



## B.Tech. in ELECTRICAL AND ELECTRONICS ENGINEERING

### COURSE STRUCTURE (VR23 Regulations)

Applicable from 2023-24 Batch

#### I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	23MA101BS	Matrices and Calculus	3	1	0	4
2	23CH102BS	Engineering Chemistry	3	1	0	4
3	23EE103ES	Electrical Circuit Analysis – I	3	0	0	3
4	23EE104ES	Elements of Electrical and Electronics Engineering	0	0	2	1
5	23ME105ES	Computer Aided Engineering Graphics	1	0	4	3
6	23CS106ES	C Programming and Data Structures	3	0	0	3
7	23CH107BS	Engineering Chemistry Laboratory	0	0	2	1
8	23CS108ES	C Programming and Data Structures Laboratory	0	0	2	1
		Induction Program				
		<b>Total Credits</b>	<b>13</b>	<b>2</b>	<b>10</b>	<b>20</b>

#### I Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	23MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	23PH202BS	Applied Physics	3	1	0	4
3	23ME203ES	Engineering Workshop	0	1	3	2.5
4	23EN204HS	English for Skill Enhancement	2	0	0	2
5	23CS205ES	Applied Python Programming Laboratory	0	1	2	2
6	23EE206ES	Electrical Circuit Analysis - II	2	0	0	2
7	23PH207BS	Applied Physics Laboratory	0	0	3	1.5
8	23EN208HS	English Language and Communication Skills Laboratory	0	0	2	1
9	23EE209ES	Electrical Circuit Analysis Laboratory	0	0	2	1
10	23CH210MC	Environmental Science	3	0	0	0
		<b>Total Credits</b>	<b>13</b>	<b>2</b>	<b>14</b>	<b>20</b>

**MATRICES AND CALCULUS**  
**(Course Code: 23MA101BS)****B.Tech. I Year I Sem.**

L	T	P/D	C
3	1	0	4

**Course Objectives:**

1. To learn the types of matrices, Concept of Rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
2. To learn the concept of Eigen values and Eigen vectors of a matrix, Diagonalization of a matrix, Cayley Hamilton theorem and Reduce a quadratic form into a canonical form through an orthogonal transformation.
3. To learn the concept of the Mean value theorems, Evaluation of Improper integrals using Beta and Gamma Functions.
4. To learn the Partial differentiation, Jacobian, maxima and minima and Taylor series expansion of functions of two variables.
5. To learn The Evaluation of multiple integrals and their applications in the allied fields.

**Course Outcomes:** After completing this course

1. Student will be able to find the Rank of a matrix and analyze solutions of system of linear equations.
2. Student will be able to find the Eigen values and Eigen vectors of a matrix, Diagonalization of a matrix, verification of Cayley Hamilton theorem and reduce a quadratic form into a canonical form through orthogonal transformation.
3. Student will be able to verify mean value theorems and Evaluate Improper Integrals using Beta and Gamma Functions.
4. Student will be able to find the maxima and minima of function of two variables, Jacobian and Taylor series expansion of functions of two variables.
5. Student will be able to Evaluate Multiple Integrals

**UNIT-I: Matrices****[10 Periods]**

Matrices: Types of Matrices, Symmetric, Skew-symmetric, Hermitian, Skew- Hermitian, orthogonal and Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; Solving system of Homogeneous and Non-Homogeneous linear equations, LU – Decomposition Method.

**UNIT- II: Eigen Values and Eigen Vectors****[8 Periods]**

Linear Transformation, Orthogonal Transformation. Eigen values, Eigen vectors, properties of eigen values and Eigen vectors with reference to different matrices; Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem.

**Quadratic Forms:** Nature, rank, index and signature of the Quadratic Form, Reduction of Quadratic form to canonical forms by Orthogonal Transformation Method.

### **UNIT- III: Calculus**

**[10 Periods]**

Mean value theorems: Rolle's Theorem and Lagrange's Mean value theorem with their Geometrical Interpretation and its applications, Cauchy's mean value Theorem. Taylor's Series. (All the theorems without proof). Beta and Gamma Functions: Introduction to Improper Integrals, Definition of Beta and Gamma functions, properties, and other forms. Relation between Beta and Gamma functions. Evaluation of Improper integrals using Beta and Gamma functions.

### **UNIT- IV: Multivariable Calculus (Partial differentiation and applications) [10 Periods]**

Definitions of Limit and Continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence and Independence. Taylor's Series for functions of two variables,

Applications: Maxima and Minima of function two variables and three variables using Method of Lagrange Multipliers.

### **UNIT - V: Multivariable Calculus (Integration)**

**[8 Periods]**

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form). Evaluation of Triple Integrals. Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Finding areas using double integrals and Volumes using double and triple integrals.

### **TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics , Narosa Publications, 5<sup>th</sup> Edition 2016.

### **REFERENCES:**

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

**ENGINEERING CHEMISTRY**  
**(Course Code: 23CH102BS)**

**B.Tech. I Year I Sem.**

L	T	P/D	C
3	1	0	4

**Course Objectives:**

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion its control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like Cement, lubricants and refractories.

**Course Outcomes:**

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

**UNIT - I: Water and its treatment: [8]**

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications-Steps involved in the treatment of potable water-Disinfection of potable water by chlorination and break point of chlorination.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning-Phosphate conditioning-Colloidal conditioning, External treatment methods - Softening of water by ion-exchange processes and Zeolite processes. Desalination of water – Reverse osmosis.

**UNIT – II Battery Chemistry & Corrosion [8]**

Introduction of **Electro chemistry**-Electro chemical cells, Electrode potential, standard electrode potential, Nernst equation, Numerical problems.

**Batteries:** Classification of batteries-Basic requirements for commercial batteries. Primary battery-Li cell, Secondary battery-Construction, working and applications of Lithium ion battery and Lead-acid battery. Fuel Cells-Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell.

**Corrosion:** Causes and effects of corrosion—theories of chemical and electrochemical corrosion—mechanism of electrochemical corrosion. Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods—Cathodic protection—Sacrificial anode and impressed current methods. Electro plating—copper plating, Electro less plating—Ni plating.

### **UNIT - III: Polymeric materials: [8]**

Definition—Classification of polymers with examples—Types of polymerization—addition (free radical addition) and condensation polymerization with examples.

**Fibers:** Nylon 6:6 and Terylene

**Plastics:** Definition and characteristics—thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

**Rubbers:** Natural rubber and its vulcanization. **Elastomers:** Characteristics, preparation, properties and applications of Buna-S, Butyl and Thiokol rubber.

**Conducting polymers:** Characteristics and Classification with examples—mechanism of conduction in Trans-polyacetylene and applications of conducting polymers.

**Biodegradable polymers:** Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

### **UNIT - IV: Energy Sources: [8]**

Introduction, Calorific value of fuel – HCV, LCV—Dulong's formula, Calorific value numerical problems.

Classification of fuels. **Solid fuels:** analysis of coal—proximate and ultimate analysis and their significance. **Liquid fuels:** petroleum and its refining, cracking types—moving bed catalytic cracking. Knocking—octane and cetane rating, synthetic petrol—Fischer-Tropsch's process; **Gaseous fuels:** Composition and uses of natural gas, LPG and CNG.

### **UNIT - V: Engineering Materials: [8]**

**Cement:** Portland cement, its composition, classification of cements, setting and hardening of cement.

**Lubricants:** Classification of lubricants with examples—characteristics of a good lubricants, properties of lubricants: viscosity, cloud point, pour point, flash point and fire point, mechanism of lubrication (thick film, thin film and extreme pressure).

**Refractories:** Classification of refractories, characteristics of good refractories. Applications of refractories.

### **TEXT BOOKS:**

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

**REFERENCE BOOKS:**

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

**ELECTRICAL CIRCUIT ANALYSIS - I**

(Course Code: 23EE103ES)

**B.Tech. I Year I Sem.**

L	T	P	C
3	0	0	3

**Prerequisites:** Mathematics**Course Objectives:**

- To gain knowledge in circuits and to understand the fundamentals of derived circuit laws.
- To learn steady state and transient analysis of single phase and 3-phase circuits.
- To understand Theorems and concepts of coupled circuits.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Understand network analysis, techniques using mesh and node analysis.
- Evaluate steady state and transient behavior of circuits for DC and AC excitations.
- Analyze electric circuits using network theorems and concepts of coupled circuits.

**UNIT-I:**

**Network Elements & Laws:** Active elements, Independent and dependent sources. Passive elements R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method.

**UNIT-II:**

**Single-Phase Circuits:** RMS and average values of periodic sinusoidal and non-sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

**UNIT-III:**

**Network theorems:** Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millman's theorem and Reciprocity theorem. (AC & DC).

**UNIT-IV:**

**Poly-phase Circuits:** Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

**UNIT-V:**

**Coupled circuits:** Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption

**TEXTBOOKS:**

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3<sup>rd</sup> Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2<sup>nd</sup> Edition, 2019.

**REFERENCE BOOKS:**

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11<sup>th</sup> Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5<sup>th</sup> Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3<sup>rd</sup> Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6<sup>th</sup> Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.



**ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING**

(Course Code: 23EE104ES)

**B.Tech. I Year I Sem.**

L	T	P	C
0	0	2	1

**Prerequisites:** Elements of Electrical Engineering**Course Objectives:**

- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC machines and Transformers.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

**List of experiments/demonstrations:****PART-A (compulsory)**

1. Verification Ohm's Law
2. Verification of KVL and KCL
3. Verification of Thevenin's and Norton's theorem
4. Verification of Superposition theorem
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. To draw the locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.
7. Verification of Reciprocity theorem
8. Study and operation of (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO

**PART-B (any two experiments from the given list)**

1. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
2. Verification of Milliman's Theorem.
3. Verification of Maximum Power Transfer Theorem.
4. Determination of form factor for non-sinusoidal waveform
5. Transient Response of Series RC circuits for DC excitation

**TEXTBOOKS:**

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4<sup>th</sup> Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2<sup>nd</sup> Edition, 2008.

**REFERENCE BOOKS:**

1. P.Ramana, M.Suryakalavathi, G.T.Chandrasheker, “Basic Electrical Engineering”, S.Chand, 2<sup>nd</sup> Edition, 2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M.S.Sukhija, T.K.Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1<sup>st</sup> Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2<sup>nd</sup> Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

**COMPUTER AIDED ENGINEERING GRAPHICS**

(Course Code: 23ME105ES)

**B.Tech. I Year I Sem.**

L	T	P/D	C
1	0	4	3

**Course Objectives:**

- To develop the ability of visualization of different objects through technical drawings.
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products.

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

- CO 1: To learn basic engineering graphic communication skills, sketch conic sections, cycloids and scales manually and using computer aided drafting.
- CO 2: To learn the 2D principles of orthographic projections and multiple views of the same.
- CO 3: To know the solid Projection and its Sectional Views.
- CO 4: Appreciate the need of Development of solid surfaces.
- CO 5: Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting.

**UNIT – I:**

**Introduction to Engineering Graphics:** Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

**UNIT- II:**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

**UNIT – III:**

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

**UNIT – IV:**

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

**UNIT – V:**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and

Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

**TEXT BOOKS:**

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S.Chand and company Ltd.

**REFERENCE BOOKS:**

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**Note:** - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

## C PROGRAMMING AND DATA STRUCTURES

(Course Code: 23CS106ES)

### B.Tech. I Year I Sem.

L	T	P/D	C
3	0	0	3

**Course Objectives:** Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

**Course Outcomes:**

1. Understand the various steps in Program development.
2. Explore the basic concepts in C Programming Language.
3. Develop modular and readable C Programs
4. Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Datastructures.
5. Apply data structures such as stacks, queues in problem solving
6. To understand and analyze various searching and sorting algorithms.

#### UNIT - I

**Introduction to Computers** – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development

**Introduction to C Language** – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output

**Structure of a C Program** – Operators, Bit-wise operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements.

#### UNIT - II

**Statements** – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Recursion.

**Designing Structured Programs** – Functions, basics, user defined functions, inter function communication, standard functions.

**Arrays** – Concepts, using arrays in C, inter function communication, array applications, two –dimensional arrays, multidimensional arrays.

#### UNIT - III

**Pointers** – Introduction, Pointers for inter function communication, pointers to pointers, compatibility,

**Pointer Applications** – Passing an array to a function, Memory allocation functions, array of pointers

**Strings** – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

#### UNIT - IV

**Derived types** – The Typedef, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

**Input and Output** – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

#### **UNIT – V**

**Sorting**- selection sort, bubble sort, insertion sort,

**Searching**-linear and binary search methods.

**Data Structures** – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

#### **TEXT BOOKS:**

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

#### **REFERENCE BOOKS:**

1. C & Data structures – P. Padmanabham, 3<sup>rd</sup> Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

**ENGINEERING CHEMISTRY LABORATORY**  
(Course Code: 23CH107BS)

**B.Tech. I Year I Sem.**

L	T	P/D	C
0	0	2	1

**Course Objectives:** The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6:6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

**Course Outcomes:** The experiments will make the student gain skills on:

- Determination of parameters like hardness of water.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6:6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

**List of Experiments:**

**I. Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

**II. Conductometry:** Estimation of the concentration of a weak acid vs Strong base by Conductometry.

**III. Potentiometry:** Estimation of the concentration of a strong acid vs Strong base by Potentiometry.

**IV. pH Metry:** Determination of the concentration of a strong acid vs Strong base by using pH meter.

**V. Preparations:**

1. Preparation of Bakelite.
2. Preparation Nylon-6:6

**VI. Lubricants:**

1. Determination of surface tension of a given liquid by using stalagmometer.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

**VII. Colorimetry:** Determination of Ferrous Iron in Cement by Colorimetric method.

**VIII. Virtual lab experiments**

1. Construction of Fuel cell and its working.
2. Batteries for electrical vehicles.
3. Functioning of solar cell and its applications.
4. Smart materials for Biomedical applications

**REFERENCE BOOKS:**

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

## C PROGRAMMING AND DATA STRUCTURES LABORATORY

(Course Code: 23CS108ES)

### B.Tech. I Year I Sem.

L	T	P/D	C
0	0	2	1

**Course Objectives:** Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

**Course Outcomes:**

1. Develop modular and readable C Programs
2. Solve problems using strings, functions
3. Handle data in files
4. Implement stacks, queues using arrays, linked lists.
5. To understand and analyze various searching and sorting algorithms

**List of Experiments:**

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to a given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.



17. Write a C program that uses functions to perform the following operations:
- i) Reading a complex number
  - ii) Writing a complex number
  - iii) Addition of two complex numbers
  - iv) Multiplication of two complex numbers
- (Note: represent complex number using a structure.)
- 18.
- i. Write a C program which copies one file to another.
  - ii. Write a C program to reverse the first n characters in a file.(Note: The file name and n are specified on the command line.)
- 19.
- i. Write a C program to display the contents of a file.
  - ii. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)
20. Write a C program that uses functions to perform the following operations on singly linkedlist.:
- i) Creation
  - ii) Insertion
  - iii) Deletion
  - iv) Traversal
21. Write C programs that implement stack (its operations) using
- i) Arrays
  - ii) Pointers
22. Write C programs that implement Queue (its operations) using
- i) Arrays
  - ii) Pointers
23. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
- i) Bubble sort
  - ii) Selection sort
  - iii) Insertion sort
24. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
- i) Linear search
  - ii) Binary search

**TEXT BOOKS:**

- 1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
- 2. Let us C, Yeswanth Kanitkar
- 3. C Programming, Balaguruswamy.

**ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**  
(Course Code: 23MA201BS)

**B.Tech. I Year II Sem.**

L	T	P/D	C
3	1	0	4

**Course Objectives:** To Learn

1. Methods of Solving First order Ordinary Differential Equations and its applications.
2. Methods of Solving Higher order Ordinary Differential Equations and its applications.
3. Laplace Transforms and its applications.
4. Gradient, Divergence, curl and Scalar potential function.
5. Line, Surface and volume integrals, Vector integral theorems.

**Course Outcomes:** After learning the contents of this course the student must be able to

1. Solve First order Ordinary Differential Equations and its applications.
2. Solve Higher order Ordinary Differential Equations and its applications.
3. Find Laplace transform of given functions and solution of ordinary differential equations.
4. Find Gradient, Divergence, curl and Scalar potential function.
5. Find Line, Surface and volume integrals and verify Vector integral theorems.

**UNIT- I: First Order ODE**

**[8 Periods]**

Exact Differential Equations, Non-Exact Differential Equations, Linear Differential Equations, Bernoulli's Differential Equations. Orthogonal trajectories, Applications: Newton's law of cooling, Law of natural growth and decay.

**UNIT- II: Ordinary Differential Equations of Higher Order**

**[10 Periods]**

Introduction-Homogenous, Non-homogeneous differential equations. Complementary function and Particular integral, Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin(ax)$ ,  $\cos(ax)$ , polynomial in  $x$ ,  $e^{ax} V(x)$ ,  $x^k V(x)$ , Method of variation of parameters. Applications: Electrical Circuits

**UNIT-III : Laplace Transforms**

**[10 Periods]**

Laplace Transforms: Laplace transform of standard functions, First shifting theorem, Unit step function, Dirac delta function, second shifting theorem, Laplace transform of functions when multiplied and divided by  $t$ . Laplace transforms of derivatives and integrals of functions, Evaluation of integrals using Laplace transforms, Laplace transform of Periodic functions.

Inverse Laplace transform by different methods, Convolution Theorem, Applications: Solving differential equations with constants coefficients with Initial conditions by Laplace transform method. (All the theorems without proof).

**UNIT-IV: Vector Differentiation****[10 Periods]**

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Vector Identities, Solenoidal and Irrotational vectors, Scalar potential function.

**UNIT-V: Vector Integration****[10 Periods]**

Line, Surface and Volume Integrals. Green's Theorem, Gauss Divergence Theorem and Stokes Theorem (without proofs) and their applications. Discussion of these theorems with reference to solenoidal and irrotational vector fields.

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K.Jain and S.R.K.Iyengar , Advanced Engineering Mathematics , Narosa Publications, 5<sup>th</sup> Edition 2016.

**REFERENCES:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, Jogn Wiley & Sons,2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Ed, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. Alan Jeffrey, Mathematics for Engineers and Scientists, 6<sup>th</sup> Edition, 2013, Chapman & Hall.
5. Kanti B.Datta, Mathematical Methods of Science and Engineering, Cengage Learning.

**APPLIED PHYSICS**

(Course Code: 23PH202BS)

B.Tech. I Year II Sem.

L	T	P/D	C
3	1	0	4

**Course Objectives:**

The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric and magnetic materials.
4. Identify the importance of Nano scale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

**Course Outcomes:**

At the end of the course the student will be able to:

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric and magnetic materials for their applications.
4. Appreciate the features and applications of Nanomaterial.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

## **UNIT - I: QUANTUM PHYSICS AND SOLIDS (20 hrs)**

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect de-Broglie hypothesis, Expression for de-Broglie wavelength of electron- Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Free electron theory (Qualitative)- Bloch's theorem -Kronig-Penney model–E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

## **UNIT - II: SEMICONDUCTORS AND DEVICES (15 hrs)**

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

## **UNIT-III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS (16 hrs)**

**Dielectric Materials:** Basic definitions- Types of polarizations (Qualitative) - Ferroelectric, Piezoelectric, and Pyroelectric materials, Local field (Qualitative), Clausius-Mossotti equation.

**Magnetic Materials:** Domain Theory, Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance, applications of magnetic materials.

**Energy Materials:** Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors.

## **UNIT - IV: NANOTECHNOLOGY (12 hrs)**

Nanoscale, quantum confinement, surface to volume ratio, Properties of Nano particles, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM&TEM - applications of nanomaterials.

## **UNIT - V: LASER AND FIBER OPTICS (15 hrs)**

**Lasers:** Laser beam characteristics-three quantum processes -Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser, CO<sub>2</sub> laser, semiconductor laser-applications of laser.

**Fiber Optics:** Introduction to optical fiber- advantages of optical Fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture-classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

### **TEXT BOOKS:**

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S. Chand Publications, 11<sup>th</sup> Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4<sup>th</sup> Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2<sup>nd</sup> Edition, 2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1<sup>st</sup> Edition, 2021.

### **REFERENCE BOOKS:**

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid-State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1st Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

## ENGINEERING WORKSHOP

(Course Code: 23ME203ES)

**B.Tech. I Year II Sem.**

L	T	P/D	C
0	1	3	2.5

### Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

- CO 1: Practice the manufacturing of components using workshop trades that include fitting, carpentry, foundry, welding, tin-smithy and black-smithy.
- CO 2: Identify and apply suitable tools for different trades of engineering processes including drilling, material removal, measuring, and chiselling.
- CO 3: Apply basic electrical engineering knowledge for house wiring practice.
- CO 4: Study and practice on machine tools and their operations.
- CO 5: Get a demonstration on the basic principles of the 3D printing process and exposure to plumbing activities & modern power tools.

### 1. TRADES FOR EXERCISES:

**At least two exercises from each trade:**

- I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
- V. Welding Practice – (Arc Welding & Gas Welding)
- VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
- VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

### 2. TRADES FOR DEMONSTRATION & EXPOSURE:

3D printing, Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working.

**TEXT BOOKS:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

**REFERENCE BOOKS:**

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP



**English for Skill Enhancement**

(Course Code: 23EN204HS)

**B.Tech. I Year II Sem.**

L	T	P/D	C
2	0	0	2

**Course Objectives:** This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

**Course Outcomes:** Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

**UNIT - I**

Chapter entitled '*Toasted English*' by R.K.Narayan from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

## UNIT - II

Chapter entitled ‘**Appro JRD**’ by **Sudha Murthy** from “*English: Language, Context and Culture* ” *published* by Orient Black Swan, Hyderabad.

**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**Writing:** Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

## UNIT - III

Chapter entitled ‘**Lessons from Online Learning**’ by **F.Haider Alvi, Deborah Hurst et al** from “*English: Language, Context and Culture*” published by Orient Black Swan, Hyderabad.

**Vocabulary:** Words Often Confused - Words from Foreign Languages and their Use in English.

**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

**Writing:** Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

## UNIT - IV

Chapter entitled ‘**Art and Literature**’ by **Abdul Kalam** from “*English: Language, Context and Culture*” published by Orient Black Swan, Hyderabad.

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

## UNIT - V

Chapter entitled ‘**Go, Kiss the World**’ by **Subroto Bagchi** from “*English: Language, Context and Culture*” published by Orient Black Swan, Hyderabad.

**Vocabulary:** Technical Vocabulary and their Usage

**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports  
Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**TEXT BOOK:**

1. “English: Language, Context and Culture” by Orient Black Swan Pvt. Ltd, Hyderabad. 2022.  
Print.

**REFERENCE BOOKS:**

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition

**APPLIED PYTHON PROGRAMMING LABORATORY**

(Course Code: 23CS205ES)

**B.Tech. I Year II Sem.**

L	T	P/D	C
0	1	2	2

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

1. Build basic programs using fundamental programming constructs
2. Write and execute python codes for different applications
3. Capable to implement on hardware boards

**LIST OF EXPERIMENTS:****Cycle - 1**

1. Downloading and Installing Python and Modules

- a) Python 3 on Linux

Follow the instructions given in the URL <https://docs.python-guide.org/starting/install3/linux/>

- b) Python 3 on Windows

Follow the instructions given in the URL <https://docs.python.org/3/using/windows.html> (Please remember that Windows installation of Python is harder!)

- c) pip3 on Windows and Linux

Install the Python package installer by following the instructions given in the URL <https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/>

- d) Installing numpy and scipy

You can install any python3 package using the command `pip3 install <packagename>`

- e) Installing jupyterlab

Install from pip using the command `pip install jupyterlab`

2. Introduction to Python3

- a) Printing your biodata on the screen
- b) Printing all the primes less than a given number
- c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself

3. Defining and Using Functions

- a) Write a function to read data from a file and display it on the screen
- b) Define a boolean function *is palindrome*(<input>)
- c) Write a function *collatz*(*x*) which does the following: if *x* is odd,  $x = 3x + 1$ ; if *x* is even, then  $x = x/2$ . Return the number of steps it takes for  $x = 1$
- d) Write a function  $N(m, s) = \exp(-(x-m)^2/(2s^2))/\sqrt{2\pi}s$  that computes the Normal distribution

4. The package numpy

- a) Creating a matrix of given order  $m \times n$  containing *random numbers* in the range 1 to 99999
- b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
- c) Write a program to solve a system of  $n$  linear equations in  $n$  variables using matrix inverse

5. The package scipy and pyplot
  - a) Finding if two sets of data have the same *mean* value
  - b) Plotting data read from a file
  - c) Fitting a function through a set of data points using *polyfit* function
  - d) Plotting a histogram of a given data set
6. The strings package
  - a) Read text from a file and print the number of lines, words and characters
  - b) Read text from a file and return a list of all *n* letter words beginning with a vowel
  - c) Finding a secret message hidden in a paragraph of text
  - d) Plot a histogram of words according to their length from text read from a file

## Cycle -2

### 7. Installing OS on Raspberry Pi

- a. Installation using Pilmager
- b. Installation using image file

- Downloading an Image
  - Writing the image to an SD card
    - using Linux
    - using Windows
  - Booting up

Follow the instructions given in the URL

<https://www.raspberrypi.com/documentation/computers/getting-started.html>

### 8. Accessing GPIO pins using Python

- a) Installing GPIO Zero library.

First, update your repositories list:

```
sudo apt update
```

Then install the package for Python 3:

```
sudo apt install python3-gpiozero
```

- b) Blinking an LED connected to one of the GPIO pin
- c) Adjusting the brightness of an LED

Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.

### 9. Collecting Sensor Data

- a) DHT Sensor interface
  - Connect the terminals of DHT GPIO pins of Raspberry Pi.
  - Import the DHT library using `import Adafruit_DHT`
  - Read sensor data and display it on screen.

**ELECTRICAL CIRCUIT ANALYSIS - II**

(Course Code: 23EE206ES)

**B.Tech. I Year II Sem.**

L	T	P	C
2	0	0	2

**Prerequisites:** Mathematics**Course Objectives:**

- To study the transient analysis of various R, L and C circuits for different inputs
- To understand the Fourier series and Laplace transformation.
- To learn about two-port networks and concept of filters.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Observe the response of various R, L and C circuits for different excitations.
- Examine the behavior of circuits using Fourier, Laplace transforms and transfer function of single port network.
- Obtain two port network parameters and applications and design of various filters.

**UNIT-I:**

**Transient analysis:** Transient response of R, L & C circuits, Formulation of integral differential equations, Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks subjected to internal energy, Response to impulse, step, and ramp, sinusoidal excitations.

**UNIT-II:**

**Electrical circuit Analysis using Laplace Transforms:** Application of Laplace Transforms to RL, RC and RLC (series and parallel) Networks for impulse, step, and ramp, sinusoidal excitations.

**UNIT-III:**

**Two port network parameters:** Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks.

**UNIT-IV:**

**Topological Description of Networks :** Graph, tree, chord, cut-set, incident matrix, circuit matrix and cut-set matrix

**UNIT-V:**

**Filters:** Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters and Band pass and Band elimination filters (Elementary treatment only)

**TEXTBOOKS:**

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3<sup>rd</sup> Edition, 2000.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGrawHill, 2<sup>nd</sup> Edition, 2019.

**REFERENCE BOOKS:**

1. B. Subramanyam, “Electric Circuit Analysis”, Dreamtech Press & Wiley, 2021.
2. James W. Nilsson, Susan A.Riedel, “Electric Circuits”, Pearson, 11<sup>th</sup> Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGrawHill, 5<sup>th</sup> Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3<sup>rd</sup> Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGrawHill, 6<sup>th</sup> Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

**APPLIED PHYSICS LAB**

(Course Code: 23PH207BS)

**B.Tech. I Year II Sem.**

L	T	P/D	C
0	0	3	1.5

**Course Objectives:**

The objectives of this course for the student to

1. Capable of handling instruments related to the Hall Effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and time constant of RC circuit.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

**Course Outcomes:**

The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.



## LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)  
b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the time constant of RC circuit.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the Wavelength of LASER beam by using diffraction grating method.  
b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

Note: Any 8 experiments are to be performed.

## REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017

**English Language Communication Skills Lab**

(Course Code: 23EN208HS)

L	T	P	C
0	0	2	1

**B.Tech. I Year II Sem.**

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

**Course Objectives:**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize the impact of dialects.
- To train students to use language appropriately for public speaking, group discussions and interviews

**Course Outcomes:** Students will be able to:

- Understand the nuances of English language through audio-visual experience and group activities
- Neutralize their accent for intelligibility
- Speak with clarity and confidence which in turn enhances their employability skills

**Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:**

- a. **Computer Assisted Language Learning (CALL) Lab**
- b. **Interactive Communication Skills (ICS) Lab**

**Listening Skills:****Objectives**

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content

- Listening to fill up information
- Intensive listening
- Listening for specific information

### **Speaking Skills:**

#### **Objectives**

1. To involve students in speaking activities in various contexts
  2. To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities
- 
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication**

### **Skills Lab.Exercise – I**

#### **CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs-Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

#### **ICS Lab:**

*Understand:* Spoken vs. Written language- Formal and Informal English.  
*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave –Introducing Oneself and Others.

#### **Exercise II CALL Lab:**

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.  
*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

#### **ICS Lab:**

*Understand:* Features of Good Conversation – Strategies for Effective Communication.  
*Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

#### **Exercise - III CALL Lab:**

*Understand:* Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).  
*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

**ICS Lab:**

*Understand:* Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**Exercise IV CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests - *Testing Exercises*

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

*Practice:* Making a Short Speech – Extempore- Making a Presentation.

**Exercise – VCALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests - *Testing Exercises*

**ICS Lab:**

*Understand:* Group Discussion

*Practice:* Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

**1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

*Computer network with LAN facility (minimum 40 systems with multimedia) with the followings specifications:*

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab :**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

**Source of Material (Master Copy):**

- *Exercises in Spoken English. Part 1,2,3.* CIEFL and Oxford University Press

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10<sup>th</sup> Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

**REFERENCE BOOKS:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook*. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook*. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook*. Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities*. Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach*. Cambridge University Press.

**ELECTRICAL CIRCUIT ANALYSIS LABORATORY**

(Course Code: 23EE209ES)

**B.Tech. I Year II Sem.**

L	T	P	C
0	0	2	1

**Prerequisites:** Elements of Electrical Engineering & Electrical Circuit Analysis

**Course Objectives:**

- To design electrical systems and analyze them by applying various Network Theorems
- To measure three phase Active and Reactive power.
- To understand the locus diagrams and concept of resonance.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Analyze complex DC and AC linear circuits
- Apply concepts of electrical circuits across engineering
- Evaluate response of a given network by using theorems.

**The following experiments are required to be conducted as compulsory**

1. Verification of Series and Parallel Resonance.
2. Determination of Time response of first order RL and RC circuit for periodic non –sinusoidal inputs – Time Constant and Steady state error.
3. Determination of Two port network parameters – Z & Y parameters.
4. Determination of Two port network parameters – A, B, C, D parameters.
5. Determination of Co-efficient of Coupling and Separation of Self and Mutual inductance in a Coupled Circuits.
6. Frequency domain analysis of Low-pass filter.
7. Frequency domain analysis of Band-pass filter.
8. Measurement of Active Power for Star and Delta connected balanced loads.

**In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted**

1. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum.
2. Measurement of Reactive Power for Star and Delta connected balanced loads.
3. Frequency domain analysis of High-pass filter.
4. Determination of Two port network parameters -Hybrid parameters.
5. Determination of Time response of first order RLC circuit for periodic non – sinusoidal inputs – Time Constant and Steady state error.

**TEXTBOOKS:**

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3<sup>rd</sup> Edition, 2000.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGrawHill, 2<sup>nd</sup> Edition, 2019.

**REFERENCE BOOKS:**

1. B. Subramanyam, “Electric Circuit Analysis”, Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A. Riedel, “Electric Circuits”, Pearson, 11<sup>th</sup> Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGrawHill, 5<sup>th</sup> Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3<sup>rd</sup> Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGrawHill, 6<sup>th</sup> Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

**Environmental Science**  
**(Course Code: 23CH210MC)**

**B.Tech. I Year II Sem.**

L	T	P/D	C
3	0	0	0

**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**Course Outcomes:**

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source (hydroelectric energy, solar energy, geothermal energy, wind energy, nuclear energy, and biomass energy) and case studies.

**UNIT - III**

**Biodiversity and Biotic Resources:** Introduction, 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, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment



methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

**Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives. Carbon trading.

## **UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan.(EMP).

**Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Carbon Capture technology and CO<sub>2</sub> Sequestration technology.

## **TEXT BOOKS:**

- 1 Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

## **REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.