VIGNAN INSTITUTE OF TECHNOLOGY AND SCIENCE, DESHMUKHI
(AN AUTONOMOUS INSTITUTION)
B.Tech. in COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

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	23CD103ES	Programming for Problem Solving	3	0	0	3
4	23EE104ES	Basic Electrical Engineering	2	0	0	2
5	23ME105ES	Computer Aided Engineering Graphics	1	0	4	3
6	23CD106ES	Elements of Computer Science & Engineering	0	0	2	1
7	23CH107BS	Engineering Chemistry Laboratory	0	0	2	1
8	23CD108ES	Programming for Problem Solving Laboratory	0	0	2	1
9	23EE109ES	Basic Electrical Engineering Laboratory	0	0	2	1
		Induction Program				
		Total	**12**	**2**	**12**	**20**

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	23EC205ES	Electronic Devices and Circuits	2	0	0	2
6	23CD206ES	Python Programming Laboratory	0	1	2	2
7	23PH207BS	Applied Physics Laboratory	0	0	3	1.5
8	23EN208HS	English Language and Communication Skills Laboratory	0	0	2	1
9	23CD209ES	IT Workshop	0	0	2	1
10	23CH210MC	Environmental Science	3	0	0	0
		Total	**13**	**4**	**12**	**20**

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. The student will be able to find the Rank of a matrix and analyze solutions of system of linear equations.
2. The 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. The student will be able to verify mean value theorems and Evaluate Improper Integrals using Beta and Gamma Functions.
4. The 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.

The 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,5th 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 batterychemistry, significance of corrosion it's 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 tocorrosion 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 ofwater – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion: [8]
Introduction of **Electro chemistry**-Electro chemical cells, Electrode potential, standard electrodepotential, 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-Dulongs 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)

PROGRAMMING FOR PROBLEM SOLVING
(Course Code: 23CD103ES)

B.Tech. I Year I Sem.

L	T	P/D	C
3	0	0	3

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes:

CO1: Describe the structure of C-program, and use iterative and decision control statements for developing solutions to computational problems.

CO2: Organize data in Arrays, structures and perform operations on data stored in Arrays.

CO3: Create and manipulate C-File structures and use preprocessing directives to control C source code.

CO4: Design and develop modular solutions using C-functions and allocate memory dynamically for variables.

CO5: Compare and contrast various searching and sorting strategies.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3					1	2	2
CO2	3	3	3	1	2							
CO3	3	1	3		3							
CO4	3	2	3	2								
CO5	3	3	2		2						1	1

UNIT - I: Introduction to Programming
Compilers, compiling and executing a program.
Representation of Algorithm - Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudo code with examples, Program design and structured programming
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self referential structures in linked list (no implementation) Enumerationdata type

UNIT - III: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT - V: Searching and Sorting:

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXT BOOKS:
1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCE BOOKS:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

BASIC ELECTRICAL ENGINEERING
(Course Code: 23EE104ES)

B.Tech. I Year I Sem.

L	T	P	C
2	0	0	2

Prerequisites: Mathematics

Course Objectives:
- To understand DC and Single & Three phase AC circuits
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

Course Outcomes: After learning the contents of this paper the student must be able to
- Understand and analyze basic Electrical circuits
- Study the working principles of Electrical Machines and Transformers
- Introduce components of Low Voltage Electrical Installations.

UNIT-I:
D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, The venin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:
A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations series resonance in series R-L-C circuit.

UNIT-III:
Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:
Electrical DC Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine.
Electrical AC Machines Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Construction and working of Single-phaseinduction motor,.

UNIT-V:
Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:
1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic ElectricalEngineering", S. Chand,2nd 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^{st}Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic ElectricalEngineering", 2nd 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, ideasin 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.

ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING
(Course Code: 23CD106ES)

B.Tech. I Year I Sem.

L	T	P/D	C
0	0	2	1

Course Objective:

To provide an overview of the subjects of computer science and engineering.

Course Outcomes:

CO1: Know the working principles of functional units of a basic Computer
CO2: Understand program development, the use of data structures and algorithms in problemsolving.
CO3: Know the need and types of operating system, database systems.
CO4: Understand the significance of networks, internet, WWW and cyber security.
CO5: Understand Autonomous systems, the application of artificial intelligence.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3		2									2
CO3	3		2									2
CO4	3		1			1		2				2
CO5	3	1	2		2							2

UNIT – I
Basics of a Computer – Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software – systems software, application software, packages, frameworks, IDEs.

UNIT – II
Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures

UNIT – III
Operating systems: Functions of operating systems, types of operating systems, Device & Resourcemanagement
Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services

UNIT – IV
Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks, 5G communication.
World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.
Security – information security, cyber security, cyber laws

UNIT – V
Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, natural language processing, image and video processing.
Cloud Basics.

TEXT BOOK:
   1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

REFERENCE BOOKS:

   1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
   2. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
   3. Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
   4. Elements of computer science, Cengage.

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 saponificationvalue, 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 metryin 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 by Conductometry.
III. Potentiometry: Estimation of the concentration of a strong acid by Potentiomentry.
IV. pH Metry: Determination of the concentration of a strong acid 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.

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).

PROGRAMMING FOR PROBLEM SOLVING LABORATORY
(Course Code: 23CD108ES)

B.Tech. I Year I Sem.

L	T	P/D	C
0	0	2	1

[Note:The programs may be executed using any available Open Source/ Freely available IDE Some of the Tools available are:

CodeLite: https://codelite.org/
Code:Blocks:http://www.codeblocks.org/
DevCpp: http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org

This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C likeoperators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions,arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes:

CO1: Formulate the algorithms for simple problems and translate given algorithms to a working and correct program

CO2: Correct syntax errors as reported by the compilers, identify and correct logical errors encountered duringexecution

CO3: Represent and manipulate data with arrays, strings and structures and use pointers of different types

CO4: Create, read and write to and from simple text and binary files

CO5: Develop reusable code with the help C-functions

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1							
CO2			3	3	1						2	2
CO3	3	3		2								
CO4			3		2						2	
CO5	2	2	3								1	1

Practice sessions:
   a. Write a simple program that prints the results of all the operators available in C (including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
   b. Write a simple program that converts one given data type to another using auto conversion andcasting. Take the values from standard input.

Simple numeric problems:
   a. Write a program for finding the max and min from the three numbers.
   b. Write the program for the simple, compound interest.
   c. Write a program that declares Class awarded for a given percentage of marks, where mark<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
   d. Write a program that prints a multiplication table for a given number and the number of rows inthe table. For example, for a number 5 and rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 = 10
   5 x 3 = 15
   e. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:
   a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
   b. Write a C program, which takes two integer operands and one operator from the user, performsthe operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
   c. Write a program that finds if a given number is a prime number
   d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
   e. A 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.
   f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
   g. Write a C program to find the roots of a Quadratic equation.
   h. Write a C program to calculate the following, where x is a fractional value.
   1-x/2 +x^2/4-x^3/6
   i. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+…………+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Arrays, Pointers and Functions:
   a. Write a C program to find the minimum, maximum and average in an array of integers.
   b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in asingle dimension array.

   c. Write a C program that uses functions to perform the following:
      i) Addition of Two Matrices
      ii) Multiplication of Two Matrices
      iii) Transpose of a matrix with memory dynamically allocated for the new matrix as row and columncounts may not be the same.

   d. Write a C programs that use both recursive and non-recursive functions
      i) To find the factorial of a given integer.
      ii) To find the GCD (greatest common divisor) of two given integers.
      iii) To find x^n

   e. Write a program for reading elements using a pointer into an array and display the values usingthe array.

   f. Write a program for display values reverse order from an array using a pointer.

   g. Write a program through a pointer variable to sum of n elements from an array.

Files:

   a. Write a C program to display the contents of a file to standard output device.

   b. Write a C program which copies one file to another, replacing all lowercase characters withtheir uppercase equivalents.

   c. Write a C program to count the number of times a character occurs in a text file. The file nameand the character are supplied as command line arguments.

   d. Write a C program that does the following:
      It should first create a binary file and store 10 integers, where the file name and 10 values aregiven in the command line. (hint: convert the strings using atoi function)
      Now the program asks for an index and a value from the user and the value at that index shouldbe changed to the new value in the file. (hint: use fseek function)
      The program should then read all 10 values and print them back.

   e. Write a C program to merge two files into a third file (i.e., the contents of the first file followedby those of the second are put in the third file).

Strings:

   a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

   b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

   c. Write a C program that uses functions to perform the following operations:
      i) To insert a sub-string into a given main string from a given position.
      ii) To delete n Characters from a given position in a given string.

   d. Write a C program to determine if the given string is a palindrome or not (Spelled same in bothdirections with or without a meaning like madam, civic, noon, abcba, etc.)

   e. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

   f. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

   a. Write a menu driven C program that allows a user to enter n numbers and then choose betweenfinding the smallest, largest, sum, or average. The menu and all the choices are to be functions.Use a switch statement to determine what action to take. Display an error message if an invalidchoice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1              *        1        1          *
1 2            * *      2 3      2 2        * *
1 2 3          * * *    4 5 6    3 3 3      *   *
                                4 4 4 4     *
                                           * *
                                           *
```

Sorting and Searching:
a. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.
b. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.
c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
d. Write a C program that sorts the given array of integers using selection sort in descending order
e. Write a C program that sorts the given array of integers using insertion sort in ascending order
f. Write a C program that sorts a given array of names

TEXT BOOKS:
1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCE BOOKS:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

BASIC ELECTRICAL ENGINEERING LAB
(Course Code: 23EE109ES)

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: Basic 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, AC 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 of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RC circuit for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Verification of Superposition theorem

PART-B (any two experiments from the given list)
1. Torque-Speed Characteristics of a Three-phase Induction Motor.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents(Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand,2nd 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, 1stEdition, 2012.

4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd 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.

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, 5th Edition 2016.

REFERENCES:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, Jogn Wiley & Sons,2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th 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, 6th 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 ofvarious semiconductor devices.
3. Study the fundamental concepts related to the dielectric and magnetic materials.
4. Identify t h e importance of nanoscale, quantum confinement and various fabricationstechniques.
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 Quantummechanics and visualize the difference between conductor, semi conductor, and an insulatorby 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 Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diversefields.

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 filed (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, **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, **CO2 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.

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. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energ Conversionand 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.

Course Objectives: This course will enable the students to:

L	T	P/D	C
2	0	0	2

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 theoreticaland 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 writtencommunication.
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 invarious 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 BlackSwan, 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 BlackSwan, 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 BlackSwan, 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 BlackSwan, 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 BlackSwan 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

ELECTRONIC DEVICES AND CIRCUITS
(Course Code: 23EC205ES)

B.Tech. I Year II Sem.

L	T	P/D	C
2	0	0	2

Course Objectives:
1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices.

Course Outcomes: Upon completion of the Course, the students will be able to:

1. Acquire the knowledge of various electronic devices and their use on real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the role of special purpose devices and their applications.

UNIT - I
Diodes: Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

UNIT - II
Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, RPS, SMPS.
Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT - III
Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

UNIT - IV
Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, VoltAmpere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

UNIT – V
Special Purpose Devices: Zener Diode **-** Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

TEXT BOOKS:
1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

REFERENCE BOOKS:
1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5thEdition, Oxford.
2. ChinmoyS aha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge, 2018

PYTHON PROGRAMMING LABORATORY
(Course Code: 23CD206ES)

B.Tech. I Year II Sem.

L	T	P/D	C
0	1	2	2

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes:

CO 1: Design solutions to computational problems using Python programming
Language constructs.

CO 2: Write python programs to manipulate string objects.

CO 3: Use appropriate Data structures to organize and manipulate data items.

CO 4: Design modular application using python module & package concepts.

CO 5: Develop application to read and write from various file formats.

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	2	2							1
CO2	2	2	3	1	3							1
CO3	3	2	2	1	3							1
CO4	1	3	2	2	3							1
CO5		2	1	1	3							1

Note: The lab experiments will be like the following experiment examples

Week -1:

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator. 3.
   i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
3. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.

   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1

2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a Palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called is sorted that takes a list as a parameter and returns True if the list is sortedin ascending order and False otherwise.
2. Write a function called has duplicates that take a list and returns True if there is any element thatappears more than once. It should not modify the original list.
   i). Write a function called remove duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
   ii). The word list I provided, words.txt, doesn't contain single letter words. So you might want to add"I", "a", and the empty string.
   iii). Write a python code to read dictionary values from the user. Construct a function to invert itscontent. i.e., keys should be values and values should be keys.
3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
   ii) Remove the given word in all the places in a string?
   iii)Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints
   ii)Write a python program to perform addition of two square matrices
   iii)Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometricalshapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

   c. Write a function called draw point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

   d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.

3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.

2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

3. Write a Python code to Read text from a text file, find the word with most number of occurrences

4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.

2. Install NumPy package with pip and explore it.

3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

4. Write a program to implement Half Adder, Full Adder, and Parallel Adder

5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson Introduction to Python, Kenneth A. Lambert, Cengage

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

effectexperiments 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 resistivityof semiconductor materials.

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. Study the behavior of passive components.

Course Outcomes:

The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and

identifythe 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. Learn the characteristics of passive components like L, C and R and their
   applications.

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. V-I and L-I characteristics of light emitting diode (LED)

7. V-I Characteristics of solar cell

8. a) Determination of the wavelength of laser by using diffraction Gratting method

   b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.

9. Determination of Energy gap of a semiconductor.

10. RC Circuit: Growth and Decay.

11. Study B-H curve of a magnetic material.

12. Determination of dielectric constant of a given material.

13. 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 ChandPublishers, 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:

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

Course Outcomes: Students will be able to:

1. Understand the nuances of English language through audio- visual experience and groupactivities.
2. Neutralize their accent for intelligibility.
3. 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 LSRWskills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speechof 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 professionalcontexts
- 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 insentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern insentences – 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 andSeeking Permissions - Telephone Etiquette.

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

ICS Lab:
Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking andResponding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise IVCALL 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 followingspecifications:

      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 contentsof 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, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge UniversityPress.
- 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.* CengageLearning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* CambridgeUniversity Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford UniversityPress
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.* CambridgeUniversity Press.

IT WORKSHOP
(Course Code: 23CD209ES)

B.Tech. I Year II Sem.

L	T	P/D	C
0	0	2	1

Course Objectives:
The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools includingWord, Excel, PowerPoint and Publisher.

Course Outcomes:

CO1: Identify various hardware components of a system and their significances
CO2: Assemble and disassemble the computer.
CO3: Use various Microsoft tools for text processing, visual presentations, and number Crunching
CO4: Retrieve the information from Internet using web browsers.
CO5: Safeguard the system from external and internal threats.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2			1					1
CO2	3			2	2	1						1
CO3					3					2		2
CO4		2		2	3	1		1		2		2
CO5					3	3	2	2				3

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: **Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, book marks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphsand Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill,Formatting Text

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power point

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:
1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEYDreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware - A Handbook – Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion – Leslie Lamport, *PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinsonand Ken Quamme. – *CISCO Press, Pearson Education.*
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan– CISCO Press, *Pearson Education.*

Environmental Science
(Course Code: 23CH210BS)

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), 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: C**limate 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_2 Sequestration technology.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha forUniversity 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 LearningPrivate Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th 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.