UNIT I
2. Solid state chemistry: Radius ratio rule, Space lattice (only cubes), Type of unit cell, Bragg’s Law, Calculation of density of unit cell. One and Two Dimensional solids, Graphite as two dimensional solid and its conducting properties. Fullerene and its applications.

UNIT II
1. Basic principles, applications and uses of UV, IR, \(^1\)HNMR for the determination of structure of simple organic compounds.
2. Characteristics and classification of polymers.
3. Structures of the polymers: Natural and synthetic rubbers, Polyamides and polyester fibers, Polymethylmethacrylate, Polycrylonitrile and Polystyrene. A brief account of conducting polymers (polypyrrole and polythiophene) and their applications.

UNIT III
1. Stability of reaction intermediates, e.g. Carbanions, Carbocations and free radicals. Types of organic reactions, and mechanism of nucleophilic substitution reactions.
2. Mechanism of following reactions.
   (i) Aldol condensation (ii) Cannizzaro reaction (iii) Beckmann rearrangement (iv) Hofmann rearrangement and (v) Diels-Alder reaction.

UNIT IV
2. Phase Rule, its application to one component system (water).
3. Equilibrium potential, electrochemical cells (galvanic and concentration cells), Electrochemical theory of corrosion and protection of corrosion.

UNIT V
1. Classification of fuels, Coal, Biomass and Biogas. Determination of gross and net calorific values using Bomb Calorimeter.
3. Hardness of water, softening of water by Lime-Soda process, Zeolites and ion-exchange resins process and Reverse Osmosis. Treatment of boiler feed water by Calgon process.

REFERENCE BOOK:
1. Engineering Chemistry by Jain and Iain.
2. Engineering Chemistry by R. K. Agrawal
SYLLABUS OF ENVIRONMENTAL STUDIES
(ES-101)
(w.e.f. session 2015-2016)

Unit-I
Multidisciplinary nature of Environmental studies. Definition, Scope and Importance, Need for public awareness.

Natural resources:
Renewable and non-renewable resources:
Natural resources and associated problems.
  a. Forest Resources: Use and over exploitation, deforestation, case studies.
     Timber extraction, mining, dams and their effects on forests and tribal people.
  b. Water Resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.
  c. Mineral Resources: Use and exploitation, environmental effects of extracting and using minerals resources, case studies.
  d. Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Water-logging, Salinity, case studies.
  e. Energy Resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies.
  f. Land Resources: Land as a resource, Land degradation, Man induced landslides, Soil erosion and desertification.
     - Role of an individual in conservation of natural resources
     - Equitable use of resources for sustainable life styles.

Unit-II
Ecosystems
  • Concept of an Ecosystem.
  • Structure and Function of an Ecosystem.
  • Producer Consumer and decomposers.
  • Energy flow in the Ecosystem.
  • Ecological Succession.
  • Food chains, Food webs and Ecological Pyramids.
  • Introduction, types, characteristics features, structure and function of the following ecosystem:
    a- Forest Ecosystem
    b- Grassland Ecosystem
    c- Desert Ecosystem,
    d- Aquatic Ecosystem: (Ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III
Biodiversity and its conservation
  • Introduction - Definition: Genetic, Species and Ecosystem diversity.
  • Bio-Geographical classification of India,
• Value of Bio-diversity: Consumptive use, productive use, Social, ethical, aesthetic and option values
• Biodiversity at Global, National & Local levels.
• India as a Mega Diversity Nation.
• Hotspots of Biodiversity
• Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts
• Endangered and endemic species of India
• Conservation of Biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-IV
Environmental Pollution
Definition
• Causes, effects and control measures of
  a) Air Pollution
  b) Water Pollution
  c) Soil Pollution
  d) Marine Pollution
  e) Noise Pollution
  f) Thermal Pollution
  g) Nuclear Hazards
• Solid Waste Management: Causes, effects and control measures of urban and Industrial Wastes.
• Role of an Individual in prevention of pollution.
• Pollution case studies
• Disaster Management: floods, earthquake, cyclones and landslides.

Unit-V
Social Issues and the Environment
• From unsustainable development to sustainable development
• Urban problems related to Energy
• Water conservation, Rain water Harvesting, Watershed management
• Resettlement and Rehabilitation of people; its problems and concerns, case studies.
• Environmental ethics: issues and possible solutions
• Green house effect and global Warming, effects of acid Rain and their remedial measures and ozone Layer depletion.
• Wasteland reclamation,
• Consumerism and waste products

Human Population and the Environment
• Population growth variation among nations, Population Explosion, Family welfare programme,
• Environment and Human Health,
• Human Rights.
- Value education
- HIV/AIDS, Women and Child welfare
- Role of Information Technology in Environment and Human Health, Case studies.

**Suggested field work**
Visit to local area to document environment assets river/forest/grassland/hill/mountain, visit to local polluted site urban/rural/industrial/agricultural, study of common plants, insects, birds, study of simple ecosystems pond river, hill slopes etc.

**References:**
De A.K. Environmental chemistry Willey Eastern Limited.
Down to Earth, Centre for Science and Environment (R).
Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
Mhaskar A.K. Matter Hazardous, Techno Science Pub (TM)
Survey of the Environment, The Hindu (M).
Survey of the Environment, The Hindu (M).
Mathematics-I in Bioengineering
Subject Code: MT102
(Revised w.e.f. session 2015-2016)

Unit-I [8]
Algebra: Properties of determinants, solution of simultaneous equations by Cramer's rule.

Unit-II [8]
Set Theory, Solution of cubic equations: Sets and their representations, finite and infinite sets, subsets, empty set, universal set, complement of a set, difference of sets, Venn diagram, ordered pairs, Cartesian product. Solution of cubic equations by Cardon’s method.

Unit-III [8]

Unit-IV [8]
Analysis of plain geometry: Co-ordinate systems, distance between two points. Area of triangle. Locus of a point. Equation of straight line, slope and intercept form. General equation of first degree. Angle between two lines, equation of parallel and perpendicular lines to given lines. Distance between two parallel lines. Equation of second degree, Circle, Different forms of equation of circle, equation of chord of contact. Length of tangent circle.

Unit-V: [8]
Differential Calculus: Limits and functions, Definition of differential coefficients differentiation of standard functions, Function of function, parametric differentiation.
**Integral Calculus:** Integration as inverse of differentiation. Indefinite integrals of standard form, Integration by parts, Substitution and partial fractions form, evaluation of definite integrals.

**Reference Books:**

1. Mathematics: NCERT.
A. FUNDAMENTALS OF THERMODYNAMICS

Unit I

Fundamental Concepts and Definitions

Definition of thermodynamics, system, surrounding and universe, phase, concept of continuum, macroscopic & microscopic point of view. Density, specific volume, pressure, temperature. Thermodynamic equilibrium, property, state, path, process, cyclic process, Energy and its form, work and heat, Enthalpy.

Laws of thermodynamics

Zeroth law: Concepts of Temperature, zeroth law.

First law: First law of thermodynamics. Concept of processes, flow processes and control volume, Flow work, steady flow energy equation, Mechanical work in a steady flow of process.


Unit II

Properties of steam and thermodynamics cycles:

Properties of steam, use of property diagram, Steam-Tables, processes involving steam in closed and open systems. Rankine cycle.

B. MECHANICS AND STRENGTH OF MATERIALS

Unit III

Force system and Analysis


Friction: Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry friction-Belt Friction.
Unit IV
[9]
Structure Analysis, Beams: Introduction, Shear force and bending moment, Shear force and bending moment diagrams for statically determinate beams.
Trusses: Introduction, Simple Trusses, Determination of forces in simple truss members, methods of joints and method of section.

Unit V
[9]
**Simple stress and strain:** Introduction, Normal shear stresses, stress-strain diagrams for ductile and brittle materials, Elastic constants, one dimensional loading of members of varying cross sections, strain Energy.

**Compound stress and strains:** Introduction, state of plane stress, Principal stress and strain, Mohr’s stress circle.

**Pure Bending of Beams:** Introduction, Simple Bending theory, Stress in Beams of different cross sections.

**Torsion:** Introduction, Torsion of Shafts of circular section, Torque and Twist, Shear stress due to Torque.

Books recommended:

UNIT -1
Introduction to Computers: Generation of computers, Characteristic and classifications of computers.

Components of Computer: CPU, Various I/O Devices, Memory & its types, (Memory Hierarchy, Storage Media), Computer Software and their types, Operating System.

Computer Networks & Communication: LAN, MAN, WAN, Network Topologies, Modes of Data Communication.

Introduction to Internet and its Safeguard: Internet Addresses, Domain Name System, URL, Web Browsers Search Engines, Firewalls, Anti-Virus, Translators.

Algorithm and flowchart: Algorithm and flow chart characteristics, Sketching Flowcharts of various problems.

Unit 2
Starting C: Standard I/O in ‘C’, ‘C’ Fundamental, C Character set, Constants, Variables, Keywords and Identifiers, Data types, Declaration. Operators and Expressions, Conditional statements (If, If-else), Nesting of if- else statement, switch statement, The?: operator, goto statement.

Decision making and Looping (While, Do-While, for), Break and Continue statements, Case Control Structures (Switch), C programs based on above concepts.

Unit 3
Introduction to pointers: declaration and initialization of pointers, accessing the address of the variable, accessing the variable through the pointer, chain of pointers, pointers operators, pointer arithmetic

Introduction to Functions: Need of “C” function, User Defined and Library Functions, Prototype of Function, Call by Value; Call by Reference; Nesting of Functions, Recursion. Pointers with function, C program based on above concept

Unit 4
Array: Concept of One Dimensional and Multi Dimensional arrays, Declaration, Operations: insert, delete, search, traverse, and merge, matrix operations, Sorting: Bubble
sort, merge sort, insertion sort.

**Character array and strings**: declaring and initializing strings variable, reading and writing a character, reading and writing strings from terminal, Arithmetic operations on characters, string handling functions. Application of pointers, and function on array. **C program based on above concept** [10]

**Unit 5**

**Structures**: Defining Structure, Declaration of Structure Variable, Accessing Structure members, copying and comparing structure variable, operation on individual member, nesting of structures, Array of structures. Application of pointers and function on Structures.

**Union** Defining Union Declaration of Union, difference between structure and Union,

**Introduction of Static and Dynamic memory allocation** - The process of Dynamic memory allocation, **C program based on above concept.** [08]

**References:**

1. Foundation of Information Technology by ‘D.S. Yadav’- New age International
5. Pointer s in C by ‘Yashwant Kanitkar’
CHEMISTRY LAB
CH-102
(w.e.f. session 2015-2016)

List of Experiments

1. To determine the Iron content in the given iron ore by using external indicator.
2. To determine the Alkalinity in the given water sample
3. To determine the Chloride content in the given water sample by Mohr’s method. (Argentometric method)
4. To determine the Percentage of Available Chlorine in the given sample of Bleaching powder iodometrically.
5. To determine the temporary and permanent hardness in water sample by Complexometric titration using EDTA as standard solution.
6. To determine the Equivalent weight of Iron by Chemical Displacement method. (The Equivalent weight of Copper is 63.5 )
7. To determine the strength of given HCl solution by titrating it against NaOH solution using pH meter.
8. To determine the iron concentration in the given water sample by Spectrophotometer using potassium thiocyanate as colour developing agent.
9. To detect the presence of functional groups in the given organic compound.
10. To detect the presence of Elements in the given organic compound.
1. Programs based on basic concepts of C. (e.g. Addition, Subtraction, Multiplications, Swapping of numbers, Conversions, area calculation, interest calculation…etc)

2. Programs based on Conditional statement.

3. Programs based on loop Conditions (FOR, WHILE, DO-WHILE).

4. Programs based on Single & Two dimensional Array (Insertion, deletion, Multiplication, searching, etc...).

5. Programs based on Pointers.

6. Programs based on Function call (Call by value and call by reference).

7. Programs based on recursion.

8. Programs based on Strings and its operations.

9. Programs based on Structures and its operations.

10. Programs based on Miscellaneous Concepts.
1. **Introduction**  
   Difference between Introduction and Description, SWOT Analysis

2. **Software – I**  
   Listening exercises, Pronunciation improvement through self-testing, Vocabulary improvement through word games

3. **Software – II**  
   Conversational skills, Exercises based on Language Skills/ Small talk, Cultural movies

4. **Phonetic Alphabet and Phonetic Transcriptions**

5. **Intonation and Stress**

1. **Framing Questions**  
   Yes/ No questions, Wh- questions, Question tags, Rhetorical questions

2. **Group Discussion and Group Presentation**  
   (theory and practice sessions, visual aids)

3. **Situational Conversation**  
   Social language, Emergency situation, Seeking help, Inquiries, Communicating bad news

4. **Negotiation**  
   Common fears about negotiations, Building Momentum, Bargaining with more powerful opponents, Opening Tactics, Countering your opponents’ moves

5. **Mock Interview Sessions**
Books Recommended: