL:** Raptor tool

**SUGGESTED ACTIVITIES:**

Draw a flow chart and write a pseudocode to perform the following operations:

- i. Swap two numbers without temporary variable
- ii. Leap year or not
- iii. Sum of even numbers in range of 1 to N
- iv. Prime or not
- v. Find minimum in a given array of elements
- vi. Solve Towers of Hanoi problem

**UNIT II BASICS OF C PROGRAMMING 11**

Introduction to C programming – Structure of C program – Cprogramming: Data Types – Storage classes – Constants– Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements.

**SUGGESTED ACTIVITIES:**

Write a C Program to perform the following operations:

- i. Simple calculator
- ii. GCD
- iii. Fibonacci series

**UNIT III ARRAYS AND STRINGS 10**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – String operations.

**SUGGESTED ACTIVITIES:**

Write a C Program to perform the following operations:

- i. Computing Mean, Median and Mode
- ii. Matrix operations (Addition, Scaling, Multiplication and Transpose)
- iii. Bubble Sort
- iv. Linear Search
- v. String operations (length, compare, concatenate, copy, reverse)

**UNIT IV FUNCTIONS AND POINTERS 9**

Introduction to functions: Function prototype, function definition, function call, Built-in functions – Recursion – Pointers – Pointer operators – Pointer arithmetic – Parameter passing: Pass by value, Pass by reference.

### **SUGGESTED ACTIVITIES:**

Write a C Program to perform the following operations:

- i. String functions, math functions
- ii. Computation of Sine series
- iii. Scientific calculator using built-in functions
- iv. Factorial using recursive functions
- v. Swapping of two numbers using pass by value
- vi. Changing the value of a variable using pass by reference

## **UNIT V STRUCTURES AND FILE PROCESSING**

**8**

Structure – Nested structures – Array of structures – Files– Types of file processing: Sequential access, Random access – Command line arguments – Pre-processor directives.

### **SUGGESTED ACTIVITIES:**

Write a C Program to perform the following operations:

- i. Student mark sheet preparation using Structure
- ii. Read the content from a text file, convert it to upper case and store it in another text file
- iii. Search a content from the student data file (Sequential access)
- iv. Fetch nth record from the student data file (Random access)

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

- CO1: Develop algorithms for simple computational problems
- CO2: Develop simple applications in C using basic constructs
- CO3: Design and implement applications using arrays and strings
- CO4: Develop and implement applications in C using functions and pointers
- CO5: Develop applications in C using structures and files

### **TEXTBOOKS:**

1. ReemaThareja, 2016, *Programming in C*, 2<sup>nd</sup>ed, Oxford University Press.
2. Forouzan, BA&Gilberg, RF, 2006, *Computer Science: A structured programming approach using C*, 3<sup>rd</sup> ed, Cengage Learning.
3. Kernighan, B.W & Ritchie, D.M, 2006, *The C Programming language*, 2<sup>nd</sup> ed, Pearson Education.

### **REFERENCES:**

1. Paul Deitel& Harvey Deitel, *C How to Program*, 7<sup>th</sup>ed, Pearson Publication.
2. Juneja, BL & Anita Seth, 2011, *Programming in C*, CENGAGE Learning India pvt. Ltd.
3. Pradip Dey & Manas Ghosh, 2009, *Fundamentals of Computing and Programming in C*, Oxford University Press.
4. Anita Goe l& Ajay Mittal, 2011, *Computer Fundamentals and Programming in C*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia.
5. Byron S. Gottfried, 1996, *Schaum's Outline of Theory and Problems of Programming with C*, McGraw-Hill Education.

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### PHYSICS LABORATORY

#### OBJECTIVES:

To introduce different experiments to test basic understanding of physics concepts applied in optics, ultrasonics, thermal and semiconductor physics.

#### LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

- (a) Determination of wavelength, and particle size using Laser.  
(b) Determination of acceptance angle in an optical fiber.
- Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
- Determination of wavelength of mercury spectrum – spectrometer grating.
- Determination of band gap of a semiconductor.
- Determination of thickness of a thin wire – Air wedge method.
- Determination of Young's modulus by Uniform bending method.

#### Experiments using LabVIEW: (Demonstration only)

- Calibration of Ammeter/Voltmeter using potentiometer.
- Sensors - Displacement, Pressure, Strain and Acoustical sensors.

**TOTAL: 15 PERIODS**

### CHEMISTRY LABORATORY

#### OBJECTIVES:

To enable the students to

- Inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- Familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

#### LIST OF EXPERIMENTS: (Any 6 Experiments)

- Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water sample.
- Determination of total, temporary & permanent hardness of water by EDTA method.
- Determination of DO content of water sample by Winkler's method.
- Determination of chloride content of water sample by argentometric method.
- Estimation of copper content of the given solution by EDTA method
- Determination of strength of given hydrochloric acid using pH meter.
- Determination of strength of acids in a mixture of acids using conductivity meter.
- Estimation of iron content of the given solution using potentiometer.

**TOTAL: 15 PERIODS**

**COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

- CO1: Interpret the elastic property of the materials using non-uniform bending method and the size of the microscopic particles with the help of a laser.
- CO2: Find the bandgap of the semiconductor using Four probe setup and compressibility of the given liquid and velocity of the ultrasonic waves using an ultrasonic interferometer.
- CO3: Illustrate the wavelength of different colours present in the polychromatic light source using grating
- CO4: Analyse the water quality parameters like hardness, Alkalinity, Chloride, DO in the given water sample by volumetric method
- CO5: Determine the quantity of the analyte in the given sample by volumetric method with the help of instruments

**TEXT BOOKS:**

1. Jeffery, GH, Bassett, J, Mendham, J & Denney, RC, 2014, "*Vogel's Textbook of Quantitative Chemical Analysis*", 8<sup>th</sup> ed.

L	T	P	C
0	0	4	2

**OBJECTIVES:**

To enable the students to

- Learn the use of office automation tools
- Represent the solution to simple problems using algorithm and flowchart.
- Develop simple programs in C using basic constructs.
- Develop simple programs to solve primitive applications in C using strings, pointers, functions, structures and files

**LIST OF EXPERIMENTS:**

**1. OFFICE APPLICATION SOFTWARE**

- a. Word Processing
  - I. Document creation, Text manipulation with Scientific notations
  - II. Table creation, Table formatting and Conversion
  - III. Letter preparation and mail merge
  - IV. Drawing - flow Chart
- b. Spread Sheet
  - I. Formula - formula editor, Sorting
  - II. Chart - Line, XY, Bar and Pie
- c. Power point
  - I. Advertisement making
  - II. Presentation preparation

**2. DRAW FLOWCHART USING RAPTOR TOOL TO:**

- I. Find area of a circle
- II. Find the biggest of two numbers
- III. Compute grade for given mark
- IV. Find the sum and average of 'N' numbers

**3. C PROGRAMS USING I/O STATEMENTS AND EXPRESSIONS TO:**

- I. Find area and volume of shapes
- II. Convert centigrade to Fahrenheit
- III. Swap two numbers with and without using temporary variable

**4. C PROGRAMS USING DECISION-MAKING CONSTRUCTS TO:**

- I. Find the biggest of two numbers
- II. Compute grade for given mark
- III. Check whether the given number is Armstrong number or not

**5. C PROGRAMS USING ONE DIMENSIONAL ARRAY TO:**

- I. Perform linear search
- II. Sort the given numbers using bubble sort
- III. Populate an array with height of persons and find how many persons are above the average height.

**6. C PROGRAMS USING TWO DIMENSIONAL ARRAY TO:**

- III. Add two matrices
- IV. Multiply two matrices
- V. Find sum of diagonal elements of a Matrix

**7. C PROGRAMS USING FUNCTIONS TO:**

- VI. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
- VII. Find the factorial of a number using recursion
- VIII. Swap the value of two numbers (Call by value and Call by reference)

IX. Sort the list of numbers using functions

**8. C PROGRAMS USING STRINGS TO:**

- a. Check whether the given string is palindrome or not (Without using built-in functions)
- b. From a given paragraph perform the following using built-in functions:

**9. FIND THE TOTAL NUMBER OF WORDS.**

- I. Capitalize the first word of each sentence.
- II. Replace a given word with another word.

**10. C PROGRAMS USING STRUCTURES TO:**

- a. Compute internal marks of students for five different subjects using structures and files.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

CO1: Understand the use of office automation tools

CO2: Represent pictorially the solution for simple problems.

CO3: Develop C programs for simple applications making use of basic constructs, arrays and strings.

CO4: Develop C programs to solve simple applications using functions, recursion and pointers.

CO5: Build C programs to solve simple applications using structure and files.

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**OBJECTIVES:**

To enable the students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

**UNIT I TECHNICAL WRITING-AN INTRODUCTION 9**

**Listening**- Listening to talks of scientists / Indian speakers – Fill- in exercises- **Speaking** Asking for and giving directions for ESL students- **Reading** – reading short technical texts from journals- newspapers - **Writing**- purpose statements – extended definitions - Writing instructions- checklists-recommendations-**Vocabulary Development**- technical vocabulary **Language Development** –subject verb agreement – compound words

**UNIT II INTERPRETATION OF GRAPHICAL REPRESENTATION 9**

**Listening**- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a graphical interpretation-**Reading**-Error Correction- Paragraph Completion- Graphical Representation- **Writing**- interpreting charts, graphs, paragraphing- **Vocabulary Development**- vocabulary used in formal letters/emails and reports. **Language Development**- personal passive voice, numerical adjectives.

**UNIT III JOB APPLICATIONS 9**

**Listening**- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter –Resume preparation( via email and hard copy)- **Vocabulary Development**- Perfect phrases for interviews-. **Language Development**- clauses- if conditionals

**UNIT IV REPORT WRITING 9**

**Listening**- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey report-**Vocabulary Development**- prefixes and suffixes/Synonyms- Misspelled words. **Language Development**- embedded sentences.

**UNIT V ESSAY WRITING 9**

**Listening**- Listening to TED Talks that are technical in nature -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-analytical, descriptive and issue based essays- **Vocabulary Development**- verbal analogies **Language Development**- Commonly Used Idioms and Phrases.

**TOTAL PERIODS: 45**

## **COURSE OUTCOMES:**

### **Upon completion of the course, the student will be able to**

- CO1: Utilize basic grammatical skills in writing instructions, checklists and recommendations
- CO2: Apply acquired knowledge of Grammar to prepare formal letters and e-mails.
- CO3: Develop reading skills by familiarizing with different types of reading strategies.
- CO4: Construct documents with respect to career
- CO5: Make use of communicative English in report preparation and minutes.

## **TEXT BOOKS:**

1. Sam Praveen.D& K.N. Shoba, 2020, *A Course in Technical English*, CUP, Chennai.
2. Raman & Sharma, 2018, *Technical Communication*, OUP, New Delhi.

## **REFERENCES:**

1. Richard Rossner, 2017 *Language Teaching Competences*, OUP.
2. Booth, L, Diana, 2014 *Project Work*, OUP, Oxford.
3. Shoba and Praveen Sam 2018, *Technical English-Workbook*, Cambridge University Press: New Delhi.
4. Ibbotson & Mark 2009, *Professional English in use*, University Press, New Delhi,
5. Sudharshana, NP & Shavitha, C 2018, *English for Engineers*, Cambridge University Press, Chennai.

## **WEB SOURCES:**

1. [https://owl.purdue.edu/owl/subject\\_specific\\_writing/professional\\_technical\\_writing/index.html](https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/index.html)
2. <https://hbr.org/topic/communication>



CO4: Evaluate integrals using Cauchy's integral formula and residue theorem.

CO5: Apply Laplace transforms techniques in solving differential equations.

**TEXT BOOKS:**

1. Grewal, BS 2014, *Higher Engineering Mathematics*, Khanna Publishers, 43<sup>rd</sup> Edition, New Delhi.
2. Kreyszig Erwin 2016, *Advanced Engineering Mathematics*, John Wiley and Sons, 10<sup>th</sup> Edition, New Delhi.

**REFERENCES :**

1. Bali, N, Goyal, M & Watkins, C 2009, *Advanced Engineering Mathematics*, Firewall Media, 7<sup>th</sup> ed, New Delhi.
2. Jain, RK & Iyengar, SRK 2007, *Advanced Engineering Mathematics*, Narosa Publications, 3<sup>rd</sup> ed, New Delhi.
3. Wylie, RC & Barrett, LC 2012, *Advanced Engineering Mathematics*, Tata McGraw Hill Education Pvt. Ltd, 6<sup>th</sup> ed, New Delhi.
4. Peter V. O'Neil 2007, *Advanced Engineering Mathematics*, Cengage learning, 7<sup>th</sup> ed.
5. Weir, MD & Joel Hass 2016, *Thomas Calculus*, Pearson Education, 12<sup>th</sup> ed, India.

**OBJECTIVES:**

To enable the students to

- To understand the essential principles of Physics of semiconductor devices and Electron transport properties.
- To accomplish the magnetic and optical properties of materials and nanodevices.
- To impart fundamentals of superconducting, magnetic, dielectric materials and nano electronic devices.

**UNIT I CONDUCTING & SUPERCONDUCTING MATERIALS 9**

**Conducting material:** Free electron theory (Classical & Quantum) - Fermi-Dirac statistics – density of energy states – concentration of electrons in metals– low resistivity and high resistivity materials - thermostat and thermal relays.

**Super conducting material:** Meissner effect – Type I & II superconductors – BCS theory- high temperature superconductors – Josephson's effect – Electrical switching element- cryotron – SQUID - CT scan and MRI scan- magnetic levitation in trains.

**UNIT II PHYSICS OF SEMICONDUCTOR DEVICES 9**

Direct and indirect semiconductors- Generation and Recombination- Drift current -Diffusion current- Continuity equations- Einstein relation – carrier concentration in intrinsic semiconductor – extrinsic semiconductor: N – type & P-type – Hall effect– Ohmic contacts – tunnel diode – Schottky diode- MOS capacitor.

**UNIT III MAGNETIC AND DIELECTRIC MATERIALS 9**

**Magnetic material:** Domain Theory of ferro magnetism- Hysteresis - Weiss molecular field - exchange interaction- Antiferromagnetism- Application of ferromagnetic materials -ferrites – structures of ferrites – Applications of ferrites: telecommunication, radar and magnetic hard disc.

**Dielectric materials:** Polarization and its types (Qualitative) – Internal field –Clausius Mosotti relation- dielectric loss– dielectric breakdown – ferroelectricity- Applications of dielectrics: transformer, capacitor and microwave oven.

**UNIT IV OPTICAL PROPERTIES OF MATERIALS 9**

Classification of optical materials – Colour centres - carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell – LED – Organic LED – Laser diodes.

**UNIT V NANO DEVICES 9**

Zener Bloch Oscillation – Resonant tunneling – Mesoscopic structures: conductance fluctuation and coherent transport- nano wires - Ballistic transport- Quantum resistance and conductance – coulomb blockade effects - single electron transistor – Quantum dot laser.

**TOTAL: 45 PERIODS**

## **COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

- CO1: Describe the conducting and superconducting material and its applications
- CO2: Acquire knowledge on basics of semiconductor physics and its applications in various devices
- CO3: Interpret the knowledge on magnetic and dielectric properties of materials
- CO4: Infer the functioning of optical materials for optoelectronics
- CO5: Understand the basics of quantum structures and their application in single electron transistor.

## **TEXT BOOKS:**

1. Kasap, SO 2007, *Principles of Electronic Materials and Devices*, McGraw-Hill Education.
2. Umesh K Mishra & Jasprit Singh, 2008, *Semiconductor Device Physics and Design*, Springer.
3. Wahab, MA 2009, *Solid State Physics: Structure and Properties of Materials*, Narosa Publishing House.
4. Sze, SM 2007, *Physics of Semiconductor Devices*, John Wiley and Sons, USA.

## **REFERENCES:**

1. Garcia, N & Damask, A 2012, *Physics for Computer Science Students*, Springer-Verlag.
2. Hanson, GW 2009, *Fundamentals of Nanoelectronics*, Pearson Education.
3. Rogers, B, Adams, J & Pennathur, S 2014, *Nanotechnology: Understanding Small Systems*, CRC Press.
4. Suprio Dutta 1998, *Electronic transport in Mesoscopic Systems*, Cambridge University Press.

## **WEB REFERENCES:**

1. <http://www.youtube.com/watch?v=4MiBBubORsI> ( Conducting Materials)
2. [https://nptel.ac.in/courses/115/101/115101012/\(Superconductors\)](https://nptel.ac.in/courses/115/101/115101012/(Superconductors))
3. <http://www.doitpoms.ac.uk/tlplib/dielectrics/index.php> (Dielectric materials)
4. [https://www.youtube.com/watch?v=8ETYsUr0I\\_g](https://www.youtube.com/watch?v=8ETYsUr0I_g) (Quantum confinement)

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**OBJECTIVES:**

To enable the students to understand

- The interrelationship between living organism and environment.
- The integrated themes and biodiversity, natural resources, pollution control and waste management.
- Scientific, technological, economic and political solutions to environmental problems.
- The dynamic processes and understand the features of the earth's interior and surface
- The importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value

**UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES, ECOSYSTEM AND BIODIVERSITY 12**

Definition, scope and importance, need for public awareness - Environment- Concept of ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- Energy flow in the eco system - Food chain, Food web -Ecological pyramid- Ecological Succession - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries - Introduction to biodiversity definition: genetic, species and ecosystem diversity - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values - India as a mega diversity nation – Hotspots of Biodiversity - endangered and endemic species of India- Threats to Biodiversity (habitat loss, poaching, man-wildlife conflicts) -conservation of biodiversity: In-situ and ex-situ – Field study.

**UNIT II ENVIRONMENTAL POLLUTION 9**

Definition – causes, effects and control measures of: (a) Air pollution (climate change, global warming, acid rain, ozone layer depletion) (b) Water pollution (c) Noise pollution (d) Marine pollution (e) Nuclear Pollution (f) Soil Pollution - Solid waste management- causes, effects and control – e-waste - Role of an individual in prevention of pollution - Pollution case studies

**UNIT III NATURAL RESOURCES 9**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Rain water harvesting - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion - Land resources: Land as a resource, land degradation, man induced landslides, soil - role of an individual in conservation of natural resources.

**UNIT IV DISASTER MANAGEMENT AND ENVIRONMENTAL LEGISLATIONS 9**

Definition of disaster – types – Natural disasters – Earthquakes – Landslides – Flood, cyclones, Tsunami and Drought Man made disaster – Nuclear, Chemical and Biological disaster (COVID-19) – Disaster impacts (Environmental, Physical, social, ecological and economical) – Case study – Need and concept of disaster management – Disaster management cycle – Mitigation , relief – recovery –Role and responsibility of the government, community, local institutions and NGO's - Environmental ethics – Acts for prevention of environmental pollution – Wild life protection act –

Forest conservation act –Water (Prevention & control) Act – Air (Prevention & control) Act – Environmental protection Act – Public awareness.

## **UNIT V HUMAN POPULATION AND THE ENVIRONMENT**

**6**

Population growth, variation among nations – population explosion – family welfare programme – Resettlement and rehabilitation of people – human rights – value education - HIV / AIDS- women and child welfare - Environmental impact analysis (EIA)- -GIS-remote sensing- role of information technology in environment and human health – Case studies

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

CO1: Explain the natural environment and its relationships with human activities.

CO2: Summarize the causes, effects and control measures of various environmental pollution.

CO3: Illustrate the importance of various resources, its utilization and conservation

CO4: Infer that the technological development and improvement in standard of living lead to serious environmental disasters.

CO5: Outline the importance of population control and its impact on the environment.

### **TEXT BOOKS:**

1. Bharucha, E, 2013, *Textbook of Environmental studies for Undergraduate Courses*, 2<sup>nd</sup> ed, Universities Press Pvt. Ltd.
2. Benny Joseph, 2017, *Environmental Science and Engineering*, 3<sup>rd</sup> ed, Tata McGraw-Hill, New Delhi.
3. Miller, TG & Jr, Spoolman, S, 2014, *New Environmental Science*, 14<sup>th</sup> ed, Wadsworth Publishing Co, New Delhi.

### **REFERENCES:**

1. Kaushik, A & Kaushik, CP 2018, *Environmental Science and Engineering*, 6<sup>th</sup> ed, New Age International private Ltd, New Delhi.
2. Gilbert Masters & Wendell, P Ela, 2013, *Introduction to Environmental Engineering and Science*, 3<sup>rd</sup> ed, Pearson Education private Ltd.
3. De, AK 2014, *Environmental Chemistry*, 7<sup>th</sup> ed, New Age international publishers, New Delhi.
4. Sawyer, CN, Mac Carty, PL, & Parkin, GF 2003, *Chemistry for Environmental Engineering and Science*, 5<sup>th</sup> ed, Tata McGraw – Hill, New Delhi.

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**OBJECTIVES:**

To enable the students to

- Develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- Expose them to existing national standards related to technical drawings.

**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, Isometric projection of combination of solids

**UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACE (3+12)**

Orthographic projection- principles-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 Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object

**.UNIT II PROJECTIONS OF SOLIDS (3+12)**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

**UNIT III PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES (3+12)**

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

**UNIT IV ISOMETRIC AND PERSPECTIVE PROJECTIONS (3+12)**

Principles of isometric projection – isometric scale -isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - Perspective projection of simple solids- Prisms, pyramids and cylinders by visual ray method .

**UNIT V ORTHOGRAPHIC PROJECTION (3+12)**

Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid — Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of ThreeDimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects simple objects. Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Drawing of tangents and normal to the above curves

**TOTAL: 75 PERIODS**

**COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

CO1: Familiarize with the fundamentals and standards of Engineering graphics

CO2: Perform freehand sketching of basic geometrical constructions and multiple views of objects.

- CO3: Project orthographic projections of lines and plane surfaces  
CO4: Draw projections and solids and development of surfaces  
CO5: Visualize and to project isometric and perspective sections of simple solids.

**TEXT BOOKS:**

1. Natarajan, KV 2006, *A text book of Engineering Graphics*, Dhanalakshmi Publishers, Chennai.
2. Venugopal K & Prabhu Raja V 2008, *Engineering Graphics*, New Age International (P) Limited.

**REFERENCES:**

1. Bhatt ND & Panchal VM 2010, *Engineering Drawing*, 50<sup>th</sup> ed, Charotar Publishing House.
2. Basant Agarwal & Agarwal CM 2008, *Engineering Drawing*, Tata McGraw Hill Publishing Company Limited, NewDelhi.
3. Gopalakrishna KR 2007, *Engineering Drawing (Vol. I&II combined)*, Subhas Stores, Bangalore.
4. Luzzader, Warren.J. & Duff,John M 2005, *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.
5. N S Parthasarathy & Vela Murali 2015, *Engineering Graphics*, Oxford University, Press, New Delhi.
6. Shah MB & Rana BC 2009, *Engineering Drawing*, 2<sup>nd</sup> ed Pearson.

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**OBJECTIVES:**

- To impart knowledge on solving dc and ac circuits using basic electrical laws and network theorems
- To introduce the concept of resonance in coupled circuits.
- To give exposure on transient response analysis of lumped circuits with different sources.
- To introduce phasor diagrams and analysis of three phase ac circuits.

**UNIT I ANALYSIS OF DC CIRCUITS 12**

Ohm's Law- Resistive elements- Resistors in series and parallel circuits- dependent and independent sources- Basics of network graph - KVL, KCL, voltage and current division rule- Mesh current & Node voltage method of analysis - Source transformation- Star-delta conversion- Superposition Theorem - Thevenin's Theorem- Norton's Theorem- Maximum power transfer Theorem- Reciprocity Theorem.

**UNIT II ANALYSIS OF AC CIRCUITS 12**

Introduction to AC - Sine wave, phase relations in R, L and C circuits-Complex impedance- series and parallel circuits with combination of RLC elements - Mesh current & Node voltage method of analysis - Star-delta conversion - Thevenin's Theorem- Norton's Theorem-Superposition Theorem- Maximum power transfer Theorem.

**UNIT III RESONANCE AND COUPLED CIRCUITS 12**

Series Resonance- Parallel Resonance- Frequency Response of series & parallel resonance- Quality factor, Bandwidth and selectivity- Self & Mutual inductance- coupled circuits-Coefficient of coupling- Dot Conversion – Tuned circuits- Single tuned and double tuned coupled circuits.

**UNIT IV TRANSIENT RESPONSE ANALYSIS & TWO PORT NETWORKS 12**

Transient response of RL, RC and RLC circuits using Laplace transform for DC input and A.C. sinusoidal input - Two port Network – Open Circuit Impedance (Z) Parameters – Short Circuit Admittance (Y) Parameters – Hybrid (h) Parameters

**UNIT V THREE PHASE CIRCUITS 12**

A.C. circuits – Average and RMS value – Power, Power Factor and Energy - Three phase balanced / unbalanced voltage sources- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads - Phasor diagram - Power measurement in three phase circuits using two wattmeter method.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

- CO1: Solve the given DC electric circuit using basic electrical laws /network theorems.
- CO2: Solve the given AC electric circuit using basic electrical laws /network theorems
- CO3: Determine the frequency response characteristics of resonance circuits & explain the operation of coupled circuits.
- CO4: Obtain the transient response of RL, RC & RLC circuits using Laplace Transform for both AC and DC inputs
- CO5: Determine the various electrical parameters in three-phase AC circuits under balanced/unbalanced conditions.

**TEXT BOOKS:**

1. Sudhakar A & Shyam Mohan SP 2015, *Circuits and Network Analysis and Synthesis*, McGraw Hill.
2. Hayt, WH, Kemmerly, JE & Durbin, SM 1986, *Engineering circuit analysis* (p. 74). New York: McGraw-Hill.
3. Alexander, CK 2009, *Fundamentals of electric circuits*. McGraw-Hill.
4. Robbins, AH & Miller, WC 2012, *Circuit analysis: Theory and practice*. Cengage Learning.

**REFERENCES:**

1. Chakrabarti A 1999, *Circuits Theory (Analysis and synthesis)*, Dhanpath Rai & Sons, NewDelhi.
2. Jegatheesan, R 2015, *Analysis of Electric Circuits*.
3. Joseph A, Edminister & Mahmood Nahri, 2010. *Electric circuits*, Schaum's series, Mc Graw Hill, New Delhi, 2010.
4. Van Valkenburg, ME 2015, *Network Analysis*, Prentice-Hall of India Pvt. Ltd, New Delhi.
5. Mahadevan, K & Chitra, C 2015. *Electric Circuits Analysis*, Prentice-Hall of India Pvt. Ltd, New Delhi
6. Svoboda JA & Dorf, RC 2013, *Introduction to electric circuits*. John Wiley & Sons.





(c) Circular Saw	2 Nos
(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos
(f) Jigsaw	2 Nos

### **MECHANICAL**

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner, 3D Printer	One each

### **ELECTRICAL**

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

### **ELECTRONICS**

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

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**OBJECTIVES:**

- To simulate various electric circuits using Pspice / Matlab /Multi-Sim / Scilab
- To gain practical experience on electric circuits and verification of theorems

**List of Experiments:**

1. Simulation and experimental verification of Kirchhoff's voltage and current laws for the given DC circuit.
2. Simulation and experimental verification of Thevenin and Norton's theorem for the given DC & AC circuits.
3. Simulation and experimental verification of Superposition theorem for the given DC circuit.
4. Simulation and experimental verification of Maximum Power transfer Theorem for the given DC circuit.
5. Study of oscilloscopes and measurement of sinusoidal voltage, frequency and power factor using CRO.
6. Simulation and Experimental validation of frequency response of RLC electric circuit.
7. Measurement of self and mutual inductance of a coil and study of magnetically coupled coils.
8. Simulation and Experimental validation of transient behavior of R-C circuit under DC input.
9. Determination of Z and Y parameters of two-port networks.
10. Analysis of three-phase balanced and unbalanced Star/Delta network.
11. Measurement of 3-Phase Power by two wattmeter method under balanced & unbalanced load conditions.

**TOTAL: 60 PERIODS****COURSE OUTCOMES:**

Upon successful completion of course the students will be able to

- CO1: Apply basic electrical laws and network theorems for solution of simple DC & AC circuits.
- CO2: Determine transient response and frequency response of given AC circuits
- CO3: Determine network parameters of the given of two port network.
- CO4: Simulate three phase balanced / unbalanced star / delta network

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1. Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed Power Source.
2. Function Generator (1 MHz) - 10 Nos.
3. Single Phase Energy Meter - 1 No.
4. Oscilloscope (20 MHz) - 10 Nos.
5. Digital Storage Oscilloscope (20 MHz) – 1 No.
6. 10 Nos. of PC with Circuit Simulation Software (min 10 Users) ( e-Sim / Scilab/
7. Pspice / MATLAB /other Equivalent software Package) and Printer (1 No.)
8. AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10 Nos.)
9. Single Phase Wattmeter – 3 Nos.
10. Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
11. Circuit Connection Boards - 10 Nos.

Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10Watt)