1.Chemistry

2. Mathematics-1(Calculus and Linear Algrbra)

3. Programming for Problem Solving(PPS)

4. Workshop Manufacturing practice

5. English

CSE
First Semester

CHEMISTRY

Module-1

Atomic and Molecular Structure(10 Lectures)

Atomic structure and its properties at atomic and sub-atomic level, Failure of classical theories to explain properties of particles, Molecular orbitals of diatomic molecules and graphs of multicentre orbitals, Principal for combination of atomic orbita;s to form molecular orbitals, Schodinger equation, Photoelectric effect and Heisenberg uncertainty principle, Dual nature of electromagnetic radiation, Planks theory, Band structure, Electromagnetic radiation, Crystal field theory and the energy level diagram for transition metals ions and their magnetic properties.

Module-2

Spectroscopic Technique and its Applications (8 Lectures)

Principal of vibrational and rotational spectroscopy and selection rules for application in diatomic molecules, Elementary idea for elecctronic spectroscopy. UV-VIS Spectroscopy with related rules and its applications. Fluorescence and its application in medicines. Basic principle of Nuclear magnetic resonance and its applications. Basics of magnetic resonance imaging.

Module-3

Intermolecular forces and properties of Gases (4 Lectures)

Ionic, Dipolar and Vanderwalls interactions. Equations of stste of ideal and real gases, Deviation from ideal behaviour. Vanderwalls Gas Equation.

Module-4

Use of free energy in chemical equilibriya and water chemistry (8 Lecture)

Thermodynamics functions: Energy, Enthalpy,Free energy. Equation to interrelate thermodynamics properties. Free Energy, EMF, and Cell potentials, The Nearst equation and its applications, Corrosion, Use of free energy considerations in metallurgy through ellingham diagrams. Solubility equilibria. Water chemistry hard and soft water, Parameretrs of quality of water to be used in different industries as for drinking water. Calculations of hardness of water in all units. Estimation of hardness using EDTA and Alkalinity methode. Removal of hardness by Sodalime and ion exchange methode including Zeolite Methode.

Module-5

Periodic properties (4 Lectures)

Effective Nuclear charge, Penetration of orbitals, Vibrations of s,p,d,and f orbitals energies of atom in the periodic table. Electronic configuration, Atomic and ionic size, Ionization energies,Polarisation,Acid,Base,Principal of HSAB theory, Oxidation states, Hybridisation and Moecular geometry.

Module-6

Stereochemistry (4 Lectures)

Representation of 3-D structures, Structural Isomersand stereoisomers, Diastereomers,Optical activity, Configuration and symmetry and chirality,enantiomers,Absolute configurations and confirmational analysis.

Module-7

Organic reactions and synthesis of drugs moleculed (4 lectures)

Introduction to intermediates and reaction involving substitution, Addition, Elimination, Oxidation-Reductions. Diels Elders cuclization and epoxide ring opening reactiion. Synthesis of a commonly used drug molecules like Aspirin.

Practicals:

Choose any 10-12 experiments from below

1. Determination of surface tension and viscosity.
2. Thin layer chromatography.
3. Ion Exchange column for removal of hardness of water.

4. Determination of chloride component of water.

5. Colligative properties using freezing point depression.

6. Determination of rate constant of reaction.

7. Determination of cell constant and conductance of solution.

8. Potentiomerty-Determination of redox potential and Emfs.

9. synthesis of a polymer/drug.

10. Saponication/ acid value of oil.

10. Chemical analysis of a salt.

11. Lattice structure and packing of spheres.

12. Model of potential Energy surface.

13. Chemical oscillations-Iodine clock reaction.

14. Adsorption of acetic acid by charcoal.

15. Use of capillary viscisimeter to the demonstrate of the iso electric point as the PH of minimum viscosity.

MATHEMATICS-1 (Calculus and Linear Algebra)

Module-1

Calculus-I (6 Lectures)

Evolutes and involutes, Evaluation of definite and improper integrals, Beta and Gama functions anf their properties, Application of definite integrals to evaluate surface area and volume of revolutions.

Module-2

Calculus-II(6 Lectures)

Rolles theorem, Mean value theorem, Taylor and Maclaurin theorems with remainders, Intermediate forms and L-hospital rules, Maxima and Minima.

Module-3

Sequence and Series (10 Lectures)

Convergence of sequence and series,Test for convergence, Power series, Taylor series, Series for Exponential, Trigonomertic and logarithmic functions, Fourier series: Half range sine and cosine series, Parsevals theorem.

Module-4

Multivariable Calculus (Differentiation)(8 Lectures)

Limit continuty and partial Derivatives, Directional Derivatives, Total Derivatives, Tangent plane and Normal line, Maxima minima and saddle points, Methode of Lagrangemultipliers, Gradient, Curl, and Divergence.

Module-5
Matrices & Determinants (10 Lectures)

Inverse and rank of matrix, Rank-Nullity theorem, System of linear equations,Symmetric, Skew-symmertic and Orthogonal matrices. Determinants: Cayley Hamilton theorem and orthogonal transformation.

PROGRAMMING FOR PROBLEM SOLVING(PPS)

Module-1
Introduction to Programming (6 Lectures)

Introduction to components of a computer system (Disks, Memory, Processor, where a program is stored and executed, Operating system, Compilers etc). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: flowchart/pseudo code with examples. from algorithms to programs; source code, variables (with data types) variables and memory locations, type casting/type conversion, run time environment (Static, Dynamic location), Storage classes (auto, Register, static, extern), syntax and logical errors in compilation, object and executable code

Module-2
Operators & Conditional branching and loops (7 Lectures)

Arithmetic expressions/Arithmetic operators/Relational operators/Logical operators/Bitwise operators and Precedence
Writing and evaluation of Conditionals and consequent branching, Iteration and loops.

Module-3
Arrays (4 Lectures)

Array declaration and Initialisation, Bound checking arrays (1-D, 2-D), character array and Strings.

Module-4
Basic Algorithms (6 Lectures)

Searching (Linear search, Binary search etc.), Basic Sorting Algorithms (Bubble, Insertion and Selection), finding roots of equations, Notion of order of complexity through example programs (no formal definition required)

Module-5
Function (4 Lectures)

Introduction and writing functions, Scope of variables functions (Including using fault in libraries) Parameter passing in functions, Call by values, assing arrays to functios: Idea of call by reference.

Module-6
Recursion (5 Lectures)

Recursion, as a different way of solving problems. Example programs, such as finding Factorial, Fibonacci series, Reverse a string using recursion, and GCD of two numbers, Ackerman function etc. Quick sort or Merge sort.

Module-7
Structure/Union (3 Lectures)

Structures, Accessing structure elements, Way of storage of structure elements, Defining structures and arrays of structures, Basic definition of Union, Comparison B/W Structure & Union with examples.

Module-8
Pointers (5 Lectures)

Idea of pointers, Defining pointers, Use of pointers in self-referential structures, Notion of linked list (no implementation), Pointer to pointer, Pointer to array, Pointer to strings, Array of pointer, Pointer to function, Pointer to structure.

Module-9
File Handling

(Only If time is available, Otherwise should be done as part of the LAB)

LAB :

Problem solving using computers

1. Familirisation with programming Environment.
2. Variable types and type conversions (Simple computational problems using arithematics expression).
3. Branching and Logical Expression (Problem involving IF-THEN-ELSE structure).
4. Loops, While, Do-While and For loops (Iterative problems e.g. Sum of series).
5. Arrays: Searching, sorting (1-D array manipulations).
6. 2-D Array and Strings (matrix problem, stringg operations).
7. Functions, Call by value : (Simple function).
8. Programming for solving numerical methode problems (e.g. root finding).
9. Recursion, Structure of recursive calls (Recursive functions).
10. Saponication/ acid value of oil.
10. Pointers, structures and dynamic Memory allocation.
11. File handling (File Operations).

WORKSHOP MANUFACTURING PRACTICE(WMP)

Module-1

Lectures ans videos(10 Lectures)

1. Manufacturing methods- Casting, Forming, Machining, Joining Advanced manufacturing methods.
2. CNC Machining, Additive Manufacturing.
3. Fitting Operations and Power tools.
4. Carpentary
5. Plastic Moulding, Glass cutting.
6. Metal Casting
7. Welding (Arc welding and Gas welding Brazing, soldering)

Module-2

Workshop Practice (60 hours)

1. Machine shop and Fitting shop(18 hrs)
2. Carpentary(6 hrs)
3. Welding shop (Arc welding + Gas welding)(8 hrs)
4. Casting and smithy(6 hrs)
5. Plastic Moulding and Glass cutting(6 hrs)
6. 3-Printing of different models (8 hrs)

Module-1

Vocabulary Building

A. Acquantance with prefixes and suffixes from foreign languages in English to from derivatives.

B. Root words from foreign languages and their use in English.

C. A concept of word formation

D. Synonyms, Antonyms and standard abbreviations.

E. Affixes, Acronyms

Module-2

Basic writing skills

A. Use of Tense, Use in context and coherenceof tensein writing.

B. Use of phrases and Clauses in sentences.

C. Importance og proper Punctuation.

D. Kinds of sentences.

E. Sentence Structures.

F. Use of voice-Active /Passive in sentences.

G. Use of speech-Direct and Indirect speech.

H. Framing questions- Direct,Using modal verbs.

Module-3

Identifying common Errors in writing

A. Subject-Verb agreement.

B. Noun-Pronoun agreement.

C. Misplaced modifiers

D. Articles

E. Prepositions, Redundancies,Cliches.

F. Common english errors

Module-4

Nature and style of sensible writing

A. Describing

B. Defining

C. Classifying

D. Providing examples or evidence

E. Writing introduction and conclusion

F. Organising principle of paragraphs in documents

G. Argument, Describing/ Narrating/ Planning,Defining,Classifying

H. Lexical resources, using suitabble language register.

I. Coherence, writing introduction,

body and conclusion techniques for writing precisely,grammar and accuracy.

Module-5

Writing practices

A. Formal letter writing/application/Report writing/writing minutes of meetings

B. Comprehension

C. Essay writing

D. Formal Email writing

E. Resume/ CV writing /Cover letter

F. Statement of purpose

Module-6

Oral communication

(This unit involves interactive practices in language Lab.)

A. Listening Comprehension

B. Pronounciation, Intonation, Stress and Rythm.

C. Common everyday situations: Conversations and Dialogues.

D. Communication at workplace.

E. Interviews

F. Formal presentations

G. Acquanting students with IPA symbols

H. Phonetics(Basic)

I. Sounds- Vowels, Consonants

J. Clearingmother tongue influence

K. Clearing redundancies and common errors related to indianism.

L. Group discussion M.Expressing opinions

M. Coherence and Fluency in speech.

Module-7

Reading skills

A. Reading comprehension

B. Paragraph reading based on phonetic sounds / Innotation

PROFESSIONAL SKILLS

A. Team Building

B. Soft skill and entiquettes

ACQUANTANCE WITH TECHNOLOGY-AIDED LANGUAGE LEARNING
A. Use of computer softwares (Grammarly Ginger………)
B. Use of smartphone applications (Duolingo, Bussu……)

Module-8

Activities

A. Narrative chain
B. Describing / Narrating
C. Writing essay in relay
D. Peer / Group activities
E. Brain storming vocabulary
F. Debates