

THIRUVALLUVAR UNIVERSITY SERKKADU, VELLORE-632115

FIVE- YEAR INTEGRATED PROGRAMME M.SC APPLIED CHEMISTRY

SYLLABUS (University Department)

FROM THE ACADEMIC YEAR 2024 – 2025

ABOUT THE DEPARTMENT

The department of chemistry was established in 2002 as post-graduate and research department. The full-fledged department was started during academic year 2010-11. The department is offering the M.Sc., and Ph.D courses. The department consists of 5 faculty members, 1 administrative staff, 32 research scholars and 52 PG students. The faculty members have been working on the modern and thrust areas in chemistry with financial support from various national funding agencies such as DST, DRDO, BRNS, UGC etc., and continued to publish quality research papers in both national and international journals.

VISION AND MISSION

Statement of Vision

Chemistry provides immense scope for study, research and gainful employment in various sectors. The Department of Chemistry of Thiruvalluvar University is determined to educate and graduate rural students. The department is committed to prepare, compete in and contribute to the needs of modern chemical science based industries and academia. To achieve this vision, the department is dedicated to provide a course of study for post-graduate in chemistry which combines curriculum and research oriented project that are high-quality, innovative and intellectually challenging.

Statement of Mission

The mission of the Department of Chemistry of Thiruvalluvar University is to advance the chemical sciences through the education of post-graduate students in rural society by providing them with quality classroom learning and research opportunities. The department is committed to impart a high standard for excellence in all branches of chemistry by innovative and dedicated teaching at post-graduate level to produce students with good knowledge in chemistry.

THIRUVALLUVAR UNIVERSITY

Department of Chemistry

M.Sc., Chemistry (University Department)
UNDER CBCS (With effect from 2024-25)

The course of study and scheme of examinations

- 1. TITLE: M.Sc., Applied Chemistry (5yr Integrated)
- 2. YEAR OF IMPLIMENTATION: July 2024 onwards
- **3. COURSE DETAILS:** (duration of the course: **5** years)

Total No. of Semesters – 10

No. of theory papers per semester - 05/07

Total No. of theory papers - 56 (38 core papers+10 Elective

papers+2 Value added course + 4 Skill based papers + 2 Non Major

elective papers

No. of practical courses per semester – 02/03

Total No. of Practical – 16

Project – 10th semester

Total Marks for M.Sc. Degree

Theory - 4600 marks
Practicals - 1600 marks
Project - 100 marks

Total - 6300marks

4. PREAMBLE OF THE SYLLABUS:

Master of Science (M.Sc.) in Chemistry is a Integrated post graduation course of Thiruvalluvar University. The curriculum is prepared by following the prospectus of various national and international universities. The board of studies of M.Sc., Chemistry is framed the syllabus by covering the broad areas and fundamental aspects in modern chemistry.

The syllabi are all set to meet the standard of CSIR-UGC-NET, GATE and SLET examinations. The credit system to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The students pursuing this course would have to develop indepth understanding of various aspects of chemistry. The conceptual understanding, development of experimental skills, designing and implementation of novel synthetic methods, developing the aptitude for academic and professional skills, acquiring basic concepts for structural elucidation with hyphenated techniques, understanding the fundamental biological processes and rationale towards computer. The project introduced the curriculum will motivate the students to pursue the research and find a job in reputed pharmaceutical and other industries including abroad.

THIRUVALLUVAR UNIVERSITY MASTER OF SCIENCE

5yr Integrated M.Sc. APPLIED CHEMISTRY UNDER CBCS With effect from 2024-2025

The Course of Study and the Scheme of Examinations

Template for Curriculum Design for 5 Year Programme in Chemistry Credit Distribution for 5 Year Programme in Chemistry

First Year

Semester-I

| Part | List of Courses | | Hours |
|----------|---|--------|------------------------|
| | | Credit | per week (L/T/P) |
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 4 |
| Part-III | General Chemistry–I CC1 | 5 | 5 |
| | Quantitative Inorganic estimation (titrimetry) and Inorganic Preparations CC2 | 2 | 3 |
| | Mathematics (or)Botany /Zoology EC1 | 4 | 6 |
| | Skill Enhancement Course SEC-1 (NonMajor Elective) | 2 | 2 |
| Part-IV | Foundation Course FC | 2 | 2 |
| | Ability Enhancement Compulsory Course(AECC) Soft Skill-1 | 2 | 2 |
| | | 23 | 30 |

Semester-II

| Part | | Credit | Hours per week (L/T/P) |
|----------|---|--------|---------------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 4 |
| Part-III | General Chemistry–II CC3 | 5 | 5 |
| | Qualitative Organic Analysis and preparation of Organic Compounds CC4 | 2 | 3 |

| | Mathematics (or)Botany /Zoology EC 2 | 4 | 6 |
|---------|--|----|----|
| | | | |
| | Skill Enhancement Course SEC-2 (NME) | 2 | 2 |
| Part-IV | Skill Enhancement Course SEC-3 (Discipline Specific) | 2 | 2 |
| | Cosmetics and Personal care Products | | |
| | Ability Enhancement Compulsory Course(AECC) Soft | 2 | 2 |
| | Skill-2 | | |
| | | 23 | 30 |

Second Year Semester-III

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|----------|---|--------|---------------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 4 |
| Part-III | General Chemistry–III CC5 | 5 | 5 |
| | Qualitative Inorganic AnalysisCC6 | 2 | 4 |
| | Physics EC 3 | 4 | 5 |
| Part-IV | Skill Enhancement Course SEC-4: Entrepreneurial skills in Chemistry | 1 | 1 |
| | Skill Enhancement Course SEC-5: (Discipline Specific) Pesticide Chemistry | 2 | 2 |
| | Ability Enhancement Compulsory Course(AECC) Soft Skill-3 | 2 | 2 |
| | EVS | | 1 |
| | | 22 | 30 |

Semester-IV

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|----------|--|--------|------------------------------|
| Part-I | Language | 3 | 6 |
| Part-II | English | 3 | 4 |
| Part-III | General Chemistry–IV CC7 | 4 | 4 |
| | Physical Chemistry Practical- I CC8 | 3 | 3 |
| | Physics EC 4 | 4 | 5 |
| Part-IV | Skill Enhancement Course SEC-6: Instrumental methods of Chemical Analysis (Theory) | 2 | 2 |
| | Skill Enhancement Course SEC-7: (Discipline Specific) Forensic Science | 2 | 2 |

| Ability Enhancement Compulsory Course(AECC) Soft Skill-4 | 2 | 2 |
|--|----|----|
| EVS | 2 | 2 |
| | 25 | 30 |

Third Year Semester V

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|----------|--|--------|------------------------------|
| Part-III | Organic Chemistry -I CC9 | 4 | 5 |
| | Inorganic Chemistry - I CC10 | 4 | 4 |
| | Physical Chemistry -I CC11 | 4 | 5 |
| | Biochemistry EC5 | 3 | 4 |
| | Industrial Chemistry EC 6 | 3 | 4 |
| | Project with viva-voce CC12 | 4 | 4 |
| Part IV | Value Education | 2 | 2 |
| | Internship / Industrial Visit / Field Visit(Carried out in II Year Summer vacation) (30 hours) | 2 | 2 |
| | | 26 | 30 |

Semester VI

| Part | List of Courses | Credit | Hours per week (L/T/P |
|----------|---|--------|-----------------------------|
| Part-III | Organic Chemistry -II CC13 | 3 | 5 |
| | Inorganic Chemistry - II CC14 | 3 | 4 |
| | Physical Chemistry -II CC15 | 4 | 5 |
| | Physical Chemistry Practical II CC16 | 2 | 3 |
| | EC7 Fundamentals of Spectroscopy | 3 | 5 |
| | EC 8Nanoscience/Polymer science/ Pharmaceutical Chemistry (Elective based) | 3 | 4 |
| Part IV | Professional Competency Skill | 2 | 4 |
| Part V | Extension Activity | 1 | - |
| | | 21 | 30 |

Fourth Year

Semester-VII

| | | | Credit | Hours per |
|--------|--|-------|--------|--------------|
| Part | List of Courses | | | week (L/T/P) |
| Part A | CC1 – Organic Reaction Mechanism-I | | 4 | 5(4L + 1T) |
| | CC2 – Structure and Bonding in Inorganic Compounds | | 4 | 5(4L + 1T) |
| | CC3 – Organic Chemistry Practical | | 4 | 5(4L + 1T) |
| | Elective I (Generic / Discipline Specific) (One from Group A) | | 3 | 5(4L + 1T) |
| | Pharmaceutical Chemistry/Nanomaterials and Nanotechnology | | | |
| | Elective II (Generic / Discipline Specific) (One from Group B) | | 3 | 5(4L + 1T) |
| | Electrochemistry/Molecular Spectroscopy | | | |
| Part B | Ability Enhancement Compulsory Course (AECC 1) Soft Skill-1 | | 2 | 2 |
| | Skill Enhancement Course -SEC 1 (One from Group G) | | 2 | 3 |
| | 7 | Total | 22 | 30 |

Semester-VIII

| | | Credit | Hours per |
|--------|---|--------|-------------|
| Part | List of Courses | | week(L/T/P) |
| Part A | CC4 – Organic reaction mechanism-II | 4 | 5(4L + 1T) |
| | CC5 – Physical Chemistry-I | 4 | 5(4L + 1T) |
| | CC6 – Inorganic Chemistry Practical | 4 | 5(4L + 1T) |
| | Elective III (Generic / Discipline Specific) (One from Group C) | 3 | 5(4L + 1T) |
| | Medicinal Chemistry/Green Chemistry | | |
| | Elective-IV (Computer / IT related) (One from Group D) | 3 | 5 (3L+ 2 P) |
| | Bio Inorganic Chemistry/Material Science | | |
| Part B | Skill Enhancement Course -SEC 2 (One from Group G) | 2 | 3 |
| | Ability Enhancement Compulsory Course (AECC 2) Soft Skill-2 | 2 | 2 |
| | Total | 22 | 30 |

Fifth Year

Semester-IX

| Part | List of Courses | Credit | Hours per week(L/T/P) |
|--------|--|--------|--------------------------|
| Part A | CC7 – Organic synthesis and Photochemistry | 4 | 5(4L + 1T) |
| | CC8 – Coordination Chemistry-I | 4 | 5(4L + 1T) |
| | CC9 – Physical Chemistry Practical | 4 | 5(4L + 1T) |
| | Elective V (Generic / Discipline Specific) (One from Group E) | 3 | 5(4L + 1T) |
| | Pharmacognosy and Phytochemistry | | |
| | Core Industry Module | 3 | 5(4L + 1T) |
| Part B | Internship / Industrial Activity (Carried out in Summer Vacation at the end of I year – 30 hours) | 2 | |
| | Skill Enhancement Course -SEC 3: Professional Communication Skill -Term paper & Seminar presentation | 2 | 3 |
| | Ability Enhancement Compulsory Course (AECC 3) Soft Skill-3 | 2 | 2 |
| | Total | 24 | 30 |

Semester-X

| Part | List of Courses | Credit | Hours per week (L/T/P) |
|--------|---|--------|---------------------------|
| Part A | CC10-Coordination Chemistry-II | 4 | 5(4L + 1T) |
| | CC11- Physical Chemistry-II | 4 | 5(4L + 1T) |
| | CC12 – Analytical Instrumentation technique Practicals | 4 | 5(4L + 1T) |
| | Elective VI (Generic / Discipline Specific) (One from Group F) Chemistry of Natural products/Polymer Chemistry | 3 | 5(4L + 1T) |
| | Core Project with viva voce | 3 | 4 |
| Part B | Professional Competency Skill Enhancement Course Training for Competitive Examinations Chemistry for NET / UGC - CSIR/ SET / TRB Competitive Examinations (2 hours) General Studies for UPSC / TNPSC / Other Competitive Examinations (2 hours) OR Chemistry for Advanced Research Studies (4 hours) | 2 | 4 |
| | Ability Enhancement Compulsory Course (AECC 4) Soft Skill-4 | 2 | 2 |
| Part C | Extension Activity | 1 | |
| | Total | 23 | 30 |

TOTAL CREDITS: 231

Credit Distribution for UG Programme in Chemistry

| Sem I | Cr | Sem II | C | Sem III | Cr | Sem | Cr | | | Sem | | Sem VII | | rSem VIII | C | Sem IX | | Sem X | Cr |
|-----------------|---------|-----------------|---------|------------------|----------|---------------|---------|-------------|----------|-------------|---------|------------|----------|--------------|----------|-----------------|----------|-------------------|-----|
| Sem 1 | | Sem II | | Sem III | | IV | | Sem v | | VI | | Sem vm | - 1 | | | Sem IX | | | e |
| | e di | | e di | | e dit | | e di | | e dit | | e di | | e dit | | e dit | | e dit | | dit |
| | t | | t | | uit | | t | | uit | | t | | an | | uit | | uit | | un |
| 1.1. Languag | 3 | 2.1. Languag | 3 | 3.1. Language | 3 | 4.1. Langu | 3 | 5.1 Core | 4 | 6.1 Core | 4 | 7.1 Core I | 4 | Core IV | 4 | Core VII | 4 | Core X | 4 |
| e | | e | | Zungunge | | age | | Cours | | Cours | | | | | | | | | |
| | | - | | | | 8- | | e – | | e –CC | | | | | | | | | |
| | | | | | | | | \CC IX | | XIII | | | | | | | | | |
| 1.2 | 3 | 2.2 | 3 | 3.2 | 3 | 4.2 | 3 | 5.2 | 4 | 6.2 | 4 | Core II | 4 | Core V | 4 | | 4 | Core XI | 4 |
| English | 5 | English | | English | , | English | 1 - | Core | • | Core | | Core ii | ' | Core v | ' | Core VIII | ' | 0010711 | ľ |
| Liigiisii | | Liigiisii | | Liigiisii | | Liigiisii | | Cours | | Course | | | | | | Core viii | | | |
| | | | | | | | | e – | | _ | | | | | | | | | |
| | | | | | | | | CC X | | CC | | | | | | | | | |
| | | | | | | | | 0071 | | XIV | | | | | | | | | |
| 1.3 | 4 | 2.3 | 4 | 3.3 | 4 | 4.3 | 4 | 5. | 4 | 6.3 | 4 | Core III | 4 | | 4 | Core IX | 4 | Core XII | 4 |
| Core | | Core | | Core | | Core | | 3.Cor | | Core | | | | Core VI | | | | | |
| Cours | | Cours | | Cours | | Cours | | e | | Cours | | | | | | | | | |
| e –CC | | e –CC | | e – | | e –CC | | Cour | | e –CC | | | | | | | | | |
| I | | III | | CC V | | VII | | se | | XV | | | | | | | | | |
| | | | | | | Core | | CC - | | | | | | | | | | | |
| | | | | | | Indust | | XI | | | | | | | | | | | |
| | | | | | | ry | | | | | | | | | | | | | |
| | | | | | | Module | | | | | | | | | | | | | |
| 1.4 | 4 | 2.4 | 4 | 3.4 | 4 | 4.4 | 4 | 5. | 4 | 6.4 | 3 | Elective I | 3 | Elective III | 3 | Elective / ED V | 3 | Project with viva | .3 |
| Core | | Core | | Core | | Core | | 3.Core | | Electiv | | | | | | | | voce XIII | |
| Cours | | Cours | | Cours | | Cours | | Cours | | e | | | | | | | | | |
| e –CC | | e –CC | | e – | | e –CC | | e – | | -VII | | | | | | | | | |
| II | | IV | | CC | | VIII | | / | | Generi | | | | | | | | | |
| | | | | VI | | | | Projec | | c/ | | | | | | | | | |
| | | | | | | | | twith | | Discip | | | | | | | | | |
| | | | | | | | | viva- | | li ne | | | | | | | | | |
| | | | | | | | | voce | | Specif | | | | | | | | | |
| | | | | | | | | CC - | | ic | | | | | | | | | |
| | | | | | | | | XII | | | | | | | | | | | |

| 1.5 Elective I Generic/ Discipline Specific | 3 | 2.5 Elective II Generic / Discipli ne Specifi c | 3 | 3.5 Elective III Generic/ Discipli ne Specific | 3 | 4.5 Electi veIV Gener ic/ Discip line Specif ic | 3 | 5.4 Electi veV Generi c/ Discip li ne Specif ic | 3 | 6.5 Electi ve VIII Generi c/ Discip li ne Specifi c | 3 | Elective II | 3 | Elective IV | 3 | Core Industry Module | 3 | Elective VI 3 |
|--|---|---|---|---|---|---|---|--|---|---|---|---------------------------------------|---|---|---|---|---|--|
| 1.6 Skill Enhanc ement Course SEC-1 (NME) | 2 | 2.6 Skill Enhanc ement Course SEC-2 (NME) | 2 | 3.6 Skill Enhanc ement Course SEC-4, (Entrepr eneurial Skill) | 1 | 4.6 Skill Enhan ce ment Cours e SEC-6 | 2 | 5.5 Electi veVI Generi c/ Discip li ne Specifi c | 3 | 6.6 Extens ion Activi ty | 1 | Skill Enhancement Course -SEC 1 | 2 | Skill Enhance ment Course -SEC 2 | 2 | Skill based (Term paper and Seminar) | 2 | Skill 2 Enhance ment Course -SEC 4 |
| | | 2.7 Skill Enhanc ement Course –SEC-3 | 2 | 3.7 Skill Enhanc ement Course SEC-5 | 2 | 4.7 Skill Enhan ce ment Cours e SEC-7 | 2 | 5.6 Value Educat ion | 2 | 6.7 Profes si onal Comp ete ncy Skill | 2 | Ability Enhance ment Course (AECC 1) | 2 | Ability Enhance ment Course (AECC 2) | 2 | Ability Enhance ment Course (AECC 3) | 2 | Ability 2 Enhance ment Course (AECC4) |
| 1.7Abil ity Enhance ment Compul sory Course (AECC) Soft Skill-1 | 2 | 2.8 Ability Enhanc ement Compul sory Course (AECC) Soft Skill-2 | 2 | 3.7 Ability Enhance m ent Compul sory Course (AECC) Soft Skill-3 | 2 | 4.7 7Abili ty Enhan ce ment Comp ulsory Cours e (AEC | 2 | 5.5 Summ er Intern ship /Indus trial Traini ng | 2 | | | | | | | Internship / Industrial - Vacation Activity | 2 | Extension 1 Activity |

| | | | | | | C) Soft Skil I-4 | | | | | | | | | |
|---|------|-----|-----|--------------|-----|---------------------------|-----|--------|---|----|----|-----|----|----|---|
| 1.8 Skill Enhance ment - (Foundati o n Course) | 2 | | | 3.8 E.V.S | - | 4.8 E.V.S | 2 | | | | | | | | |
| | 2 3 | | 2 3 | | 2 2 | | 2 5 | 2 6 | 2 | 22 | 22 | | 24 | 2: | 3 |
| | Poir | nts | | Total Cred | | | 13 | | - | | | 231 | | | |

Consolidated Semester wise and Component wise Credit distribution

| Pa rts | S e m I | Se m II | Se m III | Sem IV | Sem V | S e m V I | Sem VII | Sem VIII | Sem IX | Sem X | Total Credit s |
|-------------|------------------|---------------|----------------|-----------|----------|-----------------------|------------|-------------|-----------|----------|----------------------|
| Part I | 3 | 3 | 3 | 3 | - | - | 12 | 12 | 12 | 12 | 60 |
| Part II | 3 | 3 | 3 | 3 | - | - | 6 | 6 | 6 | 6 | 36 |
| Part III | 1 1 | 11 | 11 | 11 | 22 | 1 8 | 4 | 4 | 4 | 4 | 100 |
| Part IV | 6 | 6 | 5 | 8 | 4 | 2 | | | 2 | 1 | 34 |
| Part V | - | - | - | - | - | 1 | | | | | 1 |
| Total | 2 3 | 23 | 22 | 25 | 26 | 2 1 | 22 | 22 | 24 | 23 | 231 |

*Part I. II , and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree

Syllabus for different Courses of 5 year Chemistry

| Title of the | | | G | ENERAL | СН | EMISTRY-I | |
|----------------|---|--|--|--|----------------------------------|---|--|
| Course | | | | | | | |
| Paper No. | Core I | | | | | | |
| Category | Core | Year | I | Credits | 5 | Course | |
| | | Semester | I | 1 | | Code | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | |
| hours per week | 4 | 1 | - | | | 5 | |
| Prerequisites | Higher sec | ondary cher | mistr | y | | • | |
| Objectives of | The course | e aims at giv | ing a | ın overall v | iew | of the | |
| the course | • various | s atomic mo | dels | and atomic | stru | icture | |
| | • wave p | article dual | ity of | f matter | | | |
| | | ic table, per cal behaviou | | ity in prope | erties | s and its applica | ation in explaining the |
| | • nature | of chemical | bone | ding, and | | | |
| | • fundan | nental conce | epts c | of organic of | hem | nistry | |
| | | | | | | | |
| Course Outline | UNIT I | | | | | | |
| | Atomic st | ructure and | l Per | riodic tren | ds | | |
| | number, A Bohr's me spectrum; Broglie Uncertaint rule, Pauli | tomic Spec odel of ato Photoelectr wavelength | tra; I om;Tl ic et -Dav Elec rincij | Black-Body he Franck ffect, Com isson an etronic Cor ple and Au | Rad Her pton d nfigu | diation and Plantz Experiment; effect; Dual Germer experimention of Atomorphic principle; | Experiment and Atomic nck's quantum theory - Interpretation of H- nature of Matter- De- eriment Heisenberg's ms and ions- Hund's |

Unit II

Introduction to Quantum mechanics

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2 .

Modern Periodic Table

Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.

Problems involving the core concepts

UNIT-III: Structure and bonding - I

Ionic bond

Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

Covalent bond

Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB₂, AB₃, AB₄, AB₅, AB₆ and AB₇

Partial ionic character of covalent bond-dipole moment, application to molecules of the type A₂, AB, AB₂, AB₃, AB₄; percentage ionic character-numerical problems based on calculation of percentage ionic character.

UNIT-IV: Structure and bonding - II

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO₂, NO₂, CO₃^{2-,} NO₃⁻; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H₂, C₂, O₂, O₂⁺, O²⁻, O₂²⁻N₂, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of BF₃, NH₃, NH₄⁺, H₃O⁺ properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V:

Basic concepts in Organic Chemistry and Electronic effects

Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free

| | radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance. |
|--|--|
| | Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane |
| | Types of organic reactions- addition, substitution, elimination and rearrangements |
| Extended Professional Component (isa part of internal component only, Not to be included in the external examination question paper) | Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional Competency, |
| from this course | Professional Communication and Transferable skills. |
| Recommended Text | Madan, R. D. and Sathya Prakash, Modern Inorganic Chemistry, 2nded.; S. Chand and Company: New Delhi, 2003. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000. Puri, B. R. and Sharma, L. R. Principles of Physical Chemistry, 38thed.;Vishal Publishing Company: Jalandhar, 2002. Bruce, P. Y. and PrasadK. J. R. Essential Organic Chemistry, Pearson Education: New Delhi, 2008. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016 |
| Reference Books | Maron, S. H. and Prutton C. P. Principles of Physical Chemistry, 4thed.; The Macmillan Company: Newyork, 1972. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London, 1991. Gurudeep Raj, Advanced Inorganic Chemistry, 26thed.; Goel Publishing House: Meerut, 2001. Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford University Press:New York, 2014. Huheey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed.; Addison, Wesley Publishing Company: India, 1993. |
| Website and e-learning source | 1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/ |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.

CO2: classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.

CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx , Δp electronegativity, percentage ionic character and bond order.

CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects

CO5: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO'

| Title of theCourse | Qua | ntitative In | orga | nic Estima Prepa | | | and Inorganic |
|--------------------|---|--|------------------------|---|-----------------------|---|---|
| Paper No. | Core II | | | | | | |
| Category | Core | Year | Ι | Credits | 2 | Course | |
| | | Semester | I | 1 | | Code | |
| Instructional | Lecture | Tutorial | | b Practice | | Total | |
| hours per week | - | - | 3 | | | 3 | |
| Prerequisites | | ondary chem | | | | | |
| Objectives of the | | e aims at pro | vidir | ng knowled | lge o | on | |
| course | | ory safety | | | | | |
| | | ng glassware | | | | | |
| | _ | tative estima | | | | | |
| | • prepara | ation of inor | ganio | e compoun | ds | | |
| Course Outline | Unit I | | | | | | |
| | Chemical | Laboratory | Safe | ety in Acad | demi | ic Institutions | |
| | prepare fo importance ventilation | r emergenc and care of system; fir | ies f PPE e ex | from unco E; proper u tinguishers | ontro se an | lled hazards; nd operation of | risk of the hazards, concept of MSDS; f chemical hoods and of fire extinguishers, osal. |
| | Common A | Apparatus l | U sed | in Quanti | itativ | ve Estimation | (Volumetric) |
| | conical flas | | unne | l, dropper, | | | measuring cylinder, h bottle, watch glass, |
| | Principle o | of Quantitat | tive l | Estimation | ı (Vo | olumetric) | |
| | concept of standards, complexor | f mole, mo preparation netric, iodin | olalit of netric | y, molarit standard s and iodo | y, r oluti omet | normality; prir ons; theories ric titrations; | ent, oxidizing agent; mary and secondary of acid-base, redox, indicators – types, indicators, choice of |
| | | | | | | rom stock solu | tion |
| | _ | - | xalat | te using sta | andaı | rd ferrous amm | nonium sulphate |

| | Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator) Iodometry Estimation of copper in copper sulphate using standard dichromate Argentimetry Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method) Unit III Complexometry Estimation of hardness of water using EDTA Estimations Estimation of iron in iron tablets Estimation of ascorbic acid. Preparation of Inorganic compounds- Potash alum Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt |
|----------------------------------|--|
| Chille apprimed | Vacariladas Duchlam salvina Analytical chility Ducfassional Commetency |
| Skills acquired from this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended | Reference Books: |
| Text | Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand &Sons: New Delhi, 1997. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; An advanced course in Practical Chemistry, 3rd ed.; New Central Book Agency: Kolkata, 2007. |
| ReferenceBooks | 1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; <i>Vogel's Textbook of Quantitative Chemical Analysis</i> , 6 th ed.; Pearson Education Ltd: New Delhi, 2000. |
| Website and | Web References: |
| e-learning | 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetric- |
| source | analysis |
| | 2) https://chemdictionary.org/titration-indicator/ |
| | |

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.

CO2: compare the methodologies of different titrimetric analysis.

CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.

CO4: assess the yield of different inorganic preparations and identify the end point of various titrations.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of the Course | | FOOD CHEMISTRY | | | | | | | | |
|------------------------|--|----------------------------|-----------|--------------|-------|-----------------|----------------------|--|--|--|
| Paper No. | SEC -I | | | | | | | | | |
| Category | NME | Year | I Credits | | 2 | Course | | | | |
| | | Semester | I | | | Code | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | - | | | |
| hours per | 2 | - | - | | | 2 | | | | |
| week | | | | | | | | | | |
| Prerequisite s | Higher sec | Higher secondary Chemistry | | | | | | | | |
| Objectivesof | This cours | e aims at giv | ing a | n overall vi | ew o | f the | | | | |
| the course | Types | of food | | | | | | | | |
| | Food adulteration and poisons | | | | | | | | | |
| | • Food | additives and | d pres | ervation | | | | | | |
| Course | UNIT I | | | | | | | | | |
| Outline | Food Adulteration | | | | | | | | | |
| | Sources of food, types, advantages and disadvantages. Food adulteration - | | | | | | | | | |
| | contamination of wheat, rice, milk, butter etc. with clay stones, water and | | | | | | | | | |
| | | | | | | • | and their detection. | | | |
| | | | | | | lytical technic | | | | |
| | Unit-II | | | | | | | | | |
| | Food Poison | | | | | | | | | |
| | Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, | | | | | | | | | |
| | BHC, Mal | athion) -Che | mical | poisons - l | First | aid for poisor | consumed victims. | | | |
| | UNIT-III | | | | | | | | | |
| | Food Add | itives | | | | | | | | |
| | Food addit | tives -artifici | al swe | eeteners – S | Sacch | arin - Cyclon | nate a n d Aspartate | | | |
| | Food flavo | ours -esters, | aldehy | des and he | teroc | yclic compou | nds – Food colours | | | |
| | - Emulsify | ying agents - | - prese | ervatives -l | eaver | ning agents. E | Baking powder – | | | |
| | yeast – tas | temakers – N | MSG - | · vinegar. | | | | | | |
| | UNIT-IV | | | | | | | | | |
| | Beverages | | | | • | | | | | |
| | Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. | | | | | | | | | |
| | Carbonation-addictionto alcohol- diseases ofliver andsocial problems. | | | | | | | | | |

| | UNIT-V |
|-------------|---|
| | Edible Oils |
| | Fats and oils - Sources of oils - production of refined vegetable oils - |
| | preservation.Saturated and unsaturated fats - iodine value - role of MUFA and |
| | PUFA in preventing heartdiseases-determination of iodine value,RM |
| | value, saponification values and their significance. |
| Recommended | |
| Text | 2010. |
| | 2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand |
| | & Co.Publishers, second edition, 2006. |
| | 3. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishning house, |
| | 2010. |
| | 4. Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022. |
| | 5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, |
| | Pdmini S Ghugre, New age international publishers, second edition, 2021. |
| | |
| Reference | 1. HD. Belitz, Werner Grosch, Food Chemistry Springer Science & |
| Books | Business Media, 4 th Edition, 2009. |
| | 2. M.Swaminathan, Food Science and Experimental Foods, Ganesh and |
| | Company,1979. |
| | 3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and their |
| | applications Springer New York 2nd ed. 2008. |
| | 4. Food Chemistry, HD. Belitz, W. Grosch, P. Schieberle, Springer, fourth |
| | revised and extended edition, 2009. |
| | 5. Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey |
| | Hurst, Chang Yong Lee, Springer, Fourth edition, 2018. |
| Website and | |

e-learning source

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

- **CO 1:** learn about Food adulteration contamination of Wheat, Rice, Milk, Butter.
- CO 2: get an awareness about food poisons like natural poisons (alkaloids nephrotoxin) pesticides, DDT, BHC, Malathion
- **CO 3:** get an exposure on food additives, artificial sweeteners, Saccharin, Cyclomate and Aspartate in the food industries.
- **CO 4:** acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.
- **CO 5:** study about fats and oils Sources of oils production of refined vegetable oils preservation. Saturated and unsaturated fats -MUFA and PUFA

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Pos | | | | | |

Level of Correlation between PSO's and CO's

| Title of the | | ROLE | OF C | HEMISTR | XY II | N DAILY LII | FE |
|--------------------------|----------------|----------------|---------|---------------|--------|-----------------|---------------------|
| Course | | | | | | | |
| Paper No. | SEC-I | | | | | | |
| Category | NME | Year | I | Credits | 2 | Course | |
| | | Semester | | | | Code | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | |
| hours perweek | 2 | - | - | | | 2 | |
| Prerequisites | Higher sec | ondary chen | nistry | | | | |
| Objectives of the | This course | e aims at pro | oviding | g an overall | viev | v of the | |
| course | • importa | ance of Cher | mistry | in everyday | y life | ; | |
| | • chemis | try of buildi | ng ma | terials and | food | | |
| | • chemis | try of Drugs | and | pharmaceut | icals | | |
| Course | UNIT-I | | | | | | |
| Outline | C 1 | C 1 | . 1 | 1 ' | 1 | 1 1:C A: | , 1 |
| | | • | | | • | • | - components and |
| | _ | | • | | | | een - house effect |
| | | • | | • | | | ater, qualities of |
| | - | iter, soft and | d hard | water, me | thods | s of removal | of hardness-water |
| | pollution | | | | | | |
| | Unit-II | | | | | | |
| | Building n | naterials - c | ement | , ceramics, | glas | ss and refract | ories - definition, |
| | | | | | _ | | e, PVC, bakelite, |
| | _ | | | • | | reparation and | |
| | | | | J | 1 | 1 | , |
| | UNIT-III | | | | | | |
| | Food and | Nutrition - | Carbo | hydrates, F | rote | ins, Fats - de | efinition and their |
| | importance | as food co | onstitu | ents – bala | ancec | diet – Calo | ries minerals and |
| | vitamins (s | sources and | their | physiologic | cal i | mportance). C | Cosmetics – tooth |
| | paste, face | powder, soa | aps an | d detergent | s, sh | ampoos, nail j | polish, perfumes - |
| | general for | mulation and | d prep | arations - p | ossib | ole hazards of | cosmetic use. |
| | | | | | | | |
| | UNIT-IV | | | | | | |
| | Chemicals | in food pro | ductio | on – fertiliz | zers - | - need. natur | al sources; urea, |
| | | - | | | | | - solid, liquid and |
| | | uclear fuel ex | - | - | | -13001110411011 | zona, nquia una |
| | S 1 0 3.2, 110 | 1001 01 | P1 | | | | |

| | UNIT-V |
|----------------|---|
| | Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples. |
| | |
| Recommended | 1.Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, |
| Text | 2010. |
| | 2.A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand |
| | publishing, 2012. |
| | 3.S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, |
| | Karur, 2006. |
| | 4.B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, |
| | sixteenth edition, 2014.Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019. |
| | 5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. |
| | Chand & Co.Publishers, second edition, 2006. |
| | |
| ReferenceBooks | 1.Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, |
| | Texas, fourthedition, 1977. |
| | 2.W.A.Poucher, Joseph A.Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, |
| | 2000. |
| | 3. A.K.De,EnvironmentalChemistry,NewAge InternationalPublicCo.,1990. |
| Website and | |
| e-learning | |
| source | |

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

- CO1: learn about the chemicals used in everyday life as well as air pollution and water pollution.
- CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,
- **CO3:** acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.
- **CO4:** discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel examples and uses
- **CO5:** have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | GENERAL CHEMISTRY-II | | | | | | | | | |
|--------------------------|----------------------|-------------------------|---------|-----------------|--------|------------------------------------|--|--|--|--|
| Course | | | | | | | | | | |
| Paper No. | Core III | | | | | | | | | |
| Category | Core | Year I Credits 5 Course | | | | | | | | |
| | | Semester | II | | | Code | | | | |
| Instructional | Lecture | Tutorial | Lal | Practice | | Total | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | |
| Prerequisites | General Cl | hemistry I | | | | | | | | |
| Objectives of the | This cours | e aims at pr | ovidi | ng an over | all vi | iew of the | | | | |
| course | • chemis | try of acids | , base | s and ioni | c equ | ıilibrium | | | | |
| | • propert | ties of s and | l p-blo | ock elemei | ıts | | | | | |
| | • chemis | try of hydro | carbo | ons | | | | | | |
| | applica | tions of aci | ds an | d bases | | | | | | |
| | 1 | | | | ts and | d hydrocarbons | | | | |
| | Compo | anas or ma | 111 010 | ok cicinen | is and | a nyarovaroono | | | | |
| Course Outline | UNIT-I | | | | | | | | | |
| Course Outline | 01111-1 | | | | | | | | | |
| | | ses and Ioni | | | eniu | s concept, Bronsted-Lowry concept, | | | | |
| | Concepts | or Acius al | и ра | ses - Alli | iciiiu | s concept, bronsicu-Lowry concept, | | | | |

Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators:

Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation;

Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis;

Solubility product - determination and applications; numerical problems involving the core concepts.

Unit-II

Chemistry of s - Block Elements

Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na₂CO₃, KBr, KClO₃ alkaline earth metals. Anomalous behaviour of Be.

Chemistry of p- Block Elements (Group 13 & 14)

preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al.

comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.

UNIT-III

Chemistry of p- Block Elements (Group 15-18)

General characteristics of elementsof Group 15; chemistry of H₂N-NH₂, NH₂OH, HN₃ and HNO₃. Chemistry of PH₃, PCl₃, PCl₅, POCl₃, P₂O₅ and oxy acids of phosphorous (H₃PO₃ and H₃PO₄).

General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium - Oxy acids of sulphur (Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids (HClO₄). Inter-halogen compounds (ICl, ClF₃, BrF₅ and IF₇), pseudo halogens [(CN)₂ and (SCN)₂] and basic nature of Iodine.

Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2 , XeF_4 , XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.

UNIT-IV

Hydrocarbon Chemistry-I

Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

Alkenes-Nomenclature, general methods of preparation – Mechanism of β -elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.

Alkadienes

Nomenclature - classification - isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes - Diels-Alder reactions - polymerisation - polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.

Alkynes

Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.

Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes.

Geometrical isomerism in cyclohexanes.

UNIT-V

Hydrocarbon Chemistry - II

Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.

Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at \square - position – reduction, oxidation – uses.

Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.

Extended
Professional
Component (is a part of internal

Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

| . 1 | 7 |
|--------------------|---|
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional Competency, |
| from this course | Professional Communication and Transferable skills. |
| Recommended | 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2 nd ed, |
| Text | S.Chand and Company, New Delhi. |
| T CAL | 2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), |
| | Advanced Inorganic Chemistry, 17 th ed., S.Chand and Company, New |
| | Delhi. |
| | 3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3 rd ed., |
| | S.Chand and Company, New Delhi. |
| | 4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of |
| | Organic Chemistry, 2 nd ed., Vikas Publishing House, New Delhi. |
| | 5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, |
| | 38 th ed., Vishal Publishing Company, Jalandhar. |
| | |
| ReferenceBooks | 1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4 th |
| | ed., The Macmillan Company, Newyork. |
| | 2. Barrow G M, (1992), Physical Chemistry, 5 th ed., Tata McGraw Hill, New |
| | Delhi. |
| | 3. Lee J D, (1991), Concise Inorganic Chemistry, 4 th ed., ELBS William |
| | Heinemann, London. |
| | 4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and |
| | Reactivity, 4 th ed., Addison Wesley Publishing Company, India. |
| | 5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26 th ed., |
| | Goel Publishing House, Meerut. |
| | 6. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry, |
| | 8 th ed., Goel Publishing House, Meerut. |
| | |
| Website and | https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lec |
| e-learning | ture_notes/4B.html |
| source | http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64 |
| | -atomic-structure-and-chemical-bonding |
| | MOOC companys |
| | MOOC components |
| | http://nptel.ac.in/courses/104101090/ |
| | Lecture 1: Classification of elements and periodic properties |
| | http://nptel.ac.in/courses/104101090/ |
| | |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of

the course the students should be able to

- CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and pblock elements, preparation and properties of aliphatic and aromatic hydrocarbons
- CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic andaromatic hydrocarbons and strength of acids
- CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons
- CO4: explain theories of acids, bases and indicators, buffer action and important compoundsof s-block elements
- CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF | | | | | | | |
|----------------|---|---------------------|-----|----------|-----|--------|------|--|
| Course | ORGANIC COMPOUNDS | | | | | | | |
| Paper No. | Core IV | | | | | | | |
| Category | Core | Year | I | Credits | 2 | Course | | |
| | | Semester | II | | | Code | | |
| Instructional | Lecture | Tutorial | | Practice | | Total | | |
| hours per week | - | - | 3 | | | 3 | | |
| Prerequisites | | eneral Chemistry II | | | | | | |
| Objectives of | This course aims at providing knowledge on | | | | | | | |
| the course | laboratory safety | | | | | | | |
| | handling glass wares | | | | | | | |
| | analysis of organic compounds | | | | | | | |
| | preparation of organic compounds | | | | | | | |
| | Propagation of organic | | | | | | | |
| Course Outline | UNIT I | | | | | | | |
| | g c . 1 | | 1 6 | | | | | |
| | Safety rules, symbols and first-aid in chemistry laboratory | | | | | | | |
| | Basic ideas about Bunsen burner, its operation and parts of the flame. | | | | | | | |
| | Chemistry laboratory glassware -basis information and uses | | | | | | | |
| | | | | | | | | |
| | Unit II | | | | | | | |
| | Qualitative Organic Analysis | | | | | | | |
| | Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups • monocarboxylic acid, dicarboxylic acid | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | monohydric phenol, polyhydric phenol | | | | | | | |
| | • aldehyde, ketone, ester | | | | | | | |
| | carbohydrate (reducing and non-reducing sugars) | | | | | | | |
| | primary, secondary, tertiary amine | | | | | | | |
| | monoamide, diamide, thioamide anilide, nitro compound | | | | | | | |
| | | | | | | | | |
| | Preparation of derivatives for functional groups | | | | | | oups | |
| | <u> </u> | Troparatio | 01 | | 101 | 1 gro | ~r~ | |

UNIT III

Preparation of Organic Compounds

- i. Nitration picric acid from Phenol
- ii. Halogenation p-bromo acetanilide from acetanilide
- iii. Oxidation benzoic acid from Benzaldehyde
- iv. Microwave assisted reactions in water:
- v. Methyl benzoate to Benzoic acid
- vi. Salicylic acid from Methyl Salicylate
- vii. Rearrangement Benzil to Benzilic Acid
- viii. Hydrolysis of benzamide to Benzoic Acid

| | Separation and Purification Techniques (Not for Examination) | | | | | | |
|-------------------------------------|--|--|--|--|--|--|--|
| | 1. Purification of organic compounds by crystallization (from water / alcohol) and distillation | | | | | | |
| | 2. Determination of melting and boiling points of organic compounds. | | | | | | |
| | 3. Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves. | | | | | | |
| | 4. Chromatography (any one) (Group experiment) | | | | | | |
| | (i) Separation of amino acids by Paper Chromatography | | | | | | |
| | (ii)Thin Layer Chromatography - mixture of sugars / plant pigments /permanganate dichromate. | | | | | | |
| | (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate. | | | | | | |
| | 5. Electrophoresis – Separation of amino acids and proteins. (Demonstration) | | | | | | |
| | 6. Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE) | | | | | | |
| Reference Books | Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi, 2012. Manna, A.K. Practical Organic Chemistry, Books and Allied: India, 2018. Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry (Organic), | | | | | | |
| | Sultan Chand: New Delhi, 1987. 4. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. <i>Vogel's Textbook of Practical Organic Chemistry</i>, 5th ed.; Pearson: India,1989. | | | | | | |
| Website and e-learning source | https://www.vlab.co.in/broad-area-chemical-sciences | | | | | | |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|----------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of | 2.0 | 2.0 | • • | • • | • |
| Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | DAIRY CHEMISTRY | | | | | | | | |
|-------------------|-------------------------------------|---------------|----------|--------------|--------|------------------|--------------------------|--|--|
| Course | | | | | | | | | |
| Paper No. | SEC- II | | | | | | | | |
| Category | NME | Year | I | Credits | 2 | Course | | | |
| | | Semester | II | 7 | | Code | | | |
| Instructional | Lecture | Tutorial | Lal | Practice | | Total | 1 | | |
| hours per week | 2 | - | - | | | 2 | | | |
| Prerequisites | Higher sec | ondary cher | nistry | 7 | | | | | |
| Objectives of the | This cours | e aims at pro | ovidir | ng an overa | ll vie | w of the | | | |
| course | chemistry of milk and milk products | | | | | | | | |
| | 1 | ssing of milk | | • | | | | | |
| | 1 | vation and f | | tion of milk | prod | lucts. | | | |
| | proser | | 01111 | | Proc | | | | |
| Course Outline | UNIT I | | | | | | | | |
| Course Guinne | | | | | | | | | |
| | 1 - | ion of Milk | | | | | | | |
| | | - | | - | | | nts of milk - lipids, | | |
| | proteins, c | arbohydrate | s, vit | amins and | mine | rals - physica | al properties of milk - | | |
| | colour, od | lour, acidity | , spe | ecific gravi | ity, v | riscosity and | conductivity -Factors | | |
| | affecting t | he composit | tion o | of milk - ac | lulter | ants, preserva | tives with neutralizer- | | |
| | examples a | and their det | ection | n- estimatio | n of | fat, acidity and | d total solids in milk. | | |
| | Unit II | | | | | | | | |
| | D . | C 3 4 2 1 1 | | | | | | | |
| | Processing | _ | 1 | | c · | | | | |
| | | | | | | | ns in milk, physico – | | |
| | | - | _ | - | | _ | rocessing - boiling, | | |
| | 1 - | | | - | | | ch and HTST (High | | |
| | 1 ^ | | me) - | - Vacuum | pastei | urization – Ul | ltra High Temperature | | |
| | Pasteurizat | tion. | | | | | | | |
| | | | | | | | | | |
| | UNIT III | | | | | | | | |
| | Major Mi | lk Products | . | | | | | | |
| | 1 | | | mnosition | - ch | emistry of | creaming process - | | |
| | | | | - | | - | eam - estimation of fat | | |
| | ~ | | _ | | _ | | nurning – desi butter - | | |
| | | | | - | | - | - | | |
| | | | | | | | n butter. Ghee - major | | |
| | | | | | | - | ir detection - rancidity | | |
| | - definition | 1 - preventio | n - aı | ntioxidants | and s | ynergists - nai | tural and synthetic. | | |
| | ***** | | | | | | | | |
| | UNIT IV | | | | | | | | |

| | Special Milk Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk - Incitation milk - Vegetable toned milk - humanized milk - |
|------------------------------|--|
| | condensed milk - definition, composition and nutritive value. UNIT V |
| | Fermented and other Milk Products Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice—cream, stabilizers - emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowder-dryingprocess-types of drying. |
| Recommended Text | K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition, 2006. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia Publishing House New Delhi, 1974. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, Indian Council of Agricultural Research, 1 st edition, 2008. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 st edition,2013. Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers, 2021. |
| ReferenceBooks | Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, New York, 2005. F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore, 2006. Sukumar De, Outlines of Dairy Technology, Oxford University Press, New Delhi, 1980. P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry, Springer, Second edition, 2016. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H. McSweeney, J.A. OMahony, Springer, Second edition, 2015. |
| Website and e-learningsource | |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the

course the students should be able to

- CO 1: understand about general composition of milk constituents and its physical properties.
- CO 2: acquire knowledge about pasteurization of Milk and various types of pasteurization -Bottle, Batch and HTST Ultra High Temperature Pasteurization.
- CO 3: learn about Cream and Butter their composition and how to estimate fat in cream and Ghee
- CO 4: explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.
- CO 5: have an idea about how to make milk powder and its drying process types of dryingprocess

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

CO-PO Mapping (Course Articulation Matrix)

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of | | | | | |
| Course Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Pos | | | | | |

Level of Correlation between PSO's and CO's

| Title of theCourse | e COSMETICS AND PERSONAL GROOMING | | | | | | | | |
|--------------------------|-----------------------------------|----------------------------------|----------|---------------------------|-------|----------------|---------------------------|--|--|
| Damar No | SEC III (| Digainlina Cu | : 6: | | | | | | |
| Paper No. | ` | Discipline Sp | | | _ | | | | |
| Category | SEC | Year | I | Credits | 2 | Course | | | |
| | | Semester | I/ II | | | Code | | | |
| Instructional | Lecture | Tutorial | La | b Practice | | Total | | | |
| hours per week | 2 | - | - | | | 2 | | | |
| Prerequisites | | ondary Chemi | | | | | | | |
| Objectives of the | | aims at famil | | • | | | | | |
| course | | | | • • | f co | smetics and t | heir significance | | |
| | | r, skin and de | | | | | | | |
| | • ma | keup preparat | tions | and perso | nal į | grooming | | | |
| Course Outline | Uni I Skin | | | | | | | | |
| | care | | | | | | | | |
| | Nutrition o | of the skin, | skin | care and | cle | ansing of th | ne skin; face powder – | | |
| | | | | | | | all purpose, shaving and | | |
| | 1 | | • | | | | dvantages; astringent and | | |
| | | key ingredie | ents, | skin lightn | ess, | depilatories. | | | |
| | Unit II Hai | r | | | | | | | |
| | care | timos nom | don | room ligu | ;a . | ral ingradia | ents; conditioner –types | | |
| | ingredient | • • | uci, i | orcani, nqu | 1u, Ę | ger – mgreuie | ints, conditioner –types | | |
| | Dental care | | | | | | | | |
| | | s – ingredient | ts — 1 | nouth was | h | | | | |
| | Unit III | | | | | | | | |
| | Make up | | | | | | | | |
| | Base – four concealers, | | es – | ingredien | ts; l | ipstick, eyeli | ner, mascara, eyeshadow | | |
| | concealers, | Touge | | | | | | | |
| | Unit IV | | | | | | | | |
| | Perfumes | N-41 | 1 | . | | -£4114 | 1 .1.:-64:44 | | |
| | | | • | 0 1 | | • | used, chief constituents; | | |
| | _ | _ | | | | | vet cat, musk from musk | | |
| | 1 | etic – classifi | | - | ızınş | g characterist | ıcs – | | |
| | esters – alco | ohols – aldehy | ydes | ketones | | | | | |
| | Unit V | | | | | | | | |
| | Beauty trea | atments | | | | | | | |
| | Facials - ts | mes – advan | tages | s – disadv | anta | ges: face ma | sks – types; bleach - | | |
| | - | - | _ | | | - | eyelash tinting; perming | | |
| | - types; ha | | and o | lyeing; pe | rma | nent waving | - hair straightening; wax | | |
| | | | | | | | | | |

| Recommended | 1. Thankamma Jacob, (1997) Foods, drugs and cometics – A consumer guide, |
|-------------------------------------|---|
| Text | Macmillan publication, London. |
| ReferenceBooks | Wilkinson J B E and Moore R J, (1997) Harry's cosmeticology, 7th ed., Chemical Publishers, London. George Howard, (1987) Principles and practiceof perfumes and cosmetics, Stanley Therones, Chettenham |
| Website and e-learning source | http://www.khake.com/page75.html Net.foxsm/list/284 |

completion of the course the students should be able to

- CO1: know about the composition of various cosmetic products
- CO2 understand chemical aspects and applications of hair care and dental care and skin care products.
- CO3 understand chemical aspects and applications of perfumes and skin care products.
- CO4 to understand the methods of beauty treatments their advantages and disadvantage
- CO5 understand the hazards of cosmetic products.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

CO-PO Mapping (Course Articulation Matrix)

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | GENERAL CHEMISTRY -III | | | | | | | | |
|--------------------------|--|---------------|--------------------------------------|------------|-------|---------------|--|--|--|
| Course | | | | | | | | | |
| Paper No. | Core V | | | | | | | | |
| Category | Core | Year | II | Credits | 5 | Course | | | |
| | | Semester | III | | | Code | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per week | 4 | 1 | - | | | 5 | | | |
| Prerequisites | General Ch | emistry – I a | nd II | | | | | | |
| Objectives of the | This course | aims to pro | provide a comprehensive knowledge on | | | | | | |
| course | the physical properties of gases, liquids, solids and X-ray diffraction of solids. fundamentals of nuclear chemistry and nuclear waste management. applications of nuclear energy basic chemistry of halo-organic compounds, phenol and other aromatic alcohols. preparation and properties of phenols and alcohols. | | | | | | | | |
| | prepara | ation and pro | рсги | es of phen | 015 6 | ind alcohols. | | | |
| Course Outline | UNIT I Gaseous state Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity | | | | | | | | |
| | plots); comp gases. equal Boyle temp gases, isoth - continuity | • | | | | | | | |
| | Liquid and | Solid State | | | | | | | |
| | Liquid and Solid State Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism. Crystals –size and shape; laws of crystallography; symmetry elements – plane, | | | | | | | | |

centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation

Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO₂; comparison of structure and properties of diamond and graphite; numerical problems involving core concepts

Defects in solids - stoichiometric and nonstoichiometric defects.

Liquid crystals – classification and applications.

UNIT-III

Nuclear Chemistry

Natural radioactivity - α , β and γ rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen; nuclear stability - neutron- proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series.

Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out)

Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures.

UNIT-IV

Halogen derivatives Aliphatic

halogen derivatives

Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions. Nucleophilic substitution reactions – S_N1 , S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent.

Di, Tri & Tetra Halogen derivatives: Nomenclature, classification, preparation, properties and applications.

Aromatic halogen compounds

Nomenclature, preparation, properties and uses

Mechanism of nucleophilic aromatic substitution – benzyne intermediate.

Arvl alkyl halides

Nomenclature, benzyl chloride – preparation – preparation properties and uses

Alcohols: Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.

UNIT-V Phenols Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching process; properties – acidic character and effect of substitution on acidity. Reactions – Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction. Resorcinol, quinol, picric acid – preparation, properties and uses. Aromatic alcohols Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus pentachloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation - substitution on the benzene nucleus, uses. Thiols: Nomenclature, structure, preparation and properties. Extended Questions related to the above topics, from various competitive examinations Professional UPSC/JAM /TNPSC others to be solved Component (is a (To be discussed during the Tutorial hours) part of internal component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional Competency, from this course Professional Communication and Transferable skills. Recommended 1. B.R. Puri, L.R. Sharma, M.S. Pathania; *Principles of Physical Chemistry*, 46th edition, Vishal Publishing, 2020. Text 2. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009. 3. 4. P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sultan Chand & amp; Sons, twentieth edition, 2006. 4. M. K. Jain, S. C. Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2003. 5. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry,

Macmillan India Ltd., third edition, 1994.

| ReferenceBooks | 1. T. W. Graham Solomons, Organic Chemistry, John Wiley & Sons, | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|
| | fifth edition, 1992. | | | | | | | | |
| | 2. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt., | | | | | | | | |
| | Ltd., New Delhi, seventh edition, 2009. | | | | | | | | |
| | 3. I. L. Finar, <i>Organic Chemistry</i> , Wesley Longman Ltd, England, sixth edition, 1996. | | | | | | | | |
| | 4. P. L. Soni, and H. M.Chawla - <i>Text Book of Organic Chemistry</i> , New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007. | | | | | | | | |
| | 5. J.D. Lee, <i>Concise Inorganic Chemistry</i> , Blackwell Science, fifth edition, 2005. | | | | | | | | |
| Website and | MOOC components | | | | | | | | |
| e-learning | https://nptel.ac.in/courses/104104101 Solid | | | | | | | | |
| source | state chemistry | | | | | | | | |
| | https://nptel.ac.in/courses/103106071 | | | | | | | | |
| | Nuclear industries and safety | | | | | | | | |
| | https://nptel.ac.in/courses/104106119s | | | | | | | | |
| | Introduction to organic chemistry | | | | | | | | |

completion of the course the students should be able to

CO1: explain the kinetic properties of gases by using mathematical concepts.

CO2: describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.

CO3: investigate the radioactivity, nuclear energy and it's production, also the nuclear waste management.

CO4: write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.

CO5: investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

CO-PO Mapping (Course Articulation Matrix)

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | | QUA | LITA | ATIVE IN | ORC | GANIC ANAL | YSIS | |
|-------------------------------------|--|--|-------|-----------------|--------|----------------|-------------------------|--|
| Course | | | | | | | | |
| Paper No. | Core VI | | | | | | | |
| Category | Core | Year | II | Credits | 2 | Course | | |
| | | Semester | III | | | Code | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | |
| hours per | 1 | - | 3 | | | 4 | | |
| week | | | | | | | | |
| Prerequisites | General ch | | | | | | | |
| Objectives of | • | the skill on | syst | ematic ana | lysis | of simple inor | ganic salts and mixture | |
| the course | of salts. | | | | | | | |
| Course | Semi - Mio | cro Oualitat | ive A | Analysis | | | | |
| Outline | 1. Analysis | Semi - Micro Qualitative Analysis1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate | | | | | | |
| | 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite.3. Elimination of interfering acid radicals and Identifying the group of basic | | | | | | | |
| | 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc,manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium | | | | | | bismuth, cadmium, tin, | |
| | 5. Analysis | | ıre - | I to VIII | | | ons and two anions (of | |
| Skills acquired from this course | | e, Problem se al Communic | | | | | nal Competency, | |
| Recommended Text | V. Venkato | Reference Books: V. Venkateswaran, R. Veeraswamy and A. R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997. | | | | | | |
| Website and e-learning source | https://wwv | w.vlab.co.in/ | broac | l-area-cher | nical- | -sciences | | |
| Course Learnin | g Outcomes | (for Mapp | ing v | vith POs a | nd P | PSOs) | | |

On successful completion of the course the students should be able to

CO 1: acquire knowledge on the systematic analysis of Mixture of salts.

CO 2: identify the cations and anions in the unknown substance.

CO 3: identify the cations and anions in the soil and water and to test the quality of water.

CO4: assess the role of common ion effect and solubility product

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |

CO-PO Mapping (Course Articulation Matrix)

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | | ENTREPR | RENE | URIAL SI | KILL | S IN CHEM | IISTRY | |
|--------------------|---|---|---------|--------------|-----------------|---------------|------------------|--|
| Paper No. | SEC IV | | | | | | | |
| Category | Skill | Year | II | Credits | redits 1 Course | | | |
| | Enhanc | Semester | III | 1 | | Code | | |
| | ement | | | | | | | |
| | Course | | | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | • | Total | • | |
| hours per week | - | - | 1 | | | 1 | | |
| Prerequisites | General C | hemistry | | | | • | | |
| Objectives of the | The course | e aims at pro | oviding | g training t | О | | | |
| course | • de | evelop entre | prenet | ır skills in | stude | ents | | |
| | • to | o provide ha | inds o | n experienc | e to | prepare and d | levelop products | |
| | • d | evelop start | ups | | | | | |
| Course Outline | UNIT -I | | | | | | | |
| | andtoxicchemicals -Common adulterants. Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect),food colourants, Preservatives, leavening agents,Baking powder and baking soda, yeast,MSG,vinegar. Dyes Classification – Natural, synthetic dyes and their characteristics – basic methods and principles of dyeing | | | | | | | |
| | UNIT II | | | | | | | |
| | Hands | on Experie | nce (S | tudents ca | n ch | oose any four | r) | |
| | Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques. Preparation of Jam, squash and Jelly, Gulkand, cottage cheese. Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powde rand disinfectants in small scale | | | | | | by simple | |
| | | | | | | | | |
| | Extraction | of oils from | ı spice | es and flow | ers. | | | |
| | Dyeing – | water samp cotton fabric tie and dye, | s with | natural ar | | nthetic dyes | | |

| Skills acquired | Entrepreneurial skills. |
|-------------------|---|
| from this course | |
| Recommended | 1. George S & Muralidharan V, (2007) Fibre to Finished Fabric – A Simple |
| Text | Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles. |
| Reference Books | Shyam Jha, Rapid detection of food adulterants and contaminants (Theory and Practice), Elsevier, e Book ISBN 9087128004289, 1st Edition, 2015 |
| Website and | https://www.vlab.co.in/broad-area-chemical-sciences |
| e-learning source | |

On completion of the course the students should be able to CO 1: identify adulterated food items by doing simple chemical tests. CO 2: prepare cleaning products and become entrepreneurs

CO 3: educate others about adulteration and motivate them to become entrepreneurs.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 6 | 6 | 6 | 6 | 6 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of the | PESTICIDE CHEMISTRY | | | | | | |
|-------------------|---------------------|---------------|----------|-------------|---------|------------------|-------------------------------|
| Course | CI II E .I | | O | . V (D'' | .1* | | |
| Paper No. | | ancement (| | | _ | | |
| Category | Skill | Year | II | Credits | 2 | Course | |
| | Enhanc | Semester | III | | | Code | |
| | ement Course | | | | | | |
| | Lecture | Tutorial | Lah | Practice | | Total | |
| hours per week | 2 | - utoriai | - Lab | Tractice | | 2 | |
| Prerequisites | Fundamen | tals in chem | istrv | | | | |
| Objectives of the | | rse aims to | | ing the stu | dents | | |
| course | | - | • | • | | | nd their toxicity. |
| | 1 | • | | | | pesticides in in | • |
| | | sidues and i | | | 11 01 1 | restrettes in in | the form of |
| | | | | • | | 1 6: 11 | 1 |
| | • K1 | nowledge on | choic | e of altern | ate a | nd eco-friendly | pesticides. |
| | | | | | | | |
| Course Outline | Unit I | | | | | | |
| | | | - | _ | | - | Pesticides: Brief |
| | | | | | | | gets), structures, |
| | | ames, physi | | | | | 1 1 1 |
| | | • | | | | • | mammals, birds, |
| | | ecies etc. Me | | | | | 1.1 |
| | | | | | | | ides with respect |
| | | | | | | | mical properties, |
| | 1 - | degradation | , meta | abolism, fo | ormu | lations, Mode | of action, uses, |
| | toxicity. | 1 4 | J D | 1 1 41 | 4 | A 1 4 . | C1-1i1 |
| | | | | | | | Chlorpyriphos, – Endosulfan, |
| | | _ | _ | | - | e, Methomyl, I | |
| | | | | | | | |
| | Unit II | | | | | | |
| | Pesticides | residues: | Int | roduction- | an | nlication of | agrochemicals, |
| | | | | | | | esidues,remedies. |
| | | | | | | | phere, action of |
| | | | | • | • | les residues in | |
| | Г | | | | | | tic environment. |
| | | | | | | | tion and transport |
| | | | | • | | • | y, decomposition |
| | | lation by cli | | | | | J, |
| | D | D 11 | P.P. | , , | | 100 . 0 | |
| | | | | | | | cides residue on |
| | | | | | | | sticides, action of |
| | | | | | | | residues- sample |
| | preparation | | | f pestici | | | * |
| | _ | truits) simp | ole me | thods and | sche | emes of analys | sis, multi-residue |
| | analysis. | | | | | | |

| | Unit III |
|---------------------|--|
| | Biopesticides: Pheromones, attractants, repellents – Introduction, types and |
| | application (8- Dodecen-1-ol, 10-cis-12-hexadecadienoic, Trimedlure, |
| | Cue-lure, methyl eugenol, N,N- Diethyl-m-toluamide, Dimethyl phthalate, |
| | Icaridin). Baits- Metaldehyde, Iron (II) phosphate, |
| | Indoxacarb, Zinc Phosphide, Bromadiolone. |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC/ JAM /TNPSC others to be solved |
| Component (is a | (To be discussed during the Tutorial hours) |
| part of internal | |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended Text | Handa SK. Principles of pesticide chemistry. Agrobios (India); 2012. Matolcsy G, Nádasy M, Andriska V. Pesticide chemistry. Elsevier; |
| | 1989. |
| | 3. J. Miyamoto and P. C. Kearney Pesticide Chemistry Human Welfare and the Environment vol. IV Pesticide Residue and Formulation |
| | Chemistry, Pergamon press, 1985. |
| | 4. R. Cremlyn: Pesticides, John Wiley. |
| | 4. R. Cleiniyii. resucides, Joini whey. |
| Reference Books | 1. Roy N. K., Chemistry of Pesticides. CBS Publisher & Distributors P |
| | Ltd; 1st Ed. (2010). |
| | 2. Nollet L.M., Rathore H.S., Handbook of pesticides: methods of |
| | pesticide residues analysis. CRC press; 2016. |
| | 3. Ellerbrock R.H., Pesticide Residues: Significance, Management and |
| | Analysis, 2005 |
| | |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO 1: teach about the pesticides and their toxicity with respect to structure and category.

CO 2: explain the preparation and property of pesticides

CO 3: investigate the pesticide residues, prevention and care

CO 4: demonstrate the extraction and analytical methods of pesticide residues

CO 5: make awareness to the public on bio-pesticides

| CO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |

| CO5 | 3 | 3 | 3 | 3 | 3 |
|-------------------------------|-----|-----|-----|-----|-----|
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course | | | | | |
| Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PSOs | | | | | |

Level of Correlation between PSO's and CO's

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PO's and CO's

| Title of the | GENERAL CHEMISTRY-IV | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|--|--|
| Course | | | | | | | | | |
| Paper No. | Core VII | | | | | | | | |
| Category | Core | Year | II | Credits | 4 | Course | | | |
| | | Semester | I | | | Code | | | |
| | | | V | | | | | | |
| Instructional | Lecture | Tutorial | Lal | Practice | Total | | | | |
| hours per week | 4 | - | - | | | 4 | | | |
| Prerequisites | General Cl | nemistry III | | | | | | | |
| Objectives of the | This course | e aims to pro | ovide | a compre | hensi | ve knowledge o | n | | |
| course | thermodynamic concepts on chemical processes and applied aspects. thermo chemical calculations transition elements with reference to periodic properties and group study of transition metals. the organic chemistry of ethers, aldehydes and ketones the organic chemistry of carboxylic acids | | | | | | | | |
| | | | | | • | | | | |
| | isolated, clearly cyclic, revolution reactions equations) application reaction - or Zeroth law Unit II Thermody Second La randomnes reversible entropy ch | gy — Intensions and opersible and individual and significant of ideal arelation between temperature and their and pressures; determination of thermodermanics II we of thermodermanics; Carnot's and irreveranges of an | en syrrever ance ions and etweet at appliare continue of ynan acycesible idea | ystems; iso ersible pro- of heat of q, w, real gases en heat ca- e. of reactions; of on enthalph a of bond calorific va- nics-Absolu- calorific va- processes all gas and | therrocesses (q), E are sumpacitions, streeffect y of energy and the course T | nal, adiabatic, is s; First law of t work (w), intend H for reverse der isothermalies (Cp & Cv) and ard states; to of temperature reactions; Heard food and fuels emperature scale ions of first law of entropy, entropy of mixin | ypes of heats of the transfer | | |

Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application.

Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.

UNIT III

General Characteristics of d-block elements

Transition Elements- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups

UNIT IV

Ethers, Thio ethers and Epoxides

Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group.

Reactions of epoxides with alcohols, ammonia derivatives and LiAH₄ Thioethers - nomenclature, structure, preparation, properties and uses.

Aldehydes and Ketones

Nomenclatue, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Nucleophilic addition reactions, base catalysed reactions with mechanism-Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with LiAlH4 and NaBH4.

Addition reactions of unsaturated carbonyl compounds: Michael addition.

UNIT V

Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdieckerreaction.Formic acid-reducing property.

Reactions of dicarboxylic acids, hydroxy acids and unsaturated acids.

Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schottan-Baumann reaction. Claisen condensation, Dieckmann and Reformatsky

reactions, Hofmann bromamide degradation and Curtius rearrangement.

Active methylene compounds: Keto – enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate

Halogen substituted acids – nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids

Hydroxy acids – nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on α , β and γ hydroxy acids.

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external

Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

| examination | |
|------------------|--|
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional Competency, |
| from this course | Professional Communication and Transferable skills. |
| Recommended | 1. B.R. Puri and L.R. Sharma, <i>Principles of Physical Chemistry</i> , Shoban |
| Text | Lal Nagin Chand and Co., thirty three edition, 1992. |
| | 2. K. L. Kapoor, <i>A Textbook of Physical chemistry</i> , (volume-2 and 3), Macmillan, India Ltd, third |
| | edition, 2009. |
| | 3. P.L. Soni and Mohan Katyal, <i>Textbook of Inorganic Chemistry</i> , Sultan Chand & Sons, twentieth edition, 2006. |
| | 4. M. K. Jain, S. C. Sharma, Modern Organic Chemistry, Vishal |
| | Publishing, fourth reprint, 2003. |
| | 5. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic |
| | Chemistry, Macmillan India Ltd., third edition, 1994. |
| ReferenceBooks | 1. Maron, S. H. and Prutton C. P. <i>Principles of Physical Chemistry</i> , 4 th ed.; The Macmillan Company: Newyork, 1972. |
| | 2. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William |
| | Heinemann: London,1991. |
| | 3. Gurudeep Raj, Advanced Inorganic Chemistry, 26thed.; Goel |
| | Publishing House: Meerut, 2001. |
| | 4. Atkins, P.W. & Paula, J. <i>Physical Chemistry</i> , 10th ed.; Oxford |
| | University Press:New York, 2014. |
| | 5. Huheey, J. E. Inorganic Chemistry: Principles of Structure and |
| | Reactivity, 4th ed; Addison Wesley Publishing Company: India,1993. |
| Website and | MOOC components |
| e-learning | https://nptel.ac.in/courses/112102255 |
| source | Thermodynamics |
| | https://nptel.ac.in/courses/104101136 |
| | Advanced transition metal chemistry |
| | |

completion of the course the students should be able to

- **CO1:** explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.
- **CO2:** discuss the second law of thermodynamics and its application to heat engine; discuss third law and its application on heat capacity measurement.
- **CO3:** investigate the chemistry of transition elements with respect to various periodic properties and group wise discussions.
- **CO4:** discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.
- CO5: discuss the chemistry and named reactions related to carboxylic acids and their

derivatives; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

CO-PO Mapping (Course Articulation Matrix)

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | | PHYSICAL CHEMISTRY PRACTICAL – I | | | | | | | | | |
|------------------------------|--|--|---------|-------------|--------|------------------|-----------------|--|--|--|--|
| | | | | | | | | | | | |
| Paper No. | Core VII | I | | | | | | | | | |
| Category | Core | Year | | Credits | 2 | Course | | | | | |
| | | Semester | IV | D | | Code | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total 3 | | | | | |
| hours per week Prerequisites | General C | - homistry |) | | | 3 | | | | | |
| Objectives of the | | | ovidine | o an under | stand | ding of | | | | | |
| course | The course aims at providing an understanding of the laboratory experiments in order to understand the concepts of physical changes in chemistry the rates of chemical reactions colligative properties and adsorption isotherm | | | | | | | | | | |
| Course Outline | | UNIT-I Chemical kinetics 1. Determination of rate constant of acid catalysed hydrolysis of an ester | | | | | | | | | |
| | | (methyl acetate). | | | | | | | | | |
| | Determination of order of reaction between iodide and persulphate (initial rate method). Polarimetry: Determination of rate constant of acid catalysedinversion of cane sugar | | | | | | | | | | |
| | Thermoch | | | | | | | | | | |
| | 4. Determinate base. | ination of h | eat of | neutralisa | tion | of a strong ac | eid by a strong | | | | |
| | 5. Determi | nation of he | at of l | nydration o | of co | pper sulphate. | | | | | |
| | UNIT II | | | | | | | | | | |
| | Electroche | emistry – C | ondu | ctance me | asur | ements | | | | | |
| | 6. Determi | nation of ce | ll con | stant | | | | | | | |
| | 7. Determi | nation of m | olar co | onductance | e of s | strong electroly | rte | | | | |
| | 8. Determi | nation of di | ssocia | tion consta | nt o | f acetic acid | | | | | |
| | Colorimet | ry | | | | | | | | | |
| | 9. Determi | nation of co | ncenti | ration of c | oppe | r sulphate solu | tion | | | | |
| | UNIT III Colligativ | e property | | | | | | | | | |

| | 10. Determination of molecular weight of an organic compound by Rast method using naphthalene or diphenyl as solvent |
|-------------------|--|
| | Adsorption |
| | 11. Construction of Freundlich isotherm for the adsorption of aceticacid on activated charcoal |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Reference Books | 1. Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India: New Delhi, 2005. |
| | 2. Khosla, B. D.Garg, V. C.; Gulati, A.; <i>Senior Practical Physical Chemistry</i> , R.Chand: New Delhi, 2011. |
| | 3. Gupta, Renu, <i>Practical Physical Chemistry</i> , 1 st Ed.; New Age International: New Delhi, 2017. |
| Website and | https://www.vlab.co.in/broad-area-chemical-sciences |
| e-learning source | |

On completion of the course the students should be able to

CO1: describe the principles and methodology for the practical work

CO2: explain the procedure, data and methodology for the practical work.

CO3: apply the principles of electrochemistry, kinetics for carrying out the practical work.

CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS | | | | | | | | |
|-------------------|---|---|---|---|---|--|--|--|--|
| Course | | | | | | | | | |
| Paper No. | | (Discipline | | | | | | | |
| Category | Skill | Year | II | Credits | 2 | Course | | | |
| | Enhanc | Semester | IV | | | Code | | | |
| | ement | | | | | | | | |
| | Course | | | | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per week | 2 | - | - | | | 2 | | | |
| Prerequisites | General C | hemistry | | | | | | | |
| Objectives of the | The course | e aims at pro | ovidin | g an overa | ll vi | ew of the | | | |
| course | operation and troubleshooting of chemical instruments fundamentals of analytical techniques and its application in the characterization of compounds theory of chromatographic separation and theory of thermo / electro analytical techniques | | | | | | | | |
| | • sto | oichiometry | and th | ie related o | conc | entration terms | | | |
| Course Outline | S.I Units, Milli equi and Volu Stoichiome Sampling, Accuracy, Methods of Standard I | valence, Mo me, ppm, etry Calcula evaluation Precision, of Expression Deviation, Co | betwolality, ppb. tions of a Min procefficial | een Mass, Molarity, Density a analytical imization ecision: Ment of Var | and No and data of Iean iatio | l Weight. Mo rmality, Percer Specific Grav , Errors – T Errors. Signi , Median, Avo | les, Millimoles, ntage by Weight vity of Liquids. ypes of Errors, ificant Figures. erage Deviation, Limits, Q- test, pration plots. | | |
| | (choice of designs. T backgroun of remova | source, mo echniques of d correction | nochrof ator , sources for | omator, de nization as ces of chen the quant | tectond s | or, choice of fl ample introduce interferences a | instrumentation ame and Burner etion; Method of and their method of trace level of | | |

UNIT III

UV-Visible and IR Spectroscopy

Origin of spectra, interaction of radiation with matter, fundamental lawsof spetroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles, instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. Infrared Spectroscopy: Basic principles of instrumentation (choice of source, monochromator& detector) for single and double beam instrument; sampling techniques.

UNIT IV

Thermal and Electro-analytical Methods of Analysis

TGA and DTA- Principle, Instrumentation, methods of obtaining Thermograms, factors affecting TGA/DTA, Thermal analysis of silver nitrate, calcium oxalate and calcium acetate

DSC- Principle, Instrumentation and applications.

Electroanalytical methods: polarography - principle, instrumentation and applications. Derivative polarography- Cyclic Voltammetry - principle.

UNIT V

Separation and purification techniques

Classification, principle, Factors affecting - Solvent Extraction - Liquid - Liquid Extraction,

Chromatography: Column, TLC, Paper, Gas, HPLC and Electrophoresis, Principle, Classification, Choice of Adsorbents, Solvents, Preparation of Column, Elution Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms and Rf value.

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired Knowledge, Problem solving, Analytical ability, Professional from this course Competency, Professional Communication and Transferable skills.

| Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed., The English Language Book Society of Longman. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007 Skoog, Holler and Crouch, Principles of Instrumental Analysis, Cengage Learning, 6th Indian Reprint (2017). R. Speyer, Thermal Analysis of Materials, CRC Press, 1993. R.A. Day and A.L. Underwood, Quantitative Analysis, 6thedn., Prentice Hall of India Private Ltd., New Delhi, 1993 |
|---|
| D. A. Skoog, D. M. West and F. J. Holler, Analytical Chemistry: An Introduction, 5thedn., Saunders college publishing, Philadelphia, 1998. Dash U N, Analytical Chemistry; Theory and Practice, Sultan Chand and sons Educational Publishers, New Delhi, 2011. Christian, Gary D; Analytical Chemistry, 6th Ed., John Wiley & Sons, New York, 2004. Mikes, O. &Chalmes, R.A. Laboratory Handbook of Chromatographic & Allied Methods, Elles Harwood Ltd. London G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, sixth edition Pearson Education, 2000 |
| http://www.epa.gov/rpdweb00/docs/marlap/402-b-04-001b-14-final.pdf http://eric.ed.gov/?id=EJ386287 http://www.sjsu.edu/faculty/watkins/diamag.htm http://www.britannica.com/EBchecked/topic/108875/separation-and-purification http://www.chemistry.co.nz/stoichiometry.htm |
| |

completion of the course the students should be able to

CO1: apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and application of flame photometry and Atomic Absorption spectrometry

CO2: explain theory, instrumentation and application of UV visible and Infrared spectroscopy.

CO3: able to discuss instrumentation, theory and applications of thermal and electrochemical techniques

CO4: explain the use of chromatographic techniques in the separation and identification of mixtures

CO5: explain preparation of solutions, stoichiometric calculations

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | FORENSIC SCIENCE | | | | | | | | |
|-------------------|--|---------------|-----------------------------------|--------------|-------|----------------|----------------------|--|--|
| Course | OP C VIII | D. | a • | ne \ | | | | | |
| Paper No. | | Discipline S | - | , | 1- | | | | |
| Category | Skill | Year | II | Credits | 2 | Course | | | |
| | Enhance | Semester | IV | | | Code | | | |
| | ment | | | | | | | | |
| | Course | | | | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per week | 2 | - | - | | | 2 | | | |
| Prerequisites | General Cl | | | | | | | | |
| Objectives of the | This course | e aims at giv | ving a | n overall vi | iew c | of | | | |
| course | • crime of | detection thr | on through analytical instruments | | | | | | |
| | • forgery | and its dete | ection | | | | | | |
| | • medica | l aspects inv | volved | 1 | | | | | |
| | | 1 | | | | | | | |
| Course Outline | UNIT I | | | | | | | | |
| | | | | | | | | | |
| | Poisons | | | | | | | | |
| | | | | | - | - | s in the living and | | |
| | | • | • | • | | | nces. Heavy metal | | |
| | contaminat | tion (Hg, Pb | , Cd) | of seafood | s - u | se of neutron | activation analysis | | |
| | in detecting | g arsenic in | huma | n hair. Tre | atme | nt in cases of | poisoning – use of | | |
| | antidotes fo | or common j | poisor | ıs. | | | | | |
| | | | | | | | | | |
| | Unit-II | | | | | | | | |
| | Crime De | 44 | | | | | | | |
| | | | lurina | manufactu | ro o | f matahas and | l firoveorles (as in | | |
| | | - | _ | | | | l fireworks (as in | | |
| | | | _ | - | | ·- | ticks and RDX) - | | |
| | | | | | ty m | easures for v | VIP-composition | | |
| | of bullets a | and detecting | g pow | der burns. | | | | | |
| | | | | | | | | | |
| | UNIT-III | | | | | | | | |
| | Forgery a | nd Counter | ·feitin | g | | | | | |
| | Documents | s - different | t type | s of forge | d sig | gnatures - sir | mulated and traced | | |
| | | | | _ | _ | | liberately modified | | |
| | _ | _ | | | | _ | letters – checking | | |
| | | | - | - | | | sis using AAS to | | |
| | | | | • | | | • | | |
| | detect counterfeit coins – detection of gold purity in 22 carat ornaments – detecting gold plated jewels -authenticity of diamond. | | | | | | | | |
| | detecting g | ora praica je | - W C13 | -aumonnoll | y 01 | aiaiiioilu. | | | |
| | UNIT-IV | | | | | | | | |
| | Tracks an | d Traces | | | | | | | |
| | | | nall tr | acks and r | olice | e dogs - foot | prints - costing of | | |
| | 11.000 une | | 11 | | | 2000 1000 | r-mis cosmis or | | |

foot prints -residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture - tool marks - paints - fibres - Analysis of biological substances - blood, semen, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - detecting steroid consumption in athletes and racehorses.

UNIT-V

Medical Aspects

Aids - causes and prevention - misuse of scheduled drugs - burns and their treatment by plastic surgery. Metabolite analysis using mass spectrum - Gas chromatography-Arson -natural fires and arson - burning characteristics and chemistry of combustible materials -nature of combustion. Ballistics - classification - internal and terminal ballistics - small arms -laboratory examination of barrel washing and detection of powder residue by chemical tests.

Recommended Text

- 1. SA Iqbal, M Liviu, Textbook of forensic chemistry, Discovery publishing house private limited, 2011.
- 2. Kelly M. Elkins, Introduction to Forensic Chemistry, CRC Press, Taylor & Francis Group, 2019.
- 3. Javed I. Khan, Thomas J. Kennedy, Donnell R. Christian, Jr., Basic principles of Forensic chemistry, Humana Press, first edition, 2012.
- 4. Bapuly AK, (2006) Forensic Science Its application in crime investigation, Paras Medical Publisher, Hyderabad.
- 5. Sharma B.R., (2006) Scientific Criminal Investigation, Universal Law Publishing Co. Pvt. Ltd, New Delhi.

ReferenceBooks

- 1. Richard Saferst in and Criminalistics-An Introduction to Forensic Science (College Version), Sopfestein, Printice hall, eighth edition, 2003
- 2. Suzanne Bell, Forensic Chemistry, Pearson, second international edition, 2014.
- 3. Jay Siegel, Forensic chemistry: Fundamentals and applications, Wiley-Blackwell, first edition, 2015.
- 4. Max M. Houck & Jay A. Segal, (2006) Fundamentals of Forensic Science, Elsevier Academic press.
- 5. Henry C. Lee, Timothy Palmbach, Marilyn T. Miller, (2006) Henry Lee's Crime Scene Book Elsevier Academic press.

Website and e-learning source

- 1. http://www.library.ucsb.edu/ist/03-spring/internet.html
- 2. http://www.wonder howto.com/topic/forensic-science/

completion of the course the students should be able to

- CO 1: learn about the Poisons types and classification of poisons in the living and the dead organisms and also get information about Postmortem.
- CO 2: get awareness on Human bombs, possible explosives (gelatin sticks and RDX) and metal defector devices and other security measures for VVIP composition of bullets and detecting powder burns
- CO 3: detect the forgery documents, different types of forged signatures
- CO4: have an idea about how to tracks and trace using police dogs, foot prints identification and gain the knowledge in analyzing biological substances blood, semen, saliva, urine and hair DNA Finger printing for tissue identification in dismembered bodies
- CO 5: get the awareness on Aids causes and prevention and also have an exposure on handling fire explodes.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

CO-PO Mapping (Course Articulation Matrix)

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | ORGANIC CHEMISTRY - I | | | | | | | | | |
|--------------------|---|---|--|---|---|---|--|--|--|--|
| Paper No. | Core IX | | | | | | | | | |
| Category | Core | Year | III | Credits | 4 | Course | | | | |
| | | Semester | V | | | Code | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | |
| Prerequisites | | hemistry I,II | | | | • | | | | |
| Objectives of the | | e aims to pr | | | | _ | | | | |
| Course Outline | • st co • pr co • pr • pr • pr pr • pr • pr • pr • pr | reparation are paration are paration. Nonversions; al isomerism: Isomerism: | sm in sof ethat properties of ethat properties | chirals and hane and be perties of mes rent dyes, perties of hiophene perties of and isoquidant and soquidant and series, meso stration- med rules. Restrict carbon thane and mpounds - preparationes; reacted characted in | food five six inoli awh anti tty, truct thoo buta | ometric isomerale natic and aliphologous and accommendate membered heterone. orse Projection isomerism, E/S specific rotatures - molecular of racemisad S notations ms – allenes arane. | ditives serocycles like erocycles like and ation; resolution-for one and two | | | |
| | Aromatic nitro compounds Nomenclature, preparation – nitration, from diazonium salts, physical properties; reactions - reduction of nitrobenzene in different medium, Electrophilic substitution reactions, TNT. | | | | | | | | | |

Amines: Aliphatic amines

Nomenclature, isomerism, preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement.

Physical properties, reactions – alkylation, acylation, carbylaminereaction, Mannich reaction,

oxidation, basicity of amines.

UNIT III

Chemistry of Nitrogen Compounds – II

Aromatic amines — Nomenclature, preparation — from nitro compounds, Hofmann's method; Schmidt reaction, properties - basic nature, ortho effect; reactions — alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation.

Distinction between primary, secondary and tertiary amines - aliphatic and aromatic

Diazonium compounds

Diazomethane, Benzene diazonium chloride - preparations and synthetic applications.

Dyes

Theory of colour and constitution; classification based onstructure and application; preparation –Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green.

Industry oriented content

Dyes Industry, Food colour and additives

UNIT IV

Heterocyclic compounds

Nomenclature and classification. General characteristics - aromatic character and reactivity.

Five-membered heterocyclic compounds

Pyrrole – preparation - from succinimide, Paal Knorr synthesis; reactions – reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.

Furan – preparation from mucic acid and pentosan; reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.

Thiophene synthesis - from acetylene; reactions -reduction; oxidation;

| electrophilic substitution reactions. |
|---|
| UNIT V |
| Six-membered heterocyclic compounds |
| Pyridine – synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses Condensed ring systems |
| Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction |
| Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution. |
| Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| |
| Knowledge, Problem solving, Analytical ability, Professional |
| Competency, Professional Communication and Transferable skills. |
| 1.M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal |
| Publishing, fourth reprint, 2009. |
| 2.S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic |
| Chemistry, Macmillan India Ltd., third edition, 2009. |
| 3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi, |
| S.Chand& CompanyPvt. Ltd., Multicolour edition, 2012. |
| 4.P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, |
| Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007. |
| 5.C.N.Pillai, Text Book of Organic Chemistry, Universities Press |
| (India) Private Ltd., 2009. |
| 1.R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson |
| Education, Asia, sixth edition, 2012. |
| 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012. |
| |

| | 3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education |
|-------------|---|
| | Pvt. Ltd., New Delhi, seventh edition,2009. |
| | 4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley |
| | Longman Ltd, sixth edition, 2006. |
| | 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth |
| | Edition, 2010. |
| Website and | 1. www.epgpathshala.nic.in |
| e-learning | 2. www.nptel.ac.in |
| sources | 3. http://swayam.gov.in |
| | 4. Virtual Textbook of Organic Chemistry |
| 1 | |

On completion of the course the students should be able to

CO1: assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.

CO2: explain preparation and properties of aromatic and aliphatic nitro compounds and amines

CO3: explain colour and constitution of dyes and food additives

CO4: discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene

CO5: discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | | Π | NOR | GANIC C | CHEN | MISTRY -I | |
|--------------------------|---|--|---|---|---|--|-------------------------------------|
| Course | | | | | | | |
| Paper No. | Core X | T | | | | I | |
| Category | Core | Year | | Credits | 4 | Course | |
| | | Semester | V | | | Code | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | |
| hours per week | 4 | - | - | | | 4 | |
| Prerequisites | | hemistry I, | | | | | |
| Objectives of the course | • no co | nd Jahn Tello reparation ar anthanoids a | , is and character theory er efformed produced and and and and and and and and and an | somerism welate comp welate, magneti ect operties of ctinoids | and plexe c pro meta | s operties, stabilit | f coordination ty of complexes |
| Course Outline | IUPAC 1 coordination Werner's of geometry ordination 4 &6. Chelates — application of DMG water usin Role of multiple To-ordination and tetral spectroche complexes crystal fie water as a spectra of | on compound coordination and magnetic compounds types of lights of chelater and oxine if g EDTA, more than the chelater attention Chemical series and compounds the compound of the compound of the chemical series are factors in the effect on the chemical series are factors in the effect on the chemical series are factors in the effect on the chemical series are factors in the effect on the chemical series are factors in the effect on the chemical series are factors in the effect on the chemical series are factors in the effect on the chemical series are chemica | ds. theoretic prowith ands ands ands ands ands ands ands ands | f coording by a effect operties by co-ordinate forming clausitative vimetric at on indicate ving system. I field split, Crystal culation ocing the cradii, late ydration), ahn — Tel | tive are Paultion in helater and analysors. tting field f CFS magnitice of interpler effects | tomic number - ing's theory - umber es – stability of quantitative and sis –estimation haemoglobin and of energy level stabilization SE in octahedra itude of crystenergies, heats oretation of mag ffect. Stability | alysis–application ofhardness of |

UNIT III

Organometallic compounds

Metal Carbonyls

Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls.

Ferrocene-Methods of preparation, physical and chemical properties

UNIT IV

Inner transition elements (Lanthanoids and Actinoids)

General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods - Lanthanoids contraction-Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.

UNIT V

Inorganic polymers

General properties – classification of inorganic polymers based on element in the backbone (Si, S, B and P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane) phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur based polymer (polysulfide and polymeric sulphur nitride), boron based polymers (borazine polymers) – industrial applications of inorganic polymers.

| Extended |
|--------------------|
| Professional |
| Component (is a |
| part of internal |
| component only, |
| Not to be included |
| in the external |
| examination |
| question paper) |
| Skills acquired |

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text

- 1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31th Edition, Milestone Publishers & Distributors, Delhi.
- 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009),

| Website and e-learning source | 1.www.epgpathshala.nic.in 2. www.nptel.ac.in 3. http:/swayam.gov.in |
|-------------------------------|---|
| Reference Books | Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi Lee J D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBS William Heinemann, London. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition, 1992. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S.Chand and Company, New Delhi. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited, Hyderabad Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson, Chennai Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014. |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain isomerism, Werner's Theory and stability of chelate complexes

CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.

CO3: explain preparation and properties of metal carbonyls

CO4: give a comparative account of the characteristics of lanthanoids and actinoids

CO5:explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Course Contribution to Pos | | | | | |

Level of Correlation between PSO's and CO's

| Title of the | |] | PHY | SICAL C | HEM | IISTRY -I | |
|--------------------------|---|--|----------------------------------|--|--|--|--|
| Course | | | | | | | |
| Paper No. | Core XI | | | | | | |
| Category | Core | Year | III | Credits | 4 | Course | |
| | | Semester | V | | | Code | |
| Instructional | Lecture | Tutorial | La | b Practice | | Total | |
| hours per week | 4 | 1 | - | | | 5 | |
| Prerequisites | General C | hemistry I,II | ,III a | ınd IV | | | |
| Objectives of the | The course | aims at pro | vidi | ng an over | all vi | ew of | |
| Course Outline | ar • ch • ac • cc • ph UNIT I Thermody | nd partial monemical kine disorption, he olloids and repote the motochemistry and work and work was and work | olar potics a comog macro ry, fl | properties and differe geneous and prodecules uorescence | nt tyjd het and | pes of chemica erogeneous can phosphorescen | talysis nce functions, Gibbs |
| | pressure and a derivation of the derivations of the derivation of | nd volume, ons and ap of state; The pplication. olar propertion | criter plica ermo | ria for spot tions; Mandynamics chemical ntial with | ontan xwell of m pote temp | eity; Gibbs-Holl relationships ixing of ideal ential, Gibbs berature and properties. | with temperature, elmholtz equation, thermodynamic gases, Ellingham Duhem equation, ressure, chemical gules equation. |

UNIT II

Chemical Kinetics

Rate of reaction - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws - Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration)

 Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry.

Effect of temperature on reaction rate – temperature coefficient - concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT.

Complex reactions – reversible and parallel reactions (no derivation and only examples)

- kinetics of consecutive reactions - steady state approximation.

UNIT III

Adsorption – Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction – Michaelis- Menten and Briggs- Haldene equation – Lineweaver- Burk plot – inhibition – reversible – competitive, noncompetitive and uncompetitive (no derivation of rate equations)

Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis

UNIT IV

Colloids and Surface Chemistry

Colloids: Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols),

Preparation of Sols- Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis,

Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels-preparation of Gels, Applications of colloids

| | Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules |
|---|--|
| | UNIT V Photochemistry |
| | Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions – rate law – Kinetics of H ₂ -Cl ₂ , H ₂ -Br ₂ and H ₂ -I ₂ reactions, comparison between thermal and photochemical reactions. |
| | Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation – examples Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended Text | B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., forty eighth edition, 2021. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986. |
| Reference Books | J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson, 1st edition, 2013. Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. |
| | 4. K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan |

| | India Ltd, third edition, 2009.5. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 |
|-------------------|--|
| Website and | 1. https://nptel.ac.in |
| e-learning source | 2. https://swayam.gov.in |
| | 3. www.epgpathshala.nic.in |

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellinghams

CO2: apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.

CO3: compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis.

CO4: demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules.

CO5: utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | | I | NDUSTI | RIAL | СНЕ | EMISTRY | |
|--------------------|--|---|--|---|---|--|-------------------------------------|
| Paper No. | EC VI | | | | | | |
| Category | Elective | Year Semester | III Cro | edits | 3 | Course Code | |
| Instructional | Lecture | Tutorial | Lab Pi | actic | <u> </u> | Total | |
| hours per week | 4 | _ | - | | | 4 | |
| Prerequisites | General Cl | nemistry I,II, | III and | V | | 1 | |
| Objectives of the | This cours | e is designed | l to provi | de kn | owled | lge on | |
| course | premaproapp | cessing | cosmetics sugar, pa abrasives | iper, o | emer | nt and leather an | nd food ustrial products |
| Course Outline | | | | | | resources in | |
| | classification calorific value Liquid functions petrol-octa Gaseous fungas, carbur | on; analysis alue-determinels: Petroletin internal ne number, contested water gas: LPG-contested, composition idea) | of coal- nation, ca um - cl combust cetane nu es over se gas - prep ompositio on, advan , ingree | prox rboni naract ion e mber. olid ar aratic n, ac ntages | imate sation eristic ingine and liquins - u dvanta, app | analysis and to of coal. es; Gasoline es, antiknock uid fuels; water uses. ages, applicati | ion; gobar gas- ellants – rocket |
| | Hair care: | | pes, ingr | edien | ts; co | nditioners-types | s, ingredients. |

animal origin-amber gries, civetone and musk; synthetic-classification-esters-amylsalicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.

Soaps and Detergents

Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.

Detergents-definition, properties-cleansing action; soapless detergentsanionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.

UNIT III

Sugar Industry

Manufacture from sugar cane; recovery of sugar from molasses; testing and estimation of sugar.

Food Preservation and processing

Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.

UNIT IV Abrasives

Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boron nitride, synthetic graphite – composition and uses.

Leather Industry

Structure and composition of skin, hide; Manufacture of leather – pretanning process – curing, liming, beating, pickling; methods of tanning-vegetable, chrome – one bath, two bath process; finishing.

Paper Industry

Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper- beating, refining, filling, sizing, colouring, calendaring; cardboard.

UNIT V

Lubricants Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point, aniline point and drop point; greases-properties, types; cutting fluids,

| | selection of lubricants. |
|------------------------------------|--|
| | Cement Industry |
| | Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete. |
| | Intellectual Property Rights Introduction to Intellectual Property Rights — Patents - Factors for patentability - Novelty, Non obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC/ JAM /TNPSC others to be solved |
| Component (is a part of internal | (To be discussed during the Tutorial hours) |
| component only, | |
| Not to be included in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. Sharma, B.K. <i>Industrial Chemistry</i> , 9 th ed.; Goel Publishing House: |
| Text | Meerut, 1998. |
| | 2. Wilkinson, J.B.E. Moore, R.J. <i>Harry's Cosmeticology</i> , 7 th ed.; Chemical Publishers: New York, 1982. |
| | 3. Alex V. Ramani, Food Chemistry, MJP publishers: Chennai, 2009. |
| | Jayashree Ghosh, Applied Chemsitry, S. Chand: New Delhi, 2006. Srilakshmi, B. Food Science, 4th ed.; New Age International Publication, 2005. |
| Reference Books | 1. Jain, P.C.; Jain, M. Engineering Chemistry, 16th ed.; Dhanapet Rai: Delhi, 1992 |
| | 2. George Howard, <i>Principles and Practice of Perfumes and Cosmetics</i> , Stanley Therones, Cheltenham: UK, 1987. |
| | 3. Thankamma Jacob, Foods, Drugs and Cosmetics - A Consumer Guide, Macmillan: London, 1997. |
| | 4. ShankuntalaManay, N.; Shadaksharaswamy, M. Food Facts and Principles, 3 rd ed.; New Age Publication, 2008. |
| | Neeraj Pandey, KhushdeepDharni, <i>Intellectual Property Rights</i>, PHI Learning, 2014. |
| | |

|--|

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: summarize the properties of fuels which include petroleum, water gas, natural gas and propellents

CO2: evaluate cosmetic products, soaps, detergents.

CO3: explain manufacture of sugar, food spoilages and food additives

CO4: explain properties of abrasives, manufacture of leather and paper

CO5: explain properties and manufacture of lubricants and cement, and intellectual property rights

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | | BIOCHEMISTRY | | | | | | | | | | |
|--------------------------|--|--|------------|-----------------|--------|------------------|-----------------|--|--|--|--|--|
| Course | ECV | | | | | | | | | | | |
| Paper No. | EC V | Voor | TIT | C dita | 14 | C | | | | | | |
| Category | Elective | Year | V | Credits | 4 | Course | | | | | | |
| T / / 1 | T | Semester | | Practice | | Code Total | | | | | | |
| Instructional | Lecture 4 | Tutorial | Lab | Practice | | 5 | | | | | | |
| hours per week | | - | - | | | 3 | | | | | | |
| Prerequisites | | nemistry - I | . منال نار | - 1-m avvil a d | ~~ ~* | | | | | | | |
| Objectives of the | | aims at pro | | | | | | | | | | |
| course | | • | etweei | n biochem | ıstry | and medicine, | composition of | | | | | |
| | | ood | | | | | | | | | | |
| | | - | _ | | ino a | acids, peptides, | enzyme, | | | | | |
| | vi | tamins and p | roteir | ıs | | | | | | | | |
| | • bi | ological fund | etions | of protein | ıs, en | nzymes, vitamin | ns and hormones | | | | | |
| | • bi | ochemistry o | of nuc | leic acids | and 1 | lipids | | | | | | |
| | • m | etabolism of | lipid | S | | • | | | | | | |
| Course Outline | UNIT I | | 1 | | | | | | | | | |
| | Blood - Co Hemophilis Maintenand UNIT II Peptides a Amino ac essential; S ion and iso Peptides — solution an terminal an | Logic of Living Organisms Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis. UNIT II Peptides and Proteins Amino acids – nomenclature, classification – essential and Nonessential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions. Peptides – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N-terminal analysis – Sanger's & Edmann method; C terminal analysis - Enzymic method. | | | | | | | | | | |
| | properties oxidation, of proteins Metabolism outline); un UNIT III Enzymes a | Proteins – classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary. Metabolism of Amino acids – general aspects of metabolism (a brief outline); urea cycle. UNIT III Enzymes and Vitamins Nomenclature and classification, characteristics, factors influencing | | | | | | | | | | |
| | | | | | | | Lock and key | | | | | |

hypothesis, Koshland's induced fit model.

| 1 | |
|----------------------------------|---|
| | Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme |
| | regulation. |
| | Vitamins as coenzymes - functions of TPP, lipoic acid, NAD, NADP, |
| | FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, |
| | cyanocobalamin. |
| | UNIT IV |
| | Amino acids |
| | Components of nucleic acids - nitrogenous bases and pentose sugars, |
| | structure of nucleosides and nucleotides, DNA- structure & functions; |
| | RNA -types- structure - functions; biosynthesis of proteins |
| | Hormones |
| | Adrenalin and thyroxine — chemistry, structure and functions (No |
| | structure elucidation). |
| İ | UNIT V |
| | Lipids |
| | Occurrence, biological significance of fats, classification of lipids. |
| | Simple lipids – Oils and fats, chemical composition, properties, reactions |
| | hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; |
| | analysis of oils and fats - saponification number, iodine number, acid |
| | value, R.M. value. Distinction between animal and vegetable fats. |
| | Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons – |
| | biological significance. |
| | Cholesterol – occurrence, structure, test, physiological activity. |
| | |
| | Metabolism of lipids: β -oxidation of fatty acids. |
| D . 1 1 | |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC/ JAM /TNPSC others to be solved |
| Component (is a part of internal | (To be discussed during the Tutorial hours) |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| nom uns course | Competency, Frotessional Communication and Transferable skills. |

| Recommended | 1. Bahl, B. S.; Bhal, A. Advanced Organic Chemistry, 3 rd ed.; S. Chand: | | | | | | | | | |
|-----------------|--|--|--|--|--|--|--|--|--|--|
| Text | New Delhi, 2003. | | | | | | | | | |
| | 2. Jain, M.K.; Sharma, S.C. <i>Modern Organic Chemistry</i> , Vishal Publications: New Delhi, 2017. | | | | | | | | | |
| | 3. Shanmugam, A. <i>Fundamentals of Biochemistry for Medical Students</i> , 6 th ed.; Published by the author, 1999. | | | | | | | | | |
| | 4. Veerakumari, L. <i>Biochemistry</i> , 1 st ed.; MJP Publications: Chennai, 2004. | | | | | | | | | |
| | 5. Jain, J. L.; Fundamentals of Biochemistry, 2 nd ed.; S.Chand: New Delhi, 1983. | | | | | | | | | |
| Reference Books | 1. Conn, E. E.; Stumpf, P. K. <i>Outline of Biochemistry</i> , 5 th ed.; Wiley Eastern: New Delhi, 2002. | | | | | | | | | |
| | 2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. <i>Text Book of Biochemistry</i> , 4 th ed.; Macmillan: New York, 1970. | | | | | | | | | |
| | 3. Lehninger, A. L. <i>Principles of Biochemistry</i> , 2 nd ed.; CBS Publisher: Delhi, 1993. | | | | | | | | | |
| | 4. Rastogi, S. C. <i>Biochemistry</i> , 2 nd ed.; Tata McGraw-Hill: New Delhi, | | | | | | | | | |

| | 2003. 5. Chatterjea, M. N.; Shinde, R. <i>Textbook of Medical Biochemistry</i>, 5th ed.; Jaypee Brothers: New Delhi, 2002. |
|-------------------|--|
| Website and | 1) http://library.med.utah.edu/NetBiochem/nucacids.html |
| e-learning source | 2) http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/E/EnzymeKine |
| | tics.html |
| | 3) https://swayam.gov.in/courses/4384-biochemistry Biochemistry |
| | 4) https://onlinecourses.nptel.ac.in/noc19_cy07/preview |
| | Experimental Biochemistry |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain molecular logic of living organisms, composition of blood and blood coagulation

CO2: explain synthesis and properties of amino acids, determination of structure of peptides and proteins

CO3: explain factors influencing enzyme activity and vitamins as coenzymes

CO4: explain RNA and DNA structure and functions

CO5: explain biological significance of simple and compound lipids

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage ofCourse | | | | | |
| Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PSOs | | | | | |

Level of Correlation between PSO's and CO's

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of theCourse | ORGANI | C CHEMIS | STRY | - II | | | | | |
|--------------------|---|--|--|--------------------------------------|----------------|---|--|--|--|
| Paper No. | Core XI | II | | | | | | | |
| Category | Core | Year | III | Credits | 3 | Course | | | |
| | | Semester | VI | | | Code | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | ı | | |
| hours per week | 1 | 4 | - | | | 5 | | | |
| Prerequisites | Organic C | hemistry – I | | | | | | | |
| Objectives of the | This cours | e aims at pr | ovidii | ng knowledg | ge o | n | | | |
| course | classification, isolation and discussing the properties of alkaloids and terpenes preparation and properties of saccharides biomolecules different molecular rearrangement preparation and properties of organometallic compounds | | | | | | | | |
| | Terpenes: elucidation UNIT II Carbohyd Definition configurat: Definition suitable ex Monosacc ketohexoso Glucose, l structural of Interconve ketose and | Irates and Classification of Sugar of enanticamples. Charides— coes. Fructose— (elucidation, ersions of sugar of sugar of enanticamples) | fications. Determined to the commers. Determined to the commercial | on of Carbotermination of diastereom | niine, is enth | drates with configuration epimers and L hexoses — ton, properties | examples.Relative (Fischer's Proof). and anomers with aldohexoses and es, reactions, | | |
| | homopolys | | starc | | | _ | nportance of saccharides – | | |

UNIT III Molecular rearrangements: Molecular Rearrangement: Type of rearrangements, Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement UNIT IV Special reagents in organic synthesis AIBN, 9BBN, BINAP/BINOL, BOC, DABCO, DCC, DIBAL, DMAP, NBS/NCS, NMP, PCC, TBHP, TEMPO Organometallic compounds in Organic Synthesis Preparation, Properties and applications: Grignard Reagents, Organo Lithium Compounds, Ziegler – Natta, Wilkinson, Metal Carbonyl, Zeiss's Salt UNIT V Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis. Green reaction media – green solvents, green reagents and catalysts; tools used like microwave and ultra-sound in chemical synthesis. Questions related to the above topics, from various competitive Extended Professional examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) Component (is a part of internal component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional from this course Competency, Professional Communication and Transferable skills. 1 M.K.Jain, S. C.Sharma, Modern Organic Chemistry, Vishal Recommended Text Publishing, 4th reprint, 2009. 2 S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan IndiaLtd., 3rd edition, 2009

3 Arun Bahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& Company Pvt. Ltd., Multicolour edition, 2012.

Sultan Chand & Sons, New Delhi, 29th edition, 2007.

4 P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry,

| | 5. C Bandyopadhya; An Insight into Green Chemistry; Published on | | | | | | | | | |
|-------------------|---|--|--|--|--|--|--|--|--|--|
| | 2020 | | | | | | | | | |
| | | | | | | | | | | |
| Reference Books | 1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson | | | | | | | | | |
| | Education, Asia,6 th edition, 2012. | | | | | | | | | |
| | 2. T.W.Graham Solomons, Organic Chemistry, John Wiley & | | | | | | | | | |
| | Sons,11 th edition, 2012. | | | | | | | | | |
| | 3. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill | | | | | | | | | |
| | Education Pvt. Ltd., New Delhi,7 th edition,2009. | | | | | | | | | |
| | 4. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley | | | | | | | | | |
| | Longman Ltd, 6 th edition, 2006. | | | | | | | | | |
| | 5. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, 5th | | | | | | | | | |
| | Edition, 2010. | | | | | | | | | |
| Website and | 1.www.epgpathshala.nic.in | | | | | | | | | |
| e-learning source | 2.www.nptel.ac.in | | | | | | | | | |
| | 3.http:/swayam.gov.in | | | | | | | | | |
| | 4. Virtual Textbook of Organic Chemistry | | | | | | | | | |
| | 5. https://vlab.amrita.edu/ | | | | | | | | | |

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

CO1: explain isolation and properties of alkaloids and terpenes

CO2: explain preparation and reactions of mono and disachharides

CO3: classify biomolecules and natural products based on their structure, properties, reactions and uses.

CO4: explain molecular rearrangements like benzidine, Hoffmann etc.,

CO5: preparation and properties of organolithium compounds

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | | II | NORO | GANIC CI | INORGANIC CHEMISTRY -II | | | | | | | |
|--------------------|--|--|---------|---------------|-------------------------|-----------------|---|--|--|--|--|--|
| Paper No. | Core XIV | | | | | | | | | | | |
| Category | Core | Year | III | I Credits | | Course | | | | | | |
| | | Semester | VI | | | Code | | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | otal | | | | | |
| hours per week | 4 | | - | | | 4 | | | | | | |
| Prerequisites | Inorganic | Chemistry | - I | | | | | | | | | |
| Objectives of the | The course aims to provide knowledge on | | | | | | | | | | | |
| course | • tracer | elements ar | nd the | ir role in th | ne bi | iological syste | em. | | | | | |
| | | | | | | | | | | | | |
| | | iron transport and storage | | | | | | | | | | |
| | metallo enzymes, oxygen transport. | | | | | | | | | | | |
| | silicates and their applications | | | | | | | | | | | |
| | • indus | trial applica | tions (| of refractor | ies, | alloys, paints | and pigments | | | | | |
| Course Outline | UNIT I | | | | | | | | | | | |
| | Bioinorga Essential a Zn ²⁺ in bi | UNIT I Bioinorganic Chemistry Essential and trace elements: Role of Na ⁺ , K ⁺ , Mg ²⁺ , Ca ²⁺ , Fe ³⁺ , Cu ²⁺ and Zn ²⁺ in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg. | | | | | | | | | | |
| | UNIT II Metal ion | UNIT II Metal ion transport and storage | | | | | | | | | | |
| | myoglobin | , haemog | lobin | - oxy | gen | transport | Iron-porphyrins – - Bohr effect; storage - copper | | | | | |

UNIT III Metallo enzymes

Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes.

Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.

UNIT IV

Silicates

Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates(talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines)

UNIT V

Industrial Applications of Inorganic Compounds

Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels.

Nanocomposite Hydrogels: synthesis, characterization and uses.

Industrial visits and internship mandatory.

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)
Skills acquired

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text

1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31th ed., Milestone Publishers & Distributors, Delhi.

| Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advancd Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS William Heinemann, London. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, Schand and Company Ltd. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh |
|---|
| edition, 1992 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, |
| 2nded., S.Chand and Company, New Delhi. Gopalan R, (2009) <u>Inorganic Chemistry for Undergraduates</u>, Ist Edition, University Press (India) Private Limited, Hyderabad |
| 3. Sivasankar B, (2013) <u>Inorganic Chemistry.</u> Ist Edition, Pearson, Chennai |
| 4. Alan G. Sharp (1992), <u>Inorganic Chemistry</u> , 3 rd Edition, Addition-Wesley, England |
| 5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014. |
| 1.www.epgpathshala.nic.in |
| 2. www.nptel.ac.in |
| 3. http://swayam.gov.in |
| |

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

CO1: ability to explain the importance of tracer elements on biological system.

CO2: explain the metal ion transport, Bohr effect, Na, K, Ca pump.

CO3: explain the function of Vitamin B₁₂, Zn-Cu enzyme, ferredoxin, cluster enzymes.

CO4: classification and structure of silicates.

CO5: explain the manufacture of refractories, explosives, paints and pigments

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | PHYSICAL CHEMISTRY-II | | | | | | | | |
|--------------------|---|---|--|---|---|---|--|--|--|
| Paper No. | Core - X | \mathbf{V} | | | | | | | |
| Category | Core | Year | III | Credits | 3 | Course | | | |
| Curegory | | Semester | VI | | | Code | | | |
| Instructional | Lecture | Tutorial | | Practice | | Total | | | |
| hours per week | 4 | 1 | _ | Tructice | | 5 | | | |
| Prerequisites | | Themistry - I | | | | | | | |
| Objectives of the | 1 - | | | an overal | 1 view | of the | | | |
| course | The course aims at providing an overall view of the • phase diagram of one and two component systems • chemical equilibrium, • separation techniques for binary liquid mixtures. • electrical conductance and transport number. • galvanic cells, EMF and significance of electrochemical | | | | | | | | |
| Course Outline | component component and bismu compound (magnesium change (stange) | of terms; t systems — t systems — th - cadmi formation m — zinc codium — p water system equilibrium ass action — application gas —equilibrium as action — application gas —equilibrium the dependence — van't H layperon equilibrium the distillation ine-water, n | water a solid lum), a with and fotassion. n therrito the rium content of a content of the conte | and sulphu liquid equi freezing nh- congruerric chlorum), solid modynamic homogene onstant and geneous edier princip equilibrium eaction is and its appurantially mice-water – escible liquid | r - sup libria- nixture uent ride - l solu deriv ous eq d degr quilibr le - v ochore olicatio | simple euteces (potassium melting poi-water systetion (gold-site euteces) water systetion (gold-site euteces) water systetion (gold-site euteces) water systetion — relatively euteces end dissociation — decompan't Hoff reaces — Clayperons | ionship between sociation of PCl ₅ ation - formation position of solid ction isotherm – on equation – | | |

Electrical Conductance and Transference

Arrhenius theory of electrolytic dissociation — Ostwald's dilution law, limitations of Arrhenius theory; behavior of strong electrolytes — interionic effects — Debye Huckel theory —Onsager equation (no derivation), significance of Onsager equation, Debye Falkenhageneffect, Wien effect. Ionic mobility — Discharge of ions on electrolysis (Hittorf's theoretical device), transport number —determination — Hittorf's method, moving boundary method — factors affecting transport number — determination of ionic mobility; Kohlrausch's law- applications; molar ionic conductance and viscosity (Walden's rule); applications of conductance measurements — determination of - degree of dissociation of weak electrolyte, dissociation constant of weak acidand weak base, ionic product of water, solubility and solubility product of sparingly soluble salts - conductometric titrations — acid base titrations.

UNIT V

Galvanic Cells and Applications

Galvanic cell, representation, reversible and irreversible cells, EMF and its measurement – standard cell; relationship between electrical energy and chemical energy; sign of EMF and spontaneity of a reaction, thermodynamics and EMF – calculation of ΔG , ΔH , and ΔS from EMF data; reversible electrodes, electrode potential, standard electrode potential, primary and secondary reference electrodes, Nernst equation for electrode potential and cell EMF; types of electrodes – metal/metal ion, metal amalgam/metal ion, metal, insoluble salt/anion, gas electrode, redox electrode; electrochemical series – applications of electrochemical series. Chemical cells with and without transport, concentration cells with and without transport;

Applications of EMF measurements

applications of EMF measurements – determination of activity

| | coefficient of electrolytes, transport number, valency of ions, solubility product, pH using hydrogen gas electrode, quinhydrone electrode and glass electrode, potentiometric titrations – acid base titrations, redox titrations, precipitation titrations, ionic product of water and degree of hydrolysis; redox indicators - use of diphenylamine indicator in the titration of ferrous iron against dichromate. Industrial component Galvanic cells- lead storage, Ni-Cd, Li and Zn-air, Al-air batteries Fuel cells – H ₂ -O ₂ cell – efficiency of fuel cells. corrosion –mechanism, types and methods of prevention. |
|---|--|
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| question paper) Skills acquired from this course Recommended Text | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, ShobanLalNagin Chand and Co., forty eighth edition, 2021. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventh edition, 2018. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physical chemistry, 28th edition 2019, S, Chand & Co. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996. J. Rajaram and J.C. Kuriacose, Thermodynamics, ShobanLalNagin Chand and CO., 1986. |
| Reference Books | K. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition,2009. Gilbert. W. Castellen, Physical Chemistry, Narosa Publishing House, third edition, 1985. P. W. Atkins, and Julio de Paula, Physical Chemistry, Oxford University press, seventh edition, 2002. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar, forty first, edition, 2001 D.N.Bajpai, Advanced Physical Chemistry, S.Chand&Co., 2001 |

| Website and | https://nptel.ac.in https://swayam.gov.in | | | | | | | |
|-------------------|--|--|--|--|--|--|--|--|
| e-learning source | https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPT | | | | | | | |
| | s/MTS_07_m.pdf | | | | | | | |
| | Γhermodynamics - NPTEL | | | | | | | |
| | https://www.youtube.com/watch?v=f0udxGcoztE Introduction | | | | | | | |
| | to chemical equilibrium – MIT opencourse ware | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Course Learning Outcomes (for Mapping with POs and PSOs)On

completion of the course the students should be able to

CO1: construct the phase diagram for one component and two component systems, explain the properties of freezing mixture, component with congruent melting points and solid solutions.

CO2: apply the concepts of chemical equilibrium in dissociation of PCl₅, N₂O₄ and formation of HI, NH₃, SO₃ and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation.

CO3: Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, partially miscible mixtures and immiscible liquids.

CO4: Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance.

CO5: Construct electrochemical cell with the help of electrochemical series and calculate cell EMF. Demonstrate the applications of EMF and significance of potentiometric titrations.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of the | FUNDAMENTALS OF SPECTROSCOPY | | | | | | | | | |
|-------------------|---|-------------|--------|--------------|---------|-----------------|---------------------------------------|--|--|--|
| Course | | | | | | | | | | |
| Paper No. | EC VII | | 1 | 1 | | T | | | | |
| Category | Elective | Year | III | Credits | 3 | Course | | | | |
| | Course | Semester | VI | | | Code | | | | |
| Instructional | Lecture | Tutorial | | | | | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | |
| Prerequisites | General Che | | | | | | | | | |
| Objectives of the | This course | _ | _ | | _ | | | | | |
| course | | | nagne | tic propert | ies (| of organic an | d inorganic | | | |
| | | npounds | | | | | | | | |
| | | | | | UV- | Visible, infra | red, Raman, | | | |
| | | IR and Mass | - | - | | | | | | |
| | | | | | UV- | -Visible, infra | red, Raman, | | | |
| | NM | IR and Mass | spect | rometry | | | | | | |
| | | | of va | rious spe | ectral | techniques | in structural | | | |
| | elu | cidation | | | | | | | | |
| | • sol | ving combin | ed spe | ectral prob | lems | | | | | |
| Course Outline | TINITE T | | | | | | | | | |
| | UNIT I | | | | | | | | | |
| | Electrical and Magnetic properties of molecules Dipole moment – polar and nonpolar molecules – polarisability of | | | | | | | | | |
| | 1 - | _ | | - | | - | • | | | |
| | | | of dij | pole mom | ents | in the study | of organic and | | | |
| | inorganic m | | 1 | | 41.1 | •, | . 11 11 | | | |
| | | - | | - | | - | sceptibility and | | | |
| | | _ | _ | - | | • | etermination of | | | |
| | " | | usii | ig Guoy | bai | ance, terron | nagnetism, anti | | | |
| | ferromagnet | | | | | | | | | |
| | Microwave | - | . • | -11 (- | .: .: 1 | 4.4 | : | | | |
| | 1 | | | , | _ | rotator approa | · · · · · · · · · · · · · · · · · · · | | | |
| | | | | | _ | | Stopic | | | |
| | substitution – instrumentation and applications | | | | | | | | | |
| | UNIT II | | | | | | | | | |
| | Ultraviolet | | _ | | | | | | | |
| | Electronic | spectra o | | | | ` | * * | | | |
| | 1 | · · | | | | | al fine structure | | | |
| | | | | | | | e – dissociation | | | |
| | | | | | | | evaluation of | | | |
| | | energy – pr | e-diss | ociation tra | ansit | ion - σ -σ *, 1 | π-π*, n-σ*, n-π* | | | |
| | transitions. | | | | | | | | | |
| | | | | | | | d to conjugated | | | |
| | | | | | | nentary Probl | | | | |
| | - | - principle | and ap | plications | (est | imation of Fe | 3+) | | | |
| | UNIT III | | | | | | | | | |

Infrared spectroscopy

Vibration spectra —diatomic molecules — harmonic oscillator and anharmonic oscillator; Vibration — rotation spectra — diatomic molecule as rigid rotator and anharmonic oscillator (Born-Oppenheimer approximation oscillator) — selection rules, vibrations of polyatomic molecules — stretching and bending vibrations — applications — determination of force constant, moment of inertia and internuclear distance — isotopic shift — application of IR spectra to simple organic and inorganic molecules — (group frequencies)

Raman Spectroscopy

Rayleigh scattering and Raman scattering of light – Raman shift – classical theory of Raman effect – quantum theory of Raman effect – Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) – applications.

UNIT IV

Nuclear magnetic resonance spectroscopy:

PMR – theory of PMR – instrumentation - number of signals – chemical shift – peak areas and proton counting – spin-spin coupling – applications. Problems related to shielding and deshielding of protons, chemical shifts of protons in hydrocarbons, and in simple monofunctional organic compounds; spin-spin splitting of neighbouring protons in vinyl and allyl systems.

UNIT V

Mass spectrometry

Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula-fragmentation and structural elucidation – McLafferty rearrangement; Retro Diels Alder reaction - illustrations with simple organic molecules.

Solving structure elucidation problems using multiple spectroscopic data (NMR, MS, IR and UV-Vis).

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended 1. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. Elements of Text Analytical Chemistry; S Chand: New Delhi, 2003. 2. Usharani, S. Analytical Chemistry, 1sted.; Macmillan: India, 2002. 3. Banwell, C.N.; Mc Cash, E. M. Fundamentals of Molecular Spectroscopy, 4th ed.; Tata McGraw Hill, New Delhi, 2017. 4. U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand &Sons,2nd Ed., 2005 5. B.K.Sharma, Spectroscopy,22nd ed., Goel Publishing House, 2011. 1. Srivastava, A. K.; Jain, P. C. Chemical Analysis an Instrumental Reference Books Approach, 3rded.; S.Chand, New Delhi, 1997. 2. Robert D Braun. Introduction to Instrumental Analysis; Mc.Graw Hill: New York, 1987. 3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. Fundamentals of Analytical Chemistry, 9thed.; Harcourt college Publishers: USA, 2013. 4. Madan, R. L.; Tuli, G. D. Physical Chemistry, 2nded.; S.Chand: New Delhi, 2005. 5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. Principles of Physical Chemistry, 43rd ed.; Vishal Publishing: Delhi, 2008. 1. http://vallance.chem.ox.ac.uk/pdfs/SymmetryLectureNotes2004.pdf Website and 2.http://chemistry.rutgers.edu/undergrad/chem207/SymmetryGroupThe e-learning source ory.html 3. www.epgpathshala.nic.in 4. www.nptel.ac.in 5.. http:/swayam.gov.in

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain electrical and magnetic properties of materials and microwave spectroscopy

CO2: explain theory, instrumentation and applications of Infrared and Raman spectroscopy

CO3: apply selection rules to understand spectral transitions, explain Woodward – Fieser's rule for the calculation of wavelength maximum of conjugated dienes

CO4: explain theory, instrumentation and applications of NMR spectroscopy

CO5: explain theory, instrumentation and applications of Mass spectrometry

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | S | S | S | S | S | S | S | M | S | M |
| CO2 | M | S | S | S | M | S | S | M | M | M |
| CO3 | S | S | S | M | S | S | S | M | S | M |
| CO4 | S | S | S | S | S | S | S | M | M | M |
| CO5 | S | M | S | S | S | S | S | M | M | S |

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| Title of theCourse | PHYSICAL CHEMISTRY PRACTICAL – II | | | | | | L – II |
|--------------------|-----------------------------------|------------------------------|----------------|------------|----------|------------------|-------------------|
| Paper No. | Core XV | I | | | | | |
| Category | Core | Year | III | Credi | 2 | Course | |
| | | Semester | VI | ts | | Code | |
| Instructional | Lecture | Tutorial | Lab | Practice | <u> </u> | Total | |
| hours per week | - | - | 3 | | | 3 | |
| Prerequisites | Theoretica | l knowledge | on pl | hysical cl | nemis | stry | |
| Objectives of the | | rse aims at | | • | | | |
| course | 1 | | • | • | hem | istry experime | nts |
| | | | | | | | |
| | • ha | inds on exp | erience | e in carry | ing c | out the experin | ients |
| Course Outline | | | | | of eı | atectic tempera | ature and |
| | | nyl amine o | | | linhe | nvl system | |
| | _ | • | • | | - | ire of a salt hy | drate. |
| | | | | | | on temperature | |
| | water syst | | 11 | | | 1 | 1 |
| | 1 | | rolyte | on misci | bility | temperature | of phenol – water |
| | system | | • | | | • | • |
| | 5. Deter | mination of | conce | ntration c | f soc | dium chloride | using phenol- |
| | | nloride syste | | | | | |
| | Unit II | | | | | | |
| | Distribution | on law | | | | | |
| | 6. Deterr | nination of | the d | istributio | n coe | efficient of io | dine between |
| | | on tetrachlo | | | | | |
| | 7. Determ | ination of e | equilib | rium cons | stant | of the reaction | 1 |
| | I ₂ + | I | I ₃ | - | | | |
| | 8. Determi | nation of c | oncent | tration of | the | given potassiu | m iodidesolution |
| | | bove equili | | | , | . 1 | |
| | UNIT III | 1 | | | | | |
| | Electroche | emistry | | | | | |
| | | | itratio | n of hydr | ochl | oric acid agair | nst sodium |
| | hydroxide | | | • | | C | |
| | | tiometric tit nhydronde e | | | s ion | against potass | ium dichromate |
| Extended | Questions | related to th | ne abov | ve topics, | fron | n various com | petitive |
| Professional | ` | | | | | to be solved | L |
| Component (is a | (To be disc | cussed durin | ng the | Tutorial 1 | nours | s) | |
| part of internal | ľ | | _ | | | • | |
| component only, | | | | | | | |
| | | | | | | | |
| Not to be included | | | | | | | |
| | | | | | | | |

| question paper) | |
|-------------------|--|
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Reference Books | Sindhu, P.S. Practicals in Physical Chemistry, Macmillan India: New Delhi, 2005. Khosla, B. D. Garg, V. C.; Gulati, A. Senior Practical Physical Chemistry, R. Chand: New Delhi, 2011. Gupta, Renu, Practical Physical Chemistry, 1st Ed.; New Age International: New Delhi, 2017. |
| Website and | https://www.vlab.co.in/broad-area-chemical-sciences |
| e-learning source | |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: Describe the principles and methodology for the practical work.
CO2: Explain the procedure, data and methodology for the practical work

CO3:Apply the principles of phase rule and electrochemistry for carrying out the practical

CO4: Demonstrate laboratory skills for safe handling of the equipment and chemicals

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution toPSOs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PO's and CO's

| Title of the | NANOSCIENCE | | | | | | | | |
|-------------------|--|--|---------------------------|---|------------------------|--|-------------------------|--|--|
| Course | E C VIII | | | | | | | | |
| Paper No. | | | | | | | | | |
| Category | Elective | | VI | Credits | 3 | Code | | | |
| T 4 4 1 | T4 | Semester | | D., 4: | | Code | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per week | 4 D : 1 | 1 1 ' 1 | <u> </u> - | 1 1 ' 4 | | 4 | | | |
| Prerequisites | | wledge in phy | | · | | | | | |
| Objectives of the | | se aims at pro | • | • | | | | | |
| course | | roduction to 1 | | | ers a | and nanocom | posites | | |
| | 1 | perties of nar | | | | | | | |
| | | aracterization | | | • | | | | |
| | | thesis of car | | | aphe | ne, quantum | dots, self- | | |
| | | embled nanor | | | | | | | |
| | • app | olications of r | nanoma | terials as so | ensoi | rs | | | |
| | | | | | | | | | |
| Course Outline | UNIT I | | | | | · | | | |
| | | on to nanosci | | | | | | | |
| | | | | | | | , quantum dots, | | |
| | | | | tes. Electro | on be | haviour in | free space, bulk | | |
| | | d nanomateria | | | | | | | |
| | | | | | | | proach(physical | | |
| | | | • | | | • | nods based on | | |
| | evaporation of a precursor-inert gas condensation, ion sputtering, spray | | | | | | | | |
| | pyrolysis, | | | nthesis-nanolithography. Bottom-up approach | | | | | |
| | (chemical methods) - solvothermal synthesis, photochemical method, | | | | | | | | |
| | gamma radiolysis, sonochemical synthesis, electro deposition, sol-gel | | | | | | | | |
| | method, nanomaterials via chemical routes- solvents reducing agents, | | | | | | | | |
| | capping agents-stabilization of nanoparticles -electrostatic and steric | | | | | | | | |
| | stabilization, common stabilizers, nanoparticle growth in solution, | | | | | | | | |
| | templated growth, Langmuir – Blodgett (L-B) method, reverse micelles- | | | | | | | | |
| | emulsion method. | | | | | | | | |
| | 1 | Unit II | | | | | | | |
| | Properties of materials on a nanoscale | | | | | | | | |
| | Optical properties of metal and semiconductor nanomaterials- surface | | | | | | | | |
| | Plasmon resonance (SPR), surface enhanced Raman spectra (SERS), | | | | | | | | |
| | | | | | | | m. Magnetic | | |
| | | | | | | | es, electronic | | |
| | properties, Chemical properties- chemical process on the surface of | | | | | | | | |
| | nanoparticles, catalysis, mechanical properties. | | | | | | | | |
| | UNIT III | | | | | | | | |
| | Techniques employed for characterisation of nanomaterials | | | | | | | | |
| | Spectrocopy | y – UV-visi | ible, P | Spectrocopy – UV-visible, Photoelectron spectroscopy – Electron | | | | | |
| l . | microscopy – Cy-visible, Filotoelectron spectroscopy – Electron microscopy – Scanning Flectron Microscopy (SFM) Transmission | | | | | | | | |
| | microscopy – Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning probe microscopy (SPM) – | | | | | | | | |
| | | Scanning | Elect | ron Micro | scop | y (SEM), | Transmission | | |
| | Electron M | Scanningicroscopy (T | Election (EM), | ron Micro Scanning | oscop prob | y (SEM), ne microsco | Transmission py (SPM) – | | |
| | Electron M Atomic For | Scanning icroscopy (Tree Microscopy | Electronic EEM), Eppy (A. | ron Micro Scanning FM), Scar | oscop prob nning | y (SEM), be microsco g Tunneling | Transmission | | |

| | (XRD) [Principle and Block diagram only]. |
|--------------------|---|
| | UNIT IV |
| | Special nanomaterials |
| | Carbon Nano Structures Carbon nanotubes: Introduction - types - zigzag, armchair, helical, synthesis by CVD, Functionalization of Carbon Nanotubes, Reactivity of Carbon Nanotubes, Field emission, Fuel Cells, Display devices. Other Important Carbon based materials: Preparation and |
| | Characterization Fullerene, Graphene, properties, DLC and nanodiamonds and Applications |
| | Semiconductor nanoparticles: Quantum dots, synthesis – chemical synthesis using clusters, properties, porous silicon – electrochemical etching, aerogel – types – silica aerogel, resorcinol formaldehyde (RF) aerogels, zeolites – applications. Self Assembled Nanomaterials: Self Assembled Monolayers (SAMS) – inorganic, organic molecules. |
| | UNIT V |
| | Application of nanomaterials |
| | Biomedical Applications- drug, drug delivery, biolabelling, artificial implants, cancer treatment. Sensors – Natural nanoscale sensors, chemical sensors, biosensors, electronic noses. |
| | Optics & Electronics – Nanomaterials in the next generation computer technology, high definition TV, flat panel displays, quantum dot laser, single electron transistors [SET]. |
| | Nanotechnology in agriculture – Fertilizer and pesticides nanomaterials for water purification, nanomaterials in food and packaging materials, fabric industry. Impacts of Nanotechnology – human & environmental safety risks. |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC/ JAM /TNPSC others to be solved |
| Component (is a | (To be discussed during the Tutorial hours) |
| part of internal | 120 00 albeaused during the Tatorial Hours) |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| nom ans course | compound, Troissional Communication and Transferable skills. |

| Recommended | 1. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices, | | | | | | |
|-------------------|--|--|--|--|--|--|--|
| Text | Capital Publishing Co., New Delhi. | | | | | | |
| | 2. Pradeep. T, Nano: The Essentials, Understanding Nanoscience and | | | | | | |
| | Nanotechnology; Tata McGraw-Hill Publishing Company Limited, | | | | | | |
| | NewDelhi, 2007. | | | | | | |
| | 3. Shah. M.A.; Tokeer Ahmad, Principles of Nanoscince and | | | | | | |
| | Nanotechnology; Narosa Publishing House, New Delhi, 2010. | | | | | | |
| | 4. Murthy. B.S; Shankar. P, Baldev Raj.; Rath. B.B. JamesMurday, | | | | | | |
| | Textbook of Nanoscience and Nanotechnology; Universities press, | | | | | | |
| | India Ltd ,Hyderabad. 2012. | | | | | | |
| | | | | | | | |
| Reference Books | 1. Sharma. P.K., <i>Understanding Nanotechnology</i> ; Vista International | | | | | | |
| | Publishing House, Delhi. 2008. | | | | | | |
| | 2. Charles P. Poole Jr.; Frank J. Owens. <i>Introduction to</i> | | | | | | |
| | Nanotechnology; A John Wiley & Sons, INC., Publication, 2003. | | | | | | |
| | 3. Viswanathan B., <i>Nano Materials;</i> Narosa Publishing House, New | | | | | | |
| | Delhi, 2009. | | | | | | |
| | 4. Edited by C.N.R. Rao; Mu"ller.A; Cheetham. A.K. Nanomaterials | | | | | | |
| | Chemistry Recent Developments and New Directions, WILEY-VCH | | | | | | |
| | Verlag GMBH & Co.,KGaA, Darmstad. | | | | | | |
| | 5. Jing Zhong Zhang, Optical properties and spectroscopy of | | | | | | |
| | Nanomaterials; World Scientific Publishing Pvt. Ltd., Singapore. | | | | | | |
| | | | | | | | |
| Website and | 1) http://www.nanotechnology.com/docs/wtd015798.pdf | | | | | | |
| e-learning source | 2) http://nccr.iitm.ac.in/Nanomaterials.pdf | | | | | | |
| | | | | | | | |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain the general concepts and physical phenomena of relevance within the field of nanoscience.

CO2: describe the properties, synthesis, characteristics of nanomaterials, special nanomaterials and applications.

CO3: examine the structure, properties, applicability and characterization of nanomaterials.

CO4: analyze various synthesis procedures, characterizations and uses of carbon nanotubes, fullerene and graphene

CO5: discuss applications of nanomaterials of sensors and in optics and electronics

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution toPSOs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PO's and CO's

| Title of the | POLYMER SCIENCE | | | | | | | |
|--------------------------|---|---------------------------------------|--------|-------------|--------|---------------------------------------|--------------------|--|
| Course | FC VIII | | | | | | | |
| Paper No. | EC VIII | ₹7 | TIT | G 114 | 12 | | | |
| Category | Elective | Year | III | Credit | 3 | Course | | |
| | | Semeste r | VI | S | | Code | | |
| Instructional | Lecture | Tutorial | Lab | Practice | ; | Total | | |
| hours per week | 4 | | - | | | 4 | | |
| Prerequisites | Knowledge | on functio | nal g | roups and | reac | tion mechanism | ns | |
| Objectives of the | The cour | se aims at p | rovid | ling an ov | erall | view of | | |
| course | • cla | assification | of po | lymers, p | repai | ration of polym | ers | |
| | • kinetics of polymerization and characterization of polymers | | | | | | | |
| | | | | | | racterize polym | | |
| | • re | actions of p | olym | ers | | | | |
| | | eciality poly | • | | C, PN | ИMA | | |
| Course Outline | UNIT I | , , , , , , , , , , , , , , , , , , , | - | | | | | |
| | Introducti | on | | | | | | |
| | Difference | between | polyn | ner and | macı | romolecule – | classification - | |
| | synthetic | and natura | al, o | rganic a | nd | inorganic, the | rmoplastic and | |
| | thermosetti | ng. Plastics | , elas | tomers, fi | bres | and liquid resin | ns. | |
| | Technique | es of polym | eriza | tion | | | | |
| | | | | | sion 1 | oolymerization | | |
| | Unit – II | ion, cinaisi | on un | a suspens | 1011 | porjuienzation | | |
| | | f polymeriz | zatior | 1 | | | | |
| | | | | | ı pol | ymerisation; ic | onic, freeradical, | |
| | | | | | • | nerisation – rea | | |
| | | ock and graf | | • | • | | • | |
| | Character | isation of p | olym | iers | | | | |
| | Appearance | e, feel and h | nardne | ess, densit | v. ef | fect of heat, sol | ubility. | |
| | | | | | - | | gth, mechanical, | |
| | thermomec | | and | | | properties of | | |
| | viscoelastic | | | | | rr | r y | |
| | UNIT III | | | | | | | |
| | Molecular Weight and Properties of Polymers | | | | | | | |
| | | | | | | | Weight Average, | |
| | Molecular | | | | | | | |
| | _ | | | | | | ght polydispersity | |
| | | | | | | | cattering - Zimm | |
| | μ ΄ | _ | | | | velocity an | | |
| | - | | - | | | chromatograpl | - | |
| | _ | _ | _ | | | | nperature-State of | |
| | | | | | | ions, Factors | Influencing Glass | |
| | | Temperatur | | | | · · · · · · · · · · · · · · · · · · · | , | |
| | | | | | | | perature, TGA / | |
| | _ | - | Pol | ymers: (| _rys1 | aiiine Behavi | our, Degree of | |
| | Crystallinit | y | | | | | | |
| | | | | | | | | |

| | UNIT IV Reactions of Polymers-Hydrolysis, Acidolysis, Aminolysis, Additionand Substitution Reactions (One Example Each) Cyclisation, Cross-Linking and Reactions of Specific FunctionalGroups in the Polymer Polymer technology Processing of polymers – casting, thermoforming, moulding – extrusion, compression, blow moulding – foaming, lamination, reinforming, processing of fibres, malt, use and dry animaling. |
|---|--|
| | reinforcing – processing of fibres – melt, wet and dry spinning. UNIT V Speciality polymers Polyelectrolytes, conducting polymers, polymeric supports for solid phase synthesis, biomedical polymers, liquid crystalline polymers, electroluminescent polymers – two examples of each of these polymers. Polyethylene, PVC, PMMA, polyester; rubber – synthetic and natural, vulcanisation of rubber. Polymer Degradation |
| | Types of Degradation - Thermal, Mechanical, Ultra Sound, Photo Radiation and Chemical Degradation Methods. |
| | Rubber-Natural and Synthetic-Structure, Mechanism of Vulcanisation Biodegradable and Non-Biodegradable Polymers. |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| question paper) Skills acquired from this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended Text | Gowariker V.R, N.V. Viswanthan and Jayadev Sreedhar. Polymer Science. New Delhi: New Age International, 2015 Misra G.S. Introductory Polymer Chemistry. New Delhi: Wiley Eastern, 2010. Bahadur P and Sastry N V. Principles of Polymer Science. New Delhi: Narosa Publishing House, 2005 Ahluwalia, V.K. Anuradha Mishra, <i>Polymer Science A Text Book</i>, Ane Books India: New Delhi, 2008. Morrison, R. R.; Boyd, R. N.; Bhattacharjee, S. K. <i>Organic Chemistry</i>, 7th ed.; Pearson: New Delhi, 2011. |

| Reference Books | 1. Billmeyer, F.W. Polymer Science. India: Wiley-Interscience, 2007. | | | | | | | | |
|-------------------|---|--|--|--|--|--|--|--|--|
| | 2. Seymour, R. B.; CarraherJr.C.E. Polymer Chemistry: An | | | | | | | | |
| | Introduction, Marcel Dckker | | | | | | | | |
| | Inc: New York, 1981. | | | | | | | | |
| | 3. Sinha, R. Outlines of Polymer Technology, Prentice Hall of India: | | | | | | | | |
| | New Delhi, 2000. | | | | | | | | |
| | 4. Joel R. Fried, <i>Polymer Science and Technology</i> , 3 rd ed.; Prentice | | | | | | | | |
| | Hall of India: New Delhi, 2014. | | | | | | | | |
| Website and | 1. https://polymerdatabase.com | | | | | | | | |
| e-learning source | 2. http://amrita.vlab.co.in/?sub=2&brch=190∼=603&cnt=1 | | | | | | | | |
| | 3.http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/polymers. | | | | | | | | |
| | htm | | | | | | | | |
| | 4.http://nsdl.niscair.res.in/bitstream/123456789/406/2/Molecular+weigh | | | | | | | | |
| | ts+of+polymers.pdf | | | | | | | | |

CO1: explain classification of polymers, elastomers, fibres and liquid resins CO2: explain addition and condensation polymerization, mechanical properties of polymers

CO3: determine the molecular weight of polymers, and explain the thermal properties of

CO4:explain reactions of polymers and polymer processing

CO5:discuss speciality polymers like PVC, PMMA, rubbers, biodegradable polymers

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course | | | | | |
| Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PSOs | | | | | |

Level of Correlation between PSO's and CO's

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of the Course | | PHAI | RMACE | CUTICAL | L CI | HEMISTRY | | |
|------------------------|----------|----------------------------------|---------|----------|--------|------------------|--|--|
| Paper No. | Elective | Course VIII | | | | | | |
| Category | Elective | Year | III (| Credits | 3 | Course | | |
| | | Semester | VI | | | Code | | |
| Instructional | Lecture | Tutorial | Lab I | Practice | | Total | | |
| hours per week | 4 | | - | | | 4 | | |
| Prerequisites | Knowled | ge on active | chemica | al compo | unds | and biochemistry | | |
| Objectives of the | The cour | se aims at pr | oviding | an overa | ll vie | ew of | | |
| course | • dr | drugs design and drug metabolism | | | | | | |
| | | | | | | | | |

- drugs for major diseases like cancer, diabetes and AIDS
- analgesics and antipyretic agents
- significance of clinical tests

Course Outline

UNIT I

Introduction

Important terminologies – drug, pharmacognosy, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, antimetabolites, mutation, bacteria, virus, fungi, actinomycetes, vaccines, pharmacopeia, posology and therapeutic index.

Sources of drugs – dosage forms – bio availability – routes of administration –

absorption, distribution and elimination of drugs – drug metabolism – prescription terms.

Structure and pharmacological activity

Effect of – unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.

Development of Drugs

Development of a drug – classic steps- lead compounds- comparison of traditional and modern methods of development of drugs – drug design by method of variation – disjunction and conjunction methods.

Unit II

Indian medicinal plants

Some important Indian medicinal plants – tulsi, neem, kizhanelli, mango, semparuthi, adadodai, turmeric and thoothuvalai – uses.

Common diseases and their treatment

Causes, prevention and treatment of the following diseases:

Insect borne diseases— malaria, filariasis, plague; Air borne diseases— diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis; Water borne diseases— cholera, typhoid, dysentery.

Digestive system – jaundice; Respiratory system – asthma; Nervous system – epilepsy.

Antibiotics

Definition – classification – structure and therapeutic uses of chloramphenicol, penicillins , structure activity relationship of chloramphenicol; therapeutic uses of ampicillin, streptomycin, erythromycin, tetracycline, rifamycin.

UNIT III

Drugs for major diseases

Cancer – common causes – chemotherapy – anti neoplastic agents – classification –adverse effects of cytotoxic agents; alkylating agents – chlorambucil; anti metabolites – methotrexate, fluouracil; Vinca alkaloids – vincristine, vinblastine.Diabetes – types –

management of diabetes – insulin ; oral hypoglycemic agents - sulphonyl ureas – chlorpropamide ; biguanides - metformin – thiazolidinediones .Cardiovascular drugs– cardio glycosides ; anti arrhythmic agents – quinidine, propranolol hydrochloride ; anti-hypertensive drugs - Aldomet, pentoliniumtartarate; vasodilator-tolazoline hydrochloride, sodium nitroprusside.AIDS – causes, symptoms and prevention – anti HIV drugs - AZT, DDC.

UNIT IV

Analgesics and antipyretic agents

Classification – action of analgesics – narcotic analgesics – morphine; synthetic analgesics – pethidine, methadone; antipyretic analgesics – salicylic acid derivatives, indolyl derivatives, p-aminophenol derivatives.

Anaesthetics

Definition, characteristics, classification - general anaesthetics – volatile anaesthetics – nitrous oxide, ethers, cyclopropane, chloroform,halothane, trichloro ethylene– storage, advantages and disadvantages; non volatileanaesthetics – thiopental sodium; local anaesthetics – requisites – advantages- esters – cocaine, benzocaine; amides – lignocaine, cinchocaine.

Blood and haemotological agents

Blood— composition, grouping — physiological functions of plasma proteins — mechanism of clotting; Coagulants — vitamin K, protamine sulphate, dry thrombin; Anti coagulants — coumarins, citric acid and heparin; antifibrinolytic agents — aminocaproic acid and tranexamic acid.

Anaemia– causes, types and control – anti anaemic drugs.

UNIT V

Clinical Chemistry

Blood tests – blood count – complete haemotogram – Hb, RBC, GTT, TC, DC, platelets, PCV, ESR; bleeding and clotting time – glucose tolerance test.

Significance of Clinical Tests

Serum electrolytes - blood Glucose - orthotoluidine method; Renal functions tests - blood urea, creatinine; liver function tests - serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL, coronaryrisk index. Urine examination – pH, tests for glucose, albumin and bile pigment.

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
|-------------------|---|
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. Jayashree Ghosh, (1999), A text book of pharmaceutical chemistry, |
| Text | 2 nd ed., S.Chand& company, New Delhi. |
| | 2. Lakshmi S, (2004), Pharmaceutical chemistry, 3 rd ed., Sultan |
| | chand& sons, Delhi. |
| | 3. Tripathi K D, (2018), Essentials of medical pharmacology, 8 th ed., |
| | Jaypee brothers medical publishers (P) Limited, New Delhi. |
| | 4. Ashutosh Kar, (2018), Medicinal chemistry, 7 th ed., New age |
| | international (P) Limited, |
| | Publishers, New Delhi. |
| | |
| Reference Books | Reference Books: |
| | 1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I) |
| | 6 th ed ., Himalaya |
| | publishing house, Bombay. |
| | 2. Chatwal G R, (1991), Pharmaceutical chemistry, organic (vol-II)., |
| | Himalaya publishing house, Bombay. |
| | 3. Patrick G, (2002), Instant Notes Medicinal Chemistry, Viva Books |
| | Private Limited, New Delhi. |
| | 4. Intellectual Property Rights, NeerajPandey, Khushdeep Dharni. |
| | Publisher: PHI Learning Pvt. Ltd., 2014 ISBN: 812034989X, |
| | 9788120349896. |
| *** 1 *4 1 | |
| Website and | 1. http://www.pharmacy.umaryland.edu/faculty/amackere/courses/phar5 |
| e-learning source | 31_delete/lectures/qsar_1.pdf 2. http://www.indianmedicinalplants.info/ |
| | 3. https://www.wipo.int/about-ip/en/ |
| Course Learning O | strong (for Monning with DOs and DCOs)On |

- CO1: Define the pharmaceutical terminologies; describe the principles in pharmacological activity, drug development, clinical chemistry, hematology, therapeutic drugs and treatment of diseases; list the types of IPR and trademarks.
- CO2: Discuss the development of drugs, structural activity, disease types, physiochemical properties of therapeutic agents, significance of medicinal plants, clinical tests and factors for patentability.
- CO3: Apply the principles involved in structural activity and drug designing, functions ofhaematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.
- CO4: explain classification of analgesics and anasthetics, and physiological functions of plasma protiens
- **CO5:** explain the significance of clinical tests like blood urea, serum proteins and coronary risk index

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course | | | | | |
| Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PSOs | | | | | |

Level of Correlation between PSO's and CO's

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PO's and CO's

GENERIC ELECTIVE

| Title of theCourse | CHEMISTRY FOR PHYSICAL SCIENCES I | | | | | | |
|--------------------|-----------------------------------|----------------------------------|--------|--------------|--------|------------------|------------------|
| | | (FOR MATE | HEM | IATICS | & PI | HYSICS STU | DENTS) |
| Paper No. | Generic | Elective I | | | | | |
| Category | Generic | Year | I (| Credits | 3 | Course | |
| | Elective | Semester | I | | | Code | |
| Instructional | Lecture | Tutorial | La | b Practic | ee | Total | |
| hours per week | 4 | - | | | | 4 | |
| Prerequisites | | condary chemi | | 1 1 1 | | .1 | |
| Objectives of the | | e aims to prov | | _ | _ | | 1' |
| course | | asics of atomic | | | | | |
| | | oncepts of the oncepts of nuc | | - | | us applications | S. |
| | | nportance of c | | - | | | |
| | | ualitative and | | | | 2 | |
| | | uamanve and | ana | iyticai iiic | mou | · | |
| Course Outline | UNIT I | | | | | | |
| | Chemic | al Bonding a | nd I | Nuclear (| Chem | istry | |
| | Chemic | al Bonding: N | Mole | cular Or | bital | Theory-bondi | ng, antibonding |
| | and no | n-bonding orb | oitals | . Molecu | lar o | rbital diagram | ns for Hydrogen, |
| | Helium, | , Nitrogen; dis | scuss | ion of bo | nd o | der and magn | etic properties. |
| | Nuclea | r Chemistry: | Fu | ndamenta | al pa | articles - Is | otopes, Isobars, |
| | Isotone | es and Isome | rs-D | ifferences | bet | ween chemica | al reactions and |
| | nuclear | reactions - gr | roup | displace | ment | law. Nuclear | binding energy - |
| | mass d | lefect - calcı | ılatio | ons. Nuc | lear | fission and 1 | nuclear fusion - |
| | differe | nces – Stellar | ene | rgy. App | licati | ons of radioi | sotopes - carbon |
| | dating, | rock dating ar | nd m | edicinal a | pplic | ations. | |
| | Unit II | | | | | | |
| | Industr | ial Chemistr | y | | | | |
| | Fuels: F | Fuel gases: Na | tural | gas, wat | er ga | s, semi water | gas, carbureted |
| | water ga | as, producer g | as, C | CNG, LPC | G and | l oil gas (manı | ufacturing |
| | details r | not required). | Silic | ones: Syr | nthes | is, properties a | and uses of |
| | silicone | S. | | | | | |
| | Fertilize | ers: Urea, amn | noni | um sulph | ate, p | otassium nitra | nte, NPK |
| | fertilize | r, superphospl | hate | triple su | nernh | iosphate | |
| | TOTUTIZO | r, superphospi | iiuic, | arpre su | Perpi | iospiiaie. | |

UNIT III

Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap, hybridization and geometry of CH4, C2H4, C2H2 and C6H6. Electronic effects: Inductive effect and consequences on Ka and Kb of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.

Reaction mechanisms: Types of reactions—aromaticity (Huckel's rule)

– aromatic electrophilic substitution; nitration, halogenation, FriedelCraft's alkylation and acylation. Heterocyclic compounds:
Preparation, properties of pyrrole and pyridine.

UNIT IV

Thermodynamics and Phase Equilibria

Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its

significance. Free energy change and its importance (no derivation).

Conditions for spontaneity in terms of entropy and Gibbs free energy.

Relationship between Gibbs free energy and entropy.

Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).

UNIT V

Analytical Chemistry

Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques – extraction, distillation and crystallization.

Chromatography: principle and application of column, paper and thin layer chromatography.

Extended
Professional
Component (is a part of internal component only,
Not to be included

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

| in the external | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|
| examination | | | | | | | | |
| question paper) | | | | | | | | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional | | | | | | | |
| from this course | ompetency, Professional Communication and Transferable skills. | | | | | | | |
| Recommended | 1. V.Veeraiyan, Text book of Ancillary Chemistry; High mount | | | | | | | |
| Text | publishing house, Chennai, first edition,2009. | | | | | | | |
| | 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya | | | | | | | |
| | Publications, Karur,2006. | | | | | | | |
| | 3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and | | | | | | | |
| | Company, NewDelhi, twenty third edition, 2012. | | | | | | | |
| | 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan | | | | | | | |
| | Chand & sons, New Delhi, twenty ninthedition, 2007. | | | | | | | |
| Reference Books | 5. P.L.Soni, Mohan Katyal, Textbook of Inorganic chemistry; Sultan Chan | | | | | | | |
| | dandCompany,New Delhi, twentieth edition, 2007. | | | | | | | |
| | 6. B.R.Puri,L.R.Sharma,M.S.Pathania,TextbookPhysicalChemistry;V | | | | | | | |
| | ishalPublishingCo., New Delhi, fortyfortyseventh edition, 2018. | | | | | | | |
| | 7. B.K,Sharma,IndustrialChemistry;GOELpublishinghouse,Meerut,si | | | | | | | |
| | xteenthedition, 2014. | | | | | | | |

- CO 1: gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.
- CO 2: evaluate the efficiencies and uses of various fuels and fertilizers
- CO 3: explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
- CO 4: apply various thermodynamic principles, systems and phase rule.
- CO 5: explain various methods to identify an appropriate method for the separation of chemical components

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of theCourse | | CHEMISTRY FOR PHYSICAL SCIENCES II (FOR MATHEMATICS & PHYSICS STUDENTS) | | | | | | | |
|------------------------------|--|--|--|---|----------------|---|---|--|--|
| | (. | FOR MATH | EMIA | ATICS & | PΗ | IYSICS STUI | DENTS) | | |
| Paper No. | Generic E | lective II | | | | | | | |
| Category | Generic | Year | | Credits | 3 | | | | |
| - · · · · | Elective | Semester | II | | | Code | | | |
| Instructional | Lecture | Tutorial | La | b Practice | ; | Total | | | |
| hours per week Prerequisites | Chemistry f | or physical sc | ience | -c -I | | 4 | | | |
| Objectives of the | • | se aims at prov | | | lge | on the | | | |
| course | | ination Chem | | • | _ | | | | |
| | • Carboh | ydrates and A | min | o acids | | | | | |
| | • basics | and applicatio | ns o | f electroch | em | istry | | | |
| | • basics | and applicatio | ns o | f kinetics a | and | catalysis | | | |
| | Various | s photochemic | al p | henomeno | n | | | | |
| Course Outline | Co-ordination Werner's the to [Ni(CO) Haemoglobic qualitative at Water Technology 1 to 1 t | eory - EAN rule [Ni(CN)4], [Ni(CN)4] [In and Chlor [Ind quantitative [Ind quantitativ | e - For the control of the control o | efinition of Pauling's the Co(CN)6] ³⁻ yll (elementallysis. of water, do | f toneon | erms-IUPAC ry – Postulate helation - Bio ary idea) – | Nomenclature - s - Applications blogical role of Applications in ardness of water ques- | | |
| | Carbohyo fructose glucose a starch and A alanine, p | and sucrose. Ind fructose. I cellulose. Indicate the sucrose. | Discollection Discollection Class dipo | on, prepar cussion of ose –fructo dification - eptides usi | oj ose p | pen chain rin interconversion | ties of glucose, g structures of on. Properties of d properties of ethod. RNA and | | |

UNIT III

Electrochemistry

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.

UNIT IV

Kinetics and Catalysis

Order and molecularity. Integrated rate expression for I and II (2A \square Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.

UNIT V

Photochemistry

Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)
Skills acquired

from this course

Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

| Recommended Text | 1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009. |
|-------------------------------|---|
| | 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. |
| | 3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. |
| | 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. |
| Reference Books | P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. |
| | R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018. |
| | 3. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. |
| Website and e-learning source | |

- CO 1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology
- CO 2: explain the preparation and property of carbohydrate, amino acids and nucleic acids.
- CO 3: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
- **CO 4:** identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.
- CO 5: outline the various type of photochemical process.

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course | | | | | |
| Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PSOs | | | | | |

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of theCourse | | CHEMISTRY FOR BIOLOGICAL SCIENCES I | | | | | | | |
|---------------------------------|---|---|--|---|------------------------------------|--|--|--|--|
| | | (FOR BOTA | NY A | ND ZOO | LOG | Y STUDEN | TS) | | |
| Paper No. | | Elective III | | - · | la | - | T | | |
| Category | Generic | Year | II | Credits | 3 | Course | | | |
| I441 | Elective | Semester | III | Practice Practice | Tot | Code | | | |
| Instructional hours per week | Lecture | Tutorial | Lab | Practice | 4 | aı | | | |
| Prerequisites | Higher sec | ondary chemi | stry | | + | | | | |
| Objectives of the | | e aims at provi | | nowledge | on | | | | |
| course | | _ | | | | . 1. 1. 1. 1. 11. | 4:1 | | |
| | | sics of atomic ndamentals of | | ŕ | | nas, nybrian | zauon and | | |
| | | | _ | | | | | | |
| | • nu | clear chemistr | y and | industrial o | chemi | stry | | | |
| | • im | portance of sp | ecialit | y drugs an | d | | | | |
| | • se | paration and p | urifica | tion techni | anes | | | | |
| | | paration and p | urrirea | | ques. | | | | |
| Course Outline | UNIT I | al Dandina an | J N | deer Cher | | _ | | | |
| | Chemic | al Bonding an | iu ivuo | ciear Chei | mstry | | | | |
| | 1 | l Bonding: M l-bonding orbi | | | | • | - C | | |
| | Nitroger | ; discussion of | f bond | order and | magn | etic properti | es. | | |
| | Isotones nuclear mass de difference dating, r | Chemistry: and Isomers reactions- grou efect - calcula ces - Stellar e ock dating and | -Differ up disp ations. energy. | rences bet blacement Nuclear Applicati | ween law. I fission ons o | chemical r Nuclear bind n and nucl f radioisoto | reactions and ding energy - ear fusion - | | |
| | Unit II | | | | | | | | |
| | | Chemistry | | | | | _ | | |
| | Fuels: Fue | l gases: Natur | al gas | , water ga | s, ser | nı water ga | s, carbureted | | |
| | | producer gas, | CNG, | LPG and | oil ga | as (manufac | turing details | | |
| | not require | d). | | | | | | | |
| | Silicones: 3 | Synthesis, prop | perties | and uses of | of silic | cones. | | | |
| | Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, | | | | | | | | |
| | superphosp | superphosphate, triple superphosphate. | | | | | | | |
| | | ntal Concepts on: Orbital o | | _ | • | • | ry of CH4, | | |
| | C2H4, C2 | 2H2 and C6 | ίΗ6. | Polar eff | ects: | Inductive | effect and | | |

consequences on Ka and Kb of organic acids and bases, electromeric. mesomeric, hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine. UNIT IV Drugs and Speciality Chemicals Definition. structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon. UNIT V: **Analytical Chemistry** Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography. Extended Questions related to the above topics, from various competitive Professional examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours) Component (is a part of internal component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional from this course Competency, Professional Communication and Transferable skills. Recommended 1. V. Veeraiyan, Textbook of Ancillary Chemistry; High mount Text publishing house, Chennai, first edition, 2009. 2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition,2012. 4. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

| Reference Books | 1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; | | | | | | | |
|-----------------|---|--|--|--|--|--|--|--|
| | Sultan Chand and Company, New Delhi, twentieth edition, 2007. | | | | | | | |
| | 2. B.K,Sharma, Industrial Chemistry; GOEL publishing house, | | | | | | | |
| | Meerut, sixteenth edition, 2014. | | | | | | | |
| | 3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006. | | | | | | | |

- **CO1:** state the theories of chemical bonding, nuclear reactions and its applications.
- CO 2: evaluate the efficiencies and uses of various fuels and fertilizers.
- **CO 3:** explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
- **CO 4:** demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.
- **CO 5:** analyse various methods to identify an appropriate method for the separation of chemical components.

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution toPSOs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of theCourse | CHEMISTRY FOR BIOLOGICAL SCIENCES II | | | | | | |
|--------------------------|--------------------------------------|----------------------------------|-------------|-------------|-------|----------------------------|-----------------------------|
| | | | TANY | AND ZO | OL | OGY STUD | ENTS) |
| Paper No. | | Elective IV | | I | | T ~ | |
| Category | Generic | Year | II IV | Credits | 3 | Course | |
| | Elective | Semester | 1 | Practice | | Code Total | |
| hours per week | Lecture 4 | Tutorial | Lab | Fractice | | 4 | |
| Prerequisites | + | tur for Diolo | rical (| Caionasa I | | I. | |
| | | try for Biologree rse aims to pr | _ | | | | |
| Objectives of the course | | omenclature o | | _ | | | arbohydrates. |
| 004150 | | mino Acids a | | | _ | | - |
| | | nderstand the | | | | - | |
| | | | | _ | | - | notochemistry |
| Course Outline | | ination Chem | • | | | | |
| | Co-ordi | nation Chemi | stry: 1 | Definition | of t | erms - IUPA | C Nomenclature |
| | - Wern | er'stheory - | EAN | rule - l | Paul | ing's theory | - Postulates - |
| | Applica | tions to [N | i(CO) | 4], [Ni(C | CN)4 |] ²⁻ ,[Co(CN)6] |] ³⁻ Chelation - |
| | Biologic | cal role of H | Iemog | lobin and | Ch | lorophyll (ele | ementary idea) - |
| | Applica | tions in qualit | ative a | and quantit | ativ | e analysis. | |
| | Water 7 | Гесhnology: I | Hardn | ess of wat | ter, | determination | n of hardness of |
| | water u | sing EDTA r | netho | d, zeolite | met | nod-Purificati | on techniques – |
| | BOD an | nd COD. | | | | | |
| | Unit Carboh | II ydrates | | | | | |
| | | | , prej | paration a | ınd | properties of | of glucose and |
| | fructose | . Discussion | of o | pen chain | rin | g structures | of glucose and |
| | fructose | . Glucose-fru | ctose | interconve | rsio | n. Preparation | n and properties |
| | of sucro | se, starch and | l cellu | lose. | | | |
| | UNIT III | | | | | | |
| | | Acids and Est Classification | | | | • | es of alanine, |
| | | | • | . • | | • • | od - Proteins- |
| | classific | ation – struc | ture - | Colour re | eacti | ons – Biolog | gical functions - |
| | nucleosi | ides -nucleoti | des – | RNA and | l Di | NA – structui | re. Essentials of |
| | trace me | etals in biolog | ical sy | /stem-Na, | Cu, | K, Zn, Fe, M | g. |
| | | | | | | | |

| | UNIT IV |
|----------------------------------|--|
| | Electrochemistry |
| | Galvanic cells - Standard hydrogen electrode - calomel electrode - |
| | standard electrode potentials -electrochemical series. Strong and weak |
| | electrolytes - ionic product of water -pH, pKa, pKb. Conductometric |
| | titrations - pH determination by colorimetric method - buffer solutions |
| | and its biological applications - electroplating - Nickel and chrome |
| | plating – Types of cells -fuel cells-corrosion and its prevention. |
| | UNIT V |
| | Photochemistry |
| | Grothus - Drapper's law and Stark-Einstein's law of photochemical |
| | equivalence, Quantum yield - Hydrogen -chloride reaction. |
| | Phosphorescence, fluorescence, chemiluminescence and |
| | photosensitization and photosynthesis (definition with examples). |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC/ JAM /TNPSC others to be solved |
| Component (is a | (To be discussed during the Tutorial hours) |
| part of internal | |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired from this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| Recommended | 1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount |
| Text | publishing house, Chennai, first edition, 2009. |
| | 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya |
| | Publications, Karur, 2006. |
| | 3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand |
| | and Company, New Delhi, twenty third edition, 2012. |
| | 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan |
| | Chand & sons, New Delhi, twenty ninth edition, 2007. |
| | |
| Reference Books | 1. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand |
| | and Company, New Delhi, twenty third edition, 2012. |
| | 2. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; |
| | Sultan Chand & sons, New Delhi, twenty ninth edition, 2007. |
| | 3. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; |
| | 3. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; |

Sultan Chand and Company, New Delhi, twentieth edition, 2007.

- 4. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
- 5. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

- **CO 1:** write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.
- **CO 2:** explain the preparation and property of carbohydrate.
- CO 3: enlighten the biological role of transition metals, amino acids and nucleic acids.
- **CO 4:** apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
- **CO** 5: outline the various type of photochemical process.

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course | | | | | |
| Contribution to | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| PSOs | | | | | |

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of theCourse | CHEMISTRY PRACTICAL FOR PHYSICAL AND | | | | | | | | |
|--------------------|--|-----------------------|-----------|-------------|-------------|--------------------|---------------|--|--|
| | | CHEMISTI | | | | | AND | | |
| | | BIOLOGICAL SCIENCES | | | | | | | |
| | | ` | | • | | I Year/I Semes | | | |
| | | | any and | Zoology | II Ye | ear/III Semeste | r) | | |
| Paper No. | | Elective V | L | | г , | T | 1 | | |
| Category | Generic | Year | I/ II | Credits | 1 | Course | | | |
| | Elective | Semeste r | I/III | | | Code | | | |
| Instructional | Lecture | Tutorial | Lab P | ractice | | Total | | | |
| hours per week | - | - | 2 | | | 2 | | | |
| Prerequisites | | <u> </u> | | <u> </u> | | | | | |
| Objectives of the | This | course aim | s to pro | vide know | ledge | on the | | | |
| course | • ba | sics of prep | paration | of solution | ıs. | | | | |
| | | | | | | | | | |
| | • pr | inciples and | d practic | al experie | nce o | f volumetric an | alysis | | |
| Course Outline | VOLUME | TRIC AN | ALYSIS | 3 | | | | | |
| | 1. | . Estimatio | | dium hyd | roxid | e using standard | d sodium | | |
| | 2 | . Estimatio | on of hy | drochloric | acid | using standard | oxalic acid. | | |
| | 3 | . Estimatio | n of fer | rous sulph | ate u | sing standard M | Iohr's salt. | | |
| | 4 | . Estimatio | on of ox | alic acid u | sing | standard ferrous | sulphate. | | |
| | 5. | . Estimation sodium h | • | - | ermar | nganate using st | andard | | |
| | 6 | . Estimatio | on of ma | gnesium ı | ising | EDTA. | | | |
| | 7 | . Estimatio | n of fer | rous ion u | sing | diphenyl amine | as indicator. | | |
| Reference Books | V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles | | | | | | | | |
| | ofPractio | cal Chemist | ry; Sult | an Chand | & soi | ns, Second edition | on, 1997. | | |
| | | 3.7 | • • • • | | 1 00 | | | | |

CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.CO 2: design, carry out, record and interpret the results of volumetric titration. CO 3: apply their skill in the analysis of water/hardness.

CO4: analyze the chemical constituents in allied chemical products

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution toPSOs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| Title of theCourse | CHEMISTRY PRACTICAL FOR PHYSICAL AND | | | | | | | |
|--------------------|---|---------------|---------------------|----------|-----------------|---------------|--|--|
| | BIOLOGICAL SCIENCES | | | | | | | |
| | (For Mathematics and Physics – I year/II semester; | | | | | | | |
| | | • | tany and Zoolog | - | - | | | |
| Paper No. | Generic | Elective VI | y 20010g | <u> </u> | | (-1) | | |
| Category | Generic | Year | I/ II Credits | 1 | Course | | | |
| | Electiv e | Semester | II/IV | | Code | | | |
| Instructional | Lecture | Tutorial | Lab Practice | | Total | | | |
| hours per week | - | - | 2 | | 2 | | | |
| Prerequisites | | | | | | | | |
| Objectives of the | This | course aims | s to provide knov | vledge | on | | | |
| course | • id | lentification | of organic functi | onal g | roups | | | |
| | different types of organic compounds with respect to their | | | | | | | |
| | | | | | | | | |
| | properties. | | | | | | | |
| | • de | etermination | of elements in o | rganic | compounds | | | |
| | SYSTEM | ATIC ANA | LYSIS OF ORG | GANI | C COMPOUN | NDS | | |
| | The analys | sis must be o | carried out as foll | lows: | | | | |
| | | (a) Functi | onal group tests | [pheno | ol, acids (mono | & di) | | |
| | | aroma | atic primary amir | ne, am | ides (mono & | di), aldehyde | | |
| | | and g | lucose]. | | | | | |
| | | (b) Detec | ction of elements | (N, S, | Halogens). | | | |
| | (c) To distinguish between aliphatic and aromatic compounds. | | | | | | | |
| | (d) To distinguish – Saturated and unsaturated compounds. | | | | | | | |
| Reference Books | V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles | | | | | | | |
| | ofPractical Chemistry; Sultan Chand & sons, Second edition, 1997. | | | | | | | |

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to
CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.CO
2: design, carry out, record and interpret the results of volumetric titration.
CO 3: apply their skill in the analysis of water/hardness.

CO4: analyze the chemical constituents in allied chemical products

| CO /PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution toPSOs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

Level of Correlation between PSO's and CO's

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 12 | 12 | 12 | 12 | 12 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

DEPARTMENT OF

CHEMISTRY PROGRAMME

SPECIFIC OUTCOMES

On successful completion of the programme the students will be able to

- PSO1: acquire in-depth knowledge of the fundamental concepts in all disciplines of chemistry.
- PSO2: disseminate the basics of chemistry and advanced topics and analytical skillsin organic, inorganic and physical chemistry.
- PSO3: uphold ethical values in personal life, research and career.
- PSO4: demonstrate laboratory skills, analytical acumen, creatively in academics andresearch.
- PSO5: apply digital tools to collect, analyze and interpret data and presents cientificfindings.
- PSO6: gain competence to pursue higher education and career opportunities inchemistry and allied fields.
- PSO7: exhibit leadership qualities to work individually and within a team inorganizing curricular, co-curricular and extracurricular activities.
- PSO8: apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits.
- PSO9: exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.
- PSO10: display proactive approach towards sustainable environment through greenlaboratory practices.

| Title of the | ORGANI | ORGANIC REACTION MECHANISM - I | | | | | | | |
|---------------|---------|--------------------------------|-----|----------|---|--------|--|--|--|
| Course | | | | | | | | | |
| Paper No. | Core I | | | | | | | | |
| Category | Core | Year | IV | Credits | 4 | Course | | | |
| | | Semester | VII | | | Code | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per | 4 | 1 | - | | | 5 | | | |
| week | | | | | | | | | |

Basic concepts of organic chemistry **Prerequisites** To understand the feasibility and the mechanism of various organic **Objectives of** the course reactions. To comprehend the techniques in the determination of reaction mechanisms. To understand the concept of stereochemistry involved in organic compounds. To correlate and appreciate the differences involved in the various types of organic reaction mechanisms. To design feasible synthetic routes for the preparation of organic compounds. UNIT-I: Methods of Determination of Reaction Mechanism: Reaction Course Outline intermediates, The transition state, Reaction coordinate diagrams, Thermodynamic and kinetic requirements of reactions: Hammond postulate. Methods of determining mechanism: non-kinetic methods product analysis, determination of intermediates-isolation, detection, and trapping. Cross-over experiments, isotopic labelling, isotope effects and stereo chemical evidences. Kinetic methods - relation of rate and mechanism. Effect of structure on reactivity: Hammett and Taft equations. Linear free energy relationship, partial rate factor, substituent and reaction constants. Electrophilic UNIT-II: Aromatic and Aliphatic **Substitution:** Aromaticity: Aromaticity in benzenoid, non-benzenoid, heterocyclic compounds and annulenes. Aromatic electrophilic substitution: Orientation and reactivity of di- and polysubstituted phenol, nitrobenzene and halobenzene. Reactions involving nitrogen electrophiles: nitration, nitrosation and diazonium coupling; Sulphur electrophiles: sulphonation; Halogen electrophiles: chlorination and bromination; Carbon electrophiles: Friedel-Crafts alkylation, acylation and arylation reactions. Aliphatic electrophilic substitution Mechanisms: SE2 and SEi, SE1- Mechanism and evidences. UNIT-III: Aromatic and Aliphatic Nucleophilic Substitution: Aromatic nucleophilic substitution: Mechanisms - S_NAr, S_N1 and Benzyne mechanisms - Evidences - Reactivity, Effect of structure, leaving group and attacking nucleophile. Reactions: Oxygen and Sulphur-nucleophiles, Bucherer and Rosenmund reactions, von Richter, Sommelet- Hauser and Smiles rearrangements. S_N1, ion pair, S_N2 mechanisms and evidences. Aliphatic nucleophilic substitutions at an allylic carbon, aliphatic trigonal carbon and vinyl carbon.S_N1, S_N2, S_Ni, and S_E1 mechanism and evidences, Swain- Scott, Grunwald-Winstein relationship - Ambident nucleophiles. UNIT-IV: Stereochemistry-I: Introduction to molecular symmetry and chirality – axis, plane, center, alternating axis of symmetry. Optical isomerism due to asymmetric and dissymmetric molecules with C, N, S based chiral centers. Optical purity, prochirality, enantiotopic and diastereotopic atoms, groups, faces, axial and planar chirality, chirality due to helical shape, methods of determining theconfiguration. Racemic modifications: Racemization by thermal, anion, cation, reversible formation, epimerization, mutarotation. D, L system, Cram's and Prelog's

rules: R, S-notations, proR, proS, side phase and re phase Cahn-Ingold-Prelog rules, absolute and relative configurations. Configurations of

allenes, spiranes, biphenyls, cyclooctene, helicene, binaphthyls, ansa and cyclophanic compounds, exo-cyclic alkylidene-cycloalkanes. Topicity and prostereoisomerism, chiral shift reagents and chiral solvating reagents. optical purity: Resolution of racemic modifications, asymmetric transformations, asymmetric synthesis, destruction. Stereoselective and stereospecific synthesis. UNIT-V: Stereochemistry-II: Conformation and reactivity of acyclic systems, intramolecular rearrangements, neighbouring group participation, chemical consequence of conformational equilibrium - Curtin-Hammett Principle. Stability of five and six-membered rings: mono-, di- and polysubstituted cyclohexanes, conformation and reactivity in cyclohexane systems. Fused and bridged rings: bicyclic, poly cyclic systems, decalins and Brett's rule. Optical rotation and optical rotatory dispersion, conformational asymmetry, ORD curves, octant rule, configuration and conformation, Cotton effect, axial haloketone rule and determination of configuration. Extended Questions related to the above topics, from various competitive Professional examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to Component (is be solved a part of (To be discussed during the Tutorial hours) internal component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional Competency, from this Professional Communication and Transferable skills. course 1. J. March and M. Smith, Advanced Organic Chemistry, 5th edition, Recommended John-Wiley and Sons.2001. **Text** 2. E. S. Gould, Mechanism and Structure in Organic Chemistry, Holt, Rinehart and Winston Inc., 1959. 3. P.S.Kalsi, Stereochemistry of carbon compounds, 8th edition, New Age International Publishers, 2015. 4. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013. 5. J.Clayden, N. Greeves, S. Warren, Organic Compounds, 2ndedition, Oxford University Press, 2014. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part-A Reference 1. and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007. Books 2. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 2001. N.S. Isaacs, Physical Organic Chemistry, ELBS, Longman, UK, 1987. 3. E. L. Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000. I. L. Finar, Organic chemistry, Vol-1 & 2, 6th edition, Pearson 5. Education Asia, 2004. 1.https://sites.google.com/site/chemistryebookscollection02/home/organic-Website and chemistry/organic e-learning

source 2. https://www.organic-chemistry.org/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able

CLO1: To recall the basic principles of organic chemistry.

CLO2: To understand the formation and detection of reaction intermediates of organic reactions.

CLO3: To predict the reaction mechanism of organic reactions and stereochemistry of organic compounds.

CLO4: To apply the principles of kinetic and non-kinetic methods to determine the mechanism of reactions.

CLO5: To design and synthesize new organic compounds by correlating the stereochemistry of organic compounds.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

Strong - 3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| | Methods of Evaluation | | | | | | | |
|-----------------------------------|--|---|--|--|--|--|--|--|
| | Continuous Internal Assessment Test | | | | | | | |
| Internal | Assignments | 25 Marks | | | | | | |
| Evaluation | Seminars | 25 IVIAIRS | | | | | | |
| | Attendance and Class Participation | | | | | | | |
| External Evaluation | End Semester Examination | 75 Marks | | | | | | |
| | Total | 100 Marks | | | | | | |
| | Methods of Assessment | | | | | | | |
| Recall (K1) | Simple definitions, MCQ, Recall steps, Co | oncept definitions. | | | | | | |
| Understand/ Comprehend (K2) | MCQ, True/False, Short essays, Concept overview. | explanations, short summary or | | | | | | |
| Application | Suggest idea/concept with examples, sug | gest formulae, solve problems, | | | | | | |
| (K3) | Observe, Explain. | | | | | | | |
| Analyze (K4) | Problem-solving questions, finish a Differentiate between various ideas, Map | - · · | | | | | | |
| Evaluate (K5) | Longer essay/ Evaluation essay, Critique or justify with pros and cons. | | | | | | | |
| Create (K6) | Check knowledge in specific or offbeat story or Presentations. | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations. | | | | | | |

In order to avoid pull the score down of each PO, it is suggested that the usage L-Low (1) to the minimum.

The S, M, L is based on the course outcome. The mapping is based on the revised Bloom's Taxonomy Verbs used to describe your course outcome.

- Remember and Understanding Lower level
- Apply and Analyze Medium Level
- Evaluate and Create Strong Level

| Title of the | STRUCT | TURE AND | BON | DING IN | INC | DRGANIC CO | OMPOUNDS | | |
|-----------------------|------------|---------------|---|-------------|--------|-----------------|---------------------------------|--|--|
| Course | | | | | | | | | |
| Paper No. | Core II | T | | T =: == | | Ι ~ | | | |
| Category | Core | Year | IV | Credits | 4 | Course | | | |
| | | Semester | VII | | | Code | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per week | 4 | 1 | - | | | 5 | | | |
| Prerequisites | | icepts of In | | | | | 1 1 | | |
| Objectives of the | | nine the str | uctura | ii properti | es oi | main group | compounds and | | |
| course | clusters. | | | | | | | | |
| | To gain | fundamenta | ıl kno | wledge o | n the | e structural a | aspects of ionic | | |
| | crystals. | | | | | | | | |
| | | | | | | roscopic techn | | | |
| | _ | | | | | e defects in io | onic crystals. | | |
| | | te the struct | | | | | | | |
| Course Outline | | | | | - | - | d clusters: VB | | |
| | | | | | | | ms (Bent's rule) | | |
| | on the ge | ometry of th | ne mo | lecules; St | ructu | re of silicates | - applications of | | |
| | Paulings | rule of elec | troval | ence - ison | morp | hous replacen | nents in silicates | | |
| | - ortho, | meta and p | yro si | ilicates – | one o | limensional, t | wo dimensional | | |
| | and three | e-dimension | al sili | cates. Stri | uctur | e of silicones | , Structural and | | |
| | bonding | features of l | B-N, \$ | S-N and P- | -N co | ompounds; Po | ly acids – types, | | |
| | examples | and struct | ures: | Borane cl | uster | Structural fe | eatures of closo, | | |
| | 1 - | | - | | | | metalloboranes; | | |
| | 1 | | | - | - | | ter; main group | | |
| | | zintl ions a | | | 01 | oorane erasi | ier, mam group | | |
| | | | | | : Ion | ic crystals: Pa | acking of ions in | | |
| | | | | | | | n crystal lattice, | | |
| | | | | | | | metry operations | | |
| | | | | | | | and space group; | | |
| | | | | | | | nde equation - | | |
| | Kapustins | ski equation | , Mad | elung cons | stant. | | | | |
| | UNIT-II | I: Solid stat | te che | mistry – l | II: St | ructural featur | res of the crystal | | |
| | 1 - | | | | | | and anti-fluorite, | | |
| | | - | | | | • | Spinels -normal | | |
| | | • • | _ | | | - | Growth methods: | | |
| | | | tion (| hydrotherr | nal, | sol-gel metho | ods) – principles | | |
| | and exam | - | • | 1.1 4 | | 1 . 4 37 | 1:00 4: | | |
| | | _ | | | | • | -ray diffraction | | |
| | _ | | | | | | - Principle and OS files, Phase | | |
| | | | _ | | | | on; Systematic | | |
| | | | | | | | ue – principle, | | |
| | | | | | | - | y – difference | | |
| | | | | | | _ | - | | |
| | 1 22000000 | Crittin t | between optical and electron microscopy, theory, principle, | | | | | | |

| | instrumentation, sampling methods and applications of SEM and TEM. |
|------------------------------------|---|
| • | UNIT-V: Band theory and defects in solids |
| | Band theory – features and its application of conductors, insulators and |
| | semiconductors, Intrinsic and extrinsic semiconductors; Defects in |
| | crystals – point defects (Schottky, Frenkel, metal excess and metal |
| | , · · · · · · · · · · · · · · · · · · · |
| | deficient) and their effect on the electrical and optical property, laser |
| | and phosphors; Linear defects and its effects due to dislocations. |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | |
| Not to be included in the external | |
| examination | |
| question paper) | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. A R West, Solid state Chemistry and its applications, 2ndEdition |
| Text | (Students Edition), John Wiley & Sons Ltd., 2014. |
| | 2. A K Bhagi and G R Chatwal, A textbook of inorganic polymers, |
| | Himalaya Publishing House, 2001. |
| | 3. L Smart, E Moore, Solid State Chemistry – An Introduction, 4 th |
| | Edition, CRC Press, 2012. |
| | 4. K. F. Purcell and J. C. Kotz, Inorganic Chemistry; W.B. Saunders |
| | company: Philadelphia, 1977. |
| | 5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry; |
| | 4th ed.; Harper and Row: NewYork, 1983. |
| Reference Books | 1. D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and |
| | Models in Inorganic Chemistry, 3rd Ed, 1994. |
| | 2. R J D Tilley, Understanding Solids - The Science of Materials, 2 nd edition, Wiley Publication, 2013. |
| | 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State |
| | Chemistry, 2 nd Edition, Cambridge University Press, 199. |
| | 4. T. Moeller, Inorganic Chemistry, A Modern Introduction; John |
| | Wiley: New York, 1982. |
| | 5. D. F. Shriver, P. W. Atkins and C.H. Langford; Inorganic |
| | Chemistry; 3rd ed.; Oxford University Press: London, 2001. |
| Website and | https://ocw.mit.edu/courses/3-091-introduction-to-solid-state-chemistry- |
| e-learning source | fall-2018/video galleries/lecture-videos/ |

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able

CO1: Predict the geometry of main group compounds and clusters.

CO2: Explain about the packing of ions in crystals and apply the radius ratio rule to predict the coordination number of cations.

CO3: Understand the various types of ionic crystal systems and analyze their structural features.

CO4: Explain the crystal growth methods.

CO5: To understand the principles of diffraction techniques and microscopic techniques.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | ORGAN | IC CHEMI | STRV | V PRACT | TCA | | | | | |
|-------------------|---|--|---------------------------------------|---------------|--------|------------------|-------------------|--|--|--|
| Course | ORGAN | ic Chelvii | SIK. | IIKACI | ICA | L | | | | |
| Paper No. | Core III | | | | | | | | | |
| Category | Core | Year | IV | Credits 4 | | Course | | | | |
| Cutegory | Corc | Semester | VII | Creates | • | Code | | | | |
| Instructional | Lecture | Tutorial | Lab Practice | | | Total | | | | |
| hours per week | - | 1 | 4 | Tructice | 5 | | | | | |
| Prerequisites | Basic cor | icents of or | | | | | | | | |
| Objectives of the | Basic concepts of organic chemistry To understand the concept of separation, qualitative analysis and | | | | | | | | | |
| course | | | · · · · · · · · · · · · · · · · · · · | | | | | | | |
| | 1 | preparation of organic compounds. To develop analytical skill in the handling of chemical reagents for | | | | | | | | |
| | separation | n of binary a | and ter | mary orga | nic n | nixtures. | _ | | | |
| | 1 * | • | | | | | stematically and | | | |
| | | them suital | | 0 | | 1 | J | | | |
| | To constr | ruct suitable | e expe | erimental | setup | for the orga | anic preparations | | | |
| | involving | two stages. | | | | | | | | |
| | _ | | - | purificatio | n an | nd drying tec | chniques for the | | | |
| | | d processing | | | | | | | | |
| Course Outline | | Separation | | | | | | | | |
| | | o componen | | | | | | | | |
| | | ee compone | | tures. | | | | | | |
| | UNIT-II: | Estimation | s: | | | | | | | |
| | -) 1 | Catingatian a | £ D1 | | 4: |) | | | | |
| | a) Estimation of Phenol (bromination) | | | | | | | | | |
| | b) Estimation of Aniline (bromination)c) Estimation of Ethyl methyl ketone (iodimetry) | | | | | | | | | |
| | 1 ' | Estimation of Estimation of the Control of the Cont | - | | | ie (lodiffictry) | | | | |
| | / | Estimation of Estimation of the Control of the Cont | | ` | , | imetry) | | | | |
| | 1 ' | | | | • | ups (reduction | 1) | | | |
| | | Estimation of | | | _ | • ' | -) | | | |
| | · · · · · · | Estimation o | | ` | | • / | | | | |
| | i) 1 | Estimation o | of Ace | tyl group i | in est | ter (alkalimetr | : y) | | | |
| | j) Estimation of Hydroxyl group (acetylation) | | | | | | | | | |
| | k) Estimation of Amino group (acetylation) | | | | | | | | | |
| | UNIT-III: Two stage preparations: a) p-Bromoacetanilide from aniline b) p-Nitroaniline from acetanilide c) 1,3,5-Tribromobenzene from aniline d) Acetyl salicyclic acid from methyl salicylate | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | e) Benzilic acid from benzoin | | | | | | | | | |
| | f) <i>m</i> -Nitroaniline from nitrobenzene g) <i>m</i> -Nitrobenzoic acid from methyl benzoate | | | | | | | | | |
| | · · | | | | | | | | | |
| Extended | Questions related to the above topics, from various competitive | | | | | | | | | |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others | | | | | | | | | |
| Component (is a | to be solved (To be discussed during the Tutorial hours) | | | | | | | | | |
| part of internal | (10 be di | scussed duri | ng the | e i utorial l | nours | S) | | | | |

| component only, | |
|--------------------|---|
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. A R West, Solid state Chemistry and its applications, 2ndEdition |
| Text | (Students Edition), John Wiley & Sons Ltd., 2014. |
| | 2. A K Bhagi and G R Chatwal, A textbook of inorganic polymers, |
| | Himalaya Publishing House, 2001. |
| | 3. L Smart, E Moore, Solid State Chemistry – An Introduction, 4 th |
| | Edition, CRC Press, 2012. |
| Reference Books | 1. D. E. Douglas, D.H. McDaniel and J. J. Alexander, Concepts and |
| | Models in Inorganic Chemistry, 3rd Ed, 1994. |
| | 2. R J D Tilley, Understanding Solids - The Science of Materials, 2 nd |
| | edition, Wiley Publication, 2013. |
| | 3. C N R Rao and J Gopalakrishnan, New Directions in Solid State |
| | Chemistry, 2 nd Edition, Cambridge University Press, 199. |
| Website and | https://ocw.mit.edu/courses/3-091-introduction-to-solid-state- |
| e-learning source | chemistry-fall-2018/video_galleries/lecture-videos/ |

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: To recall the basic principles of organic separation, qualitative analysis and preparation.

CO2: To explain the method of separation and analysis of separated organic mixtures and convert them as derivatives by suitable preparation method.

CO3: To determine the characteristics of separation of organic compounds by various chemical reactions.

CO4: To develop strategies to separate, analyze and prepare organic compounds.

CO5: To formulate a method of separation, analysis of organic mixtures and design suitable procedure for organic preparations.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | PHARM | ACEUTIC | AL C | HEMIST | RY | | |
|------------------------|--------------|---------------|-----------------|------------|--------|------------------|-----------------------------------|
| Paper No. | Elective 1 | [| | | | | |
| Category | Elective | Year | IV | Credits | 4 | Course | |
| , amaga , | | Semester | VII | | | Code | |
| Instructional | Lecture | Tutorial | | Practice | ı | Total | |
| hours per week | 4 | 1 | - | | | 5 | |
| Prerequisites | Basic kno | owledge on | drug | s and dose | es | | |
| Objectives of the | | | | | | harmaceutical | l chemistry. |
| course | | | | _ | _ | tions of vario | = |
| | | | | _ | | | the consequences |
| | of various | | 10 111 | io w the m | -poru | arroe as werr | and compequences |
| | | _ | on the | various an | alvsi | s and technique | ues. |
| | | _ | | | • | structural activ | |
| Course Outline | | | | | | | ysical properties |
| | of drug 1 | nolecule: | physic | cal proper | ties. | Refractive in | dex- Definition, |
| | | | | | | | ecific & molar |
| | | - | - | | | | & polychromatic |
| | | | • | _ | | | tation examples, |
| | | - | • | • | | | ant & Induced |
| | | | | | | | determination. |
| | | | | | | | on, Definition, |
| | | | | • • | | | flow, Kinematic, |
| | | | | | | • | wtonian system, |
| | | • | | | | - | w, Dilatent flow. Newtonian and |
| | | tonian syste | | SCICCHOII | OI V | isconicier for | Newtonian and |
| | | | | tion anal | veie. | nrincinle a | nd applications, |
| | | | | | | | and limitations, |
| | Scintillati | | iters: | | _ | | ntroduction to |
| | | maceuticals | | • | | of various | |
| | | | | | | ticals as | |
| | _ | | | _ | | | emical Properties |
| | and drug | action. Ph | iysico | chemical | pro | perties of dru | ugs (a) Partition |
| | coefficier | nt, (b) solub | ility (d | c) surface | activ | ity, (d) degree | of ionization. |
| | | _ | _ | - | | - | : Introduction to |
| | _ | _ | | _ | | | Definition of |
| | | | | | | | pharmacopoeias |
| | | | | _ | _ | nomenclati | |
| | | ation of | | - 1 | | | a dosage form, |
| | | | _ | _ | • | | act development. |
| | | | _ | - | | - | ivery system – |
| | | n of Comm | | | | | ion and control, |
| | - | istration of | | | | | nenclature, routes a dosage form, |
| | | tion of dosa | | | nouu | , 11000 101 | a dosage lulil, |
| | | | _ | | dr | ugs: Introduc | ction, procedure |
| | | _ | | | | _ | ounds, molecular |
| | 10110 W C U | in drug de | 51 <u>5</u> 11, | ine resear | VII 10 | i icaa compo | Julius, illoiceulai |

modification of lead compounds. Structure-Activity Relationship (SAR): Factors effecting bioactivity, resonance, inductive effect, isoterism, bioisosterism, spatial considerations, biological properties of simple functional groups, theories of drug activity, occupancy theory, rate theory, induced-fit theory,4.3 Quantitative structure relationship Development of QSAR, (QSAR): drug receptor interactions, the additivity of group contributions, physico-chemical parameters, lipophilicity parameters, electronic parameter, ionization constants, steric parameters, chelation parameters, redox potential, indicator-variables. UNIT-V: Computers in Pharmaceutical Chemistry: Need of computers for chemistry. Computers for Analytical Chemists-Introduction to computers: Organization of computers, CPU, Computer memory, I/O devices, information storage, software components. Application of computers in chemistry: Programming in high level language (C+) to handle various numerical methods in chemistry least square fit, solution to simultaneous equations, interpolation, extrapolation, smoothing, numerical differentiation data integrations. Questions related to the above topics, from various competitive Extended examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others Professional to be solved Component (is a part of internal (To be discussed during the Tutorial hours) component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional from this course Competency, Professional Communication and Transferable skills. Recommended Physical Chemistry- Bahl and Tuli. Text Book of Physical Pharmaceutics, IInd edition, Vallabh **Text** Prakashan-. C.V.S. Subramanyam. Medicinal Chemistry (Organic Pharmaceutical Chemistry), G.R. 3. Chatwal, Himalaya Publishing house. 4. Instrumental method of Analysis: Hubert H, Willard, 7th edition. 5. Textbook of Pharmaceutical Chemistry by, Jayshree Ghosh, S. Chand & company Ltd. Pharmaceutical Chemistry by Dr. S. Lakshmi, Sultan chand & Sons. Computers in chemistry, K.V. Raman, Tata Mc.Graw-Hill, 1993. Reference Books 1. Computers for Chemists, S.K Pundir, Anshu bansal, A pragate prakashan., 2 nd edition, New age international (P) limited, New Delhi. Physical Pharmacy and Pharmaceutical Sciences by Martins, Patrick J. Sinko, Lippincott. William and Wilkins. 4. Cooper and Gunn's Tutorial Pharmacy, 6th edition by S.J. Carter, CBS Publisher Ltd. Ansels pharmaceutical Dosage forms and Drug Delivery System by 5. Allen Popvich and Ansel, Indian edition-B.I. Publication Pvt. Ltd.

| Website and | https://www.ncbi.nlm.nih.gov/books/NBK482447/ |
|-------------------|--|
| e-learning source | https://training.seer.cancer.gov/treatment/chemotherapy/types.html |

Students will be able:

CO1: To identify the suitable drugs for various diseases.

CO2: To apply the principles of various drug action and drug design.

CO3: To acquire the knowledge on product development based on SAR.

CO4: To apply the knowledge on applications of computers in chemistry.

CO5: To synthesize new drugs after understanding the concepts SAR.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 - Strong, 2 - Medium, 1 - Low

| Title of the | NANO M | IATERIAL | SAN | D NANO | TEC | CHNOLOGY | | | | |
|-------------------|------------|---|---------|-----------------|---------|-----------------|--------------------|--|--|--|
| Course | | | | | | | | | | |
| Paper No. | Elective 1 | | | | | | | | | |
| Category | Elective | Year | IV | Credits | 4 | Course | | | | |
| | | Semester | VII | | | Code | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | |
| Prerequisites | | Basic knowledge of crystallography and material science | | | | | | | | |
| Objectives of the | | | | | | als and nano te | | | | |
| course | To unders | To understand the various types of nano materials and their properties. | | | | | | | | |
| | | | appl | lications | of s | ynthetically i | mportant nano | | | |
| | materials. | | | | | | | | | |
| | 1 | | acteris | stics of var | rious | nano materials | s synthesized by | | | |
| | new techr | | | C .1 | . 11 | 1 | 1 | | | |
| C 0 11 | | • | | • | | y used new nar | | | | |
| Course Outline | UNIT-I: | | | | | | notechnologies, | | | |
| | | | | | | | 3D. Synthesis- | | | |
| | | | | | | - | ers. Features of | | | |
| | | | _ | | | _ | ues of synthesis | | | |
| | of nano | materials, | Tools | s of the | na | noscience. A | pplications of | | | |
| | nanomate | rials and tec | chnolo | ogies. | | | | | | |
| | UNIT-II: | Bonding a | and st | ructure of | the | nanomaterials, | Predicting the | | | |
| | Type of | Bonding | in | a Substa | ince | crystal struc | cture. Metallic | | | |
| | nanoparti | cles, Surfac | es of | Materials, | Nan | oparticle Size | and Properties. | | | |
| | _ | | | | | = | ondensation, arc | | | |
| | I - | = | | | | = | othermal-CVD- | | | |
| | _ | | | _ | | = | pressure CVD. | | | |
| | | e assisted a | _ | | | | F | | | |
| | | | | | | | ries relevant to | | | |
| | | | _ | _ | | | al properties of | | | |
| | | rials, adh | | - | | - | properties of | | | |
| | | * | | | | • | des: silica, iron | | | |
| | | alumina - s | | | | | , | | | |
| | | | | | | | d Resistivity, | | | |
| | | | | | | | etic properties, | | | |
| | electronic | 1 1 | | | | | of magnetic | | | |
| | | | | | | | Ge, Si, GaAs, | | | |
| | | | - | | | | p and n –type | | | |
| | | | | - | | | Hall voltage - | | | |
| | interpreta | | | ge carri | | • • | plications of | | | |
| | | uctors: p-n galvanic ce | - | on as tran | 1818101 | is and reculier | rs, photovoltaic | | | |
| | | | | nanocompo | osites | Application of | f nanoparticles in | | | |
| | | | | | | | synthesis, and | | | |
| | | | | | | | polymer-matrix | | | |
| | | | - | | | | M and AFM - | | | |
| | | instrumenta | | | | • | | | | |
| | principie, | mon unicilla | auon (| та аррис | anons | , | | | | |

| Extended | Questions related to the above topics, from various competitive |
|--------------------|--|
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | (10 be discussed during the ratorial nodis) |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | S.Mohan and V. Arjunan, Principles of Materials Science, MJP |
| Text | Publishers, 2016. |
| TCAL | 2. Arumugam, Materials Science, Anuradha Publications, 2007. |
| | 3. Giacavazzo et. al., Fundamentals of Crystallography, International |
| | Union of Crystallography. Oxford Science Publications, 2010 |
| | 4. Woolfson, An Introduction to Crystallography, Cambridge |
| | University Press, 2012. |
| | 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction |
| | to Materials Science for Engineers. 6 th ed., PEARSON Press, 2007. |
| Reference Books | 1. S.Mohan and V. Arjunan, Principles of Materials Science, MJP |
| Treference Books | Publishers, 2016. |
| | 2. Arumugam, Materials Science, Anuradha Publications, 2007. |
| | 3. Giacavazzo et. al., Fundamentals of Crystallography, International |
| | Union of Crystallography. Oxford Science Publications, 2010 |
| | 4. Woolfson, An Introduction to Crystallography, Cambridge |
| | University Press, 2012. |
| | 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction |
| | to Materials Science for Engineers. 6 th ed., PEARSON Press, 2007. |
| | |
| Website and | 1. http://xrayweb.chem.ou.edu/notes/symmetry.html . |
| e-learning source | 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf. |
| 8 | • |
| | |
| | |
| Course Learning | Dutcomes (for Manning with POs and PSOs) |

Students will be able:

CO1: To explain methods of fabricating nanostructures.

CO2: To relate the unique properties of nanomaterials to reduce dimensionality of the material

CO3: To describe tools for properties of nanostructures.

CO4: To discuss applications of nanomaterials.

CO5: To understand the health and safety related to nanomaterial.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| | ELECTE | ROCHEMI | STRY | 7 | | | |
|--------------------------|------------|---------------|------------------|-------------|--------|-----------------|-------------------------------------|
| Title of the | | | | | | | |
| Course Paper No. | Elective 1 | T . | | | | | |
| Category | Elective | | IV | Credits | 4 | Course | |
| Category | Liective | Semester | VII | Credits | - | Code | |
| Instructional | Lecture | | | Practice | | Total | |
| hours per week | 4 | 1 | - | | | 5 | |
| Prerequisites | Basic kno | wledge of e | lectro | chemistry | , | 1 | |
| Objectives of the | To under | stand the b | ehavi | or of elec | troly | tes in terms | of conductance, |
| course | ionic atmo | osphere, inte | eractio | ons. | | | |
| | To famili | arize the st | ructui | e of the | electr | rical double la | ayer of different |
| | models. | | | | | | |
| | To compa | re electrode | s betw | veen curre | nt de | ensity and over | r potential. |
| | | | | | | ical reactions. | |
| | | | | | ver v | oltages and it | ts applications in |
| G 0 11 | | lytical tech | | | • •, | | |
| Course Outline | 1 | | | • | | | loff factor and its |
| | 1 | _ | | | | | l behavior. Ionic efficient-concept |
| | | | | - | | • | etrolytes, activity |
| | | | | | | | tivity coefficient |
| | | nt and ion- | | • | | | n. Debye-Huckel |
| | | | | of Debye | -Huc | kel limiting la | aw at appreciable |
| | concentra | | | rolytes r | | | 1 1 |
| | | | | | | | tment of strong |
| | | | | | | | and limitations. |
| | formation | | aun | iosphere. | 1011 | association | and triple ion |
| | | | -elect | trolyte in | terfa | ce: Interfacia | al phenomena - |
| | 1 | | | - | | | non-polarizable |
| | | | | • | - | | equation electro |
| | capillary | curves. | Elec | tro-kinetic | e p | henomena | electro-osmosis, |
| | | | | | | | ls, colloidal and |
| | * * | • | | | • | | z -Perrin, Guoy- |
| | _ | | | | | _ | r. Zeta potential |
| | | | | | | and limitation | |
| | 1 | | | | • | | ctions: Behavior illibrium. Anodic |
| | | | | | | | of ions. Nernst |
| | | | - | | | _ | Model of three |
| | 1 - | - | | - | | | emical reactions: |
| | | • | - | | | | olmer equation- |
| | | | _ | | | • | ent density and |
| | | | | _ | | | symmetry factor |
| | | | | | | d Tafel plots. | |
| | | | | _ | | | System: Rates of |
| | reaction. | - | reacti etermi | | | - | n for a multi-step olarization and |
| | reaction. | Nate 0 | C(C(1111) | ming ste | ep, | ciecuode p | oiai izatioli alla |

depolarization. Transfer coefficients, its significance and determination, Stoichiometric number. Electro-chemical reaction mechanisms-rate expressions, order, and surface coverage. Reduction of I³⁻, Fe²⁺, and dissolution of Fe to Fe²⁺. Overvoltage - Chemical and electro chemical, Phase, activation and concentration over potentials. Evolution of oxygen and hydrogen at different pH. Pourbiax and Evan's diagrams. UNIT-V: Concentration Polarization, Batteries and Fuel cells: Modes of Transport of electro active species - Diffusion, migration and hydrodynamic modes. Role of supporting electrolytes. Polarographyprinciple and applications. Principle of square wave polarography. Cyclic voltammetry- anodic and cathodic stripping voltammetry and differential pulse voltammetry. Sodium and lithium-ion batteries and redox flow batteries. Mechanism of charge storage: conversion and alloying. Capacitors- mechanism of energy storage, charging at constant current and constant voltage. Energy production systems: Fuel Cells: classification, alkaline fuel cells, phosphoric acid fuel cells, high temperature fuel cells. Extended Questions related to the above topics, from various competitive **Professional** examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others Component (is a to be solved part of internal (To be discussed during the Tutorial hours) component only, Not to be included in the external examination question paper) Skills acquired Knowledge, Problem solving, Analytical ability, Professional from this course Competency, Professional Communication and Transferable skills. D. R. Crow, Principles and applications of electrochemistry, Recommended 4thedition, Chapman & Hall/CRC, 2014. **Text** 2. J. Rajaram and J.C. Kuriakose, Kinetics and Mechanism of chemical transformations Macmillan India Ltd., New Delhi, 2011. 3. S. Glasstone, Electro chemistry, Affiliated East-West Press, Pvt., Ltd., New Delhi, 2008. 4. B. Viswanathan, S. Sundaram, R. Venkataraman, K. Rengarajan and P.S. Raghavan, Electrochemistry-Principles and applications, S. Viswanathan Printers, Chennai, 2007. Joseph Wang, Analytical Electrochemistry, 2nd edition, Wiley, 5. 2004. Reference Books J.O.M. Bockris and A.K.N. Reddy, Modern Electro chemistry, vol.1 and 2B, Springer, Plenum Press, New York, 2008. J.O.M. Bockris, A.K.N. Reddy and M.G. Aldeco Morden Electro chemistry, vol. 2A, Springer, Plenum Press, New York, 2008. Philip H. Rieger, Electrochemistry, 2nd edition, Springer, New 3. York, 2010. 4. L.I. Antropov, Theoretical electrochemistry, Mir Publishers, 1977. K.L. Kapoor, A Text book of Physical chemistry, volume-3, Macmillan, 2001.

| Website and | 1. https://www.pdfdrive.com/modern-electrochemistry-e34333229. |
|-------------------|--|
| e-learning source | |

Students will be able:

CO1: To understand the behaviour of electrolytes in solution and compare the structures of electrical double layer of different models.

CO2: To predict the kinetics of electrode reactions applying Butler-Volmer and Tafel equations

CO3: To study different thermodynamic mechanism of corrosion,

CO4: To discuss the theories of electrolytes, electrical double layer, electrodics and activity coefficient of electrolytes

CO5: To have knowledge on storage devices and electrochemical reaction mechanism.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | MOLEC | ULAR SPE | CTR | OSCOPY | 7 | | | | |
|--------------------------|---------------------------|---------------|--------|-------------|--------|-----------------|--|--|--|
| Paper No. | Elective | II | | | | | | | |
| Category | Elective | Year | IV | Credits | 4 | Course | | | |
| | | Semester | VII | 0104105 | - | Code | | | |
| Instructional | Lecture | Tutorial | | Practice | | Total | | | |
| hours per week | 4 | 1 | - | | | 5 | | | |
| Prerequisites | Basic kn | owledge of | specti | oscopy | | 1 | | | |
| Objectives of the | | | | | on a | nd vibrations | on the spectra of | | |
| course | the polyatomic molecules. | | | | | | | | |
| | To study | the principl | e of R | aman spe | ctros | copy, ESR sp | ectroscopy, EPR | | |
| | spectrosc | opy and frag | gment | ation patte | erns i | n Mass spectre | oscopy. | | |
| | To highli | ght the sign | ifican | ce of Fran | ck-C | ondon princip | le to interpret the | | |
| | selection | rule, intensi | ty and | l types of | electi | onic transition | ns. | | |
| | | | | | | - | terms of splitting | | |
| | _ | | ns us | ing correl | lation | techniques | such as COSY, | | |
| | | R, NOESY. | 4 | .1 .1 | 4 | . C 1 1 | 1:664 | | |
| | | echniques. | ructur | ai eiucida | uion | of molecules | s using different | | |
| Course Outline | | | and] | Raman S | nectr | oscony. Rota | ational spectra of | | |
| Course Outline | | | | | | | otational spectral | | |
| | | | | | | | Classical theory | | |
| | | _ | | | | _ | ability ellipsoids, | | |
| | | | - | - | | - | | | |
| | | | | | | | Raman spectra of | | |
| | | • | | • | - | | nti-Stokes lines. | | |
| | | - | • | | | • | s, rule of mutual | | |
| | | | | structure-G |) an | d S branches | , Polarization of | | |
| | | eattered pho | | C 4 | | X7:1 4: | - C1 1 | | |
| | UNIT-II | | | | | | of molecules, ergy expression, | | |
| | | | | | | | their symmetry, | | |
| | | _ | | | | | spectral lines, | | |
| | | | - | | | - | ppic substitution. | | |
| | | | | | | | etra of diatomic | | |
| | | | | | | | rn-Oppenheimer | | |
| | | | | | | | es – symmetry | | |
| | | | | | | - | uence of rotation | | |
| | | | | | | | Q, R branches, | | |
| | molecule | | uicuia | r vioratio | ons c | or imear and | symmetric top | | |
| | | | nic | spectrose | conv | Electronic | Spectroscopy: | | |
| | | | | | | molecules, | | | |
| | | - | | | | | $\pi \rightarrow \pi^*, n \rightarrow \pi^*$ | | |
| | transition | s and their | select | ion rules. | Phot | oelectron Spe | ectroscopy: Basic | | |
| | | | | | | simple m | | | |
| | | | | | | | ction, population | | |
| | | , properties | s of | iaser radi | atior | n, examples | of simple laser | | |
| | systems. | | | | | | | | |

UNIT-IV: NMR and ESR spectroscopy: Chemical shift, Factors influencing chemical shifts: electronegativity and electrostatic effects; Mechanism of shielding and deshielding. Spin systems: First order and second order coupling of AB systems, Simplification of complex spectra. Spin-spin interactions: Homonuclear coupling interactions -AX, AX2, AB types. Vicinal, germinal and long-range coupling-spin decoupling. Nuclear Overhauser effect (NOE), Factors influencing coupling constants and Relative intensities. 13CNMR and structural correlations, Satellites. Brief introduction to 2D NMR - COSY, NOESY. Introduction to 31P, 19F NMR. ESR spectroscopy Characteristic features of ESR spectra, line shapes and line widths; ESR spectrometer. The g value and the hyperfine coupling parameter (A), origin of hyperfine interaction. Interpretation of ESR spectra and structure elucidation of organic radicals using ESR spectroscopy; Spin orbit coupling and significance of g-tensors, zero/non-zero field Kramer's degeneracy, application to transition metal complexes (having one to five unpaired electrons) including biological molecules and inorganic free radicals. ESR spectra of magnetically dilute samples.

UNIT-V: Mass Spectrometry, EPR and Mossbauer Spectroscopy: Ionization techniques- Electron ionization (EI), chemical ionization (CI), desorption ionization (FAB/MALDI), electrospray ionization (ESI), isotope abundance, molecular ion, fragmentation processes of organic molecules, deduction of structure through mass spectral fragmentation, high resolution. Effect of isotopes on the appearance of mass spectrum. EPR spectra of anisotropic systems - anisotropy in gvalue, causes of anisotropy, anisotropy in hyperfine coupling, hyperfine splitting caused by quadrupole nuclei. Zero-field splitting (ZFS) and Kramer's degeneracy. Applications of EPR to organic and inorganic systems. Structural elucidation of organic compounds by combined spectral techniques. Principle of Mossbauer spectroscopy: Doppler shift, recoil energy. Isomer shift, quadrupole splitting, magnetic interactions. Applications: Mossbauer spectra of high and low-spin Fe and Sn compounds.

Extended
Professional
Component (is a part of internal component only,
Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text

- 1. C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Ed., Tata McGraw Hill, New Delhi, 2000.
- 2. R. M. Silverstein and F. X. Webster, *Spectroscopic Identification of Organic Compounds*, 6th Ed., John Wiley & Sons, New York,

| | 2003. |
|-------------------|---|
| | 3. W. Kemp, <i>Applications of Spectroscopy</i> , English Language Book |
| | Society, 1987. |
| | 4. D. H. Williams and I. Fleming, Spectroscopic Methods in Organic |
| | Chemistry, 4 th Ed., Tata McGraw-Hill Publishing Company, New |
| | Delhi, 1988. |
| | 5. R. S. Drago, <i>Physical Methods in Chemistry</i> ; Saunders: |
| | Philadelphia, 1992. |
| Reference Books | 1. P.W. Atkins and J. de Paula, <i>Physical Chemistry</i> , 7 th Ed., Oxford |
| | University Press, Oxford, 2002. |
| | 2. I. N. Levine, <i>Molecular Spectroscopy</i> , John Wiley & Sons, New |
| | York, 1974. |
| | 3. A. Rahman, Nuclear Magnetic Resonance-Basic Principles, |
| | Springer-Verlag, New York, 1986. |
| | 4. K. Nakamoto, Infrared and Raman Spectra of Inorganic and |
| | coordination Compounds, PartB: 5th ed., John Wiley& Sons Inc., |
| | New York, 1997. |
| | 5. J. A. Weil, J. R. Bolton and J. E. Wertz, <i>Electron Paramagnetic</i> |
| | Resonance; Wiley Interscience, 1994. |
| Wahaita and | |
| Website and | 1. https://onlinecourses.nptel.ac.in/noc20_cy08/preview |
| e-learning source | 2. https://www.digimat.in/nptel/courses/video/104106122/L14.html |

Students will be able:

CO1: To understand the importance of rotational and Raman spectroscopy.

CO2: To apply the vibrational spectroscopic techniques to diatomic and polyatomic molecules.

CO3: To evaluate different electronic spectra of simple molecules using electronic spectroscopy.

CO4: To outline the NMR, ¹³C NMR, 2D NMR – COSY, NOESY, Introduction to ³¹P, ¹⁹F NMR and ESR spectroscopic techniques.

CO5: To develop the knowledge on principle, instrumentation and structural elucidation of simple molecules using Mass Spectrometry, EPR and Mossbauer Spectroscopy techniques.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------------------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Contribution to Pos | 3.0 | 3.0 | 3.0 | 5.0 | 5.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | ORGANIC | REACTION M | IECH. | ANISM-II | | | |
|------------------------|---------------|----------------------|----------|----------------|--------|-----------------|-------------|
| Paper No. | Core IV | | | | | | |
| Category | Core | Year | IV | Credits | 4 | Course | |
| | | Semester | VIII | 1 | | Code | |
| Instructional | Lecture | Tutorial | 1 | Practice | - | Total | |
| hours per | 4 | 1 | - | | | 5 | |
| week | | | | | | | |
| Prerequisites | Basic know | ledge of organic | chen | nistry | | | |
| Objectives of | To understa | nd the concept | of ar | omaticity in | benze | enoid, non-be | enzenoid, |
| the course | heterocyclic | and annulene co | ompou | nds. | | | |
| | To understa | and the mecha | nism | involved in | vario | ous types of | organic |
| | | th evidences. | | | | | |
| | | nd the application | | | - | _ | |
| | | the reactivity be | | 1 | | 1 | |
| | | nthetic routes for | | | | | |
| Course | | mination and l | | | | | |
| Outline | | mechanisms. Sy | | | | | |
| | double bond | : Hoffmann and | l Saytz | eff rules. Re | activi | ty: Effect of s | substrate, |
| | attacking b | bases, leaving | grou | o and med | lium. | Stereochem | istry of |
| | eliminations | in acyclic and | l cycli | c systems, p | yroly | tic eliminatio | on. Long |
| | lived and s | hort-lived radic | als – | Production of | of rad | licals by ther | rmal and |
| | photochemic | cal reactions, De | etection | n and stabilit | y of r | adicals, chara | cteristics |
| | of free ra | dical reactions | and | free radica | al, r€ | eactions of | radicals; |
| | polymerizati | | | ogenations, | | | stitutions, |
| | * * | nts. Reactivity: | | • | | | · · |
| | | the attacking rac | | • | | , aromane se | aostrates, |
| | | Oxidation and | | | | Machaniam | g. Direct |
| | | nsfer, hydride | | | | | |
| | | nination, oxid | | | | - | reactions. |
| | | of oxidation rea | | | | 1 0 | |
| | | rricyanide, mer | | , . | | • 1 | |
| | 1 | lioxide, osmium | | | | | |
| | _ | , alcohols, halid | | | | - | |
| | C-C bonds | - cleavage of do | ouble | bonds, oxida | tive d | ecarboxylatio | n, allylic |
| | oxidation, | oxidation by | chron | nium trioxic | le-pyr | idine, DMS | O-Oxalyl |
| | chloride (Sw | vern oxidation) a | and Co | rey-Kim oxid | dation | , dimethyl sul | lphoxide- |
| | | l carbodiimide | ` | , | | | |
| | | Wolff-Kishner, | | | | | |
| | _ | | - | | - | n-Steven's r | |
| | _ | us hydrogenatio | • | droboration | with | cyclic systen | ns, MPV |
| | | ult-Blanc reducti | | | , 1 | 1 0 . | |
| | | Rearrangement | | | | | |
| | _ | colone and sem | - | | _ | | |
| | | stry, Wagner-M | | • | | - | |
| | Venkataram | an, Benzilic acid | d and V | Wolff rearran | geme | nts. Rearrange | ements to |
| | electron defi | cient nitrogen: | Hofma | nn, Curtius, | Schmi | idt, Lossen, B | eckmann |

and abnormal Beckmann rearrangements. Rearrangements to electron deficient oxygen: Baeyer-Villiger oxidation and Dakin rearrangements. Rearrangements to electron rich atom: Favorskii, Quasi-Favorskii, Stevens, [1,2]-Wittig and [2,3]-Wittig rearrangements. Fries and Photo Fries rearrangement. Intramolecular rearrangements – Claisen, abnormal Claisen, Cope, oxy-Cope Benzidine rearrangements.

UNIT-IV: Addition to Carbon Multiple Bonds: Mechanisms: (a) Addition to carbon-carbon multiple bonds- Addition reactions involving electrophiles, nucleophiles, free radicals, carbenes and cyclic mechanisms-Orientation and reactivity, hydrogenation of double and triple bonds, Michael reaction, addition of oxygen and Nitrogen; (b) Addition to carbonhetero atom multiple bonds: Mannich reaction, acids, esters, nitrites, of Grignard reagents, Wittig reaction, Prins Stereochemical aspects of addition reactions. Addition to Carbon-Hetero atom Multiplebonds: Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Mechanism of condensation reactions involving enolates –Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.

UNIT-V: Reagents and Modern **Synthetic Reactions:** Lithium diisopropylamine (LDA), Azobisisobutyronitrile (AIBN), Sodium cyanoborohydride (NaBH₃CN), meta-Chloroperbenzoic acid (m-CPBA), Dimethyl aminiopyridine (DMAP), n-Bu₃SnD, Triethylamine (TEA), Diazobicyclo[5.4.0]undec-7-ene (DBU), Diisopropylazodicarboxylate (DIAD), Diethylazodicarboxylate (DEAD), N-bromosuccinimide (NBS), Trifluoroacetic acid (TFA), Tetramethyl piperiridin-1-oxyl (TEMPO), Phenyltrimethylammonium tribromide (PTAB). Diazomethane and Zn-Cu, Diethyl maleate (DEM), Copper diacetylacetonate (Cu(acac)₂), TiCl₃, NaIO₄, Pyridinium chlorochromate (PCC), Pyridinium dichromate (PDC), Meisenheimer complex. Suzuki coupling, Heck reaction, Negishi reaction, Baylis-Hillman reaction.

Extended
Professional
Component (is a part of internal component only, Not to be included in the external examination question paper)

Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved

(To be discussed during the Tutorial hours)

Skills acquired from this course

Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

| Recommende | 1 I M - 1 - 1 M C - 4 1 - 1 O C |
|-------------|---|
| d Text | 1. J. March and M. Smith, Advanced Organic Chemistry, 5th ed., |
| | John-Wiley and Sons. 2001. |
| | 2. E. S. Gould, Mechanism and Structure in Organic Chemistry, |
| | Holt, Rinehart and Winston Inc., 1959. |
| | 3. P. S. Kalsi, Stereochemistry of carbon compounds, 8 th edn, New |
| | Age International Publishers, 2015. |
| | 4. P. Y.Bruice, <i>Organic Chemistry</i> , 7 th edn., Prentice Hall, 2013. |
| | 5. R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee Organic |
| | Chemistry, 7 th edn., Pearson Education, 2010. |
| Reference | 1. S. H. Pine, Organic Chemistry, 5 th edn, McGraw Hill |
| Books | International Editionn, 1987. |
| | 2. L. F. Fieser and M. Fieser, Organic Chemistry, Asia Publishing |
| | House, Bombay, 2000. |
| | 3. E.S. Gould, <i>Mechanism and Structure in Organic Chemistry</i> , Holt, |
| | Rinehart and Winston Inc., 1959. |
| | 4. T. L. Gilchrist, <i>Heterocyclic Chemistry</i> , Longman Press, 1989. |
| | 5. J. A. Joule and K. Mills, <i>Heterocyclic Chemistry</i> , 4 th ed., John- |
| | Wiley, 2010. |
| Website and | 1.https://sites.google.com/site/chemistryebookscollection02/home/organ |
| e-learning | <u>ic-chemistry/organic</u> |
| source | 2. https://www.organic-chemistry.org/ |

Students will be able:

CO1: To recall the basic principles of aromaticity of organic and heterocyclic compounds.

CO2: To understand the mechanism of various types of organic reactions.

CO3: To predict the suitable reagents for the conversion of selective organic compounds.

CO4: To correlate the principles of substitution, elimination, and addition reactions.

CO5: To design new routes to synthesis organic compounds.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

 $3-Strong,\,2-Medium,\,1-Low$

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | PHYSIC | AL CHEM | ISTR | Y-I | | | | | | | |
|---------------------------------|---|---------------|---------|--------------|-----------|------------------|----------------------------------|--|--|--|--|
| Course | | | | | | | | | | | |
| Paper No. | Core V | | | T | | | | | | | |
| Category | Core | Year | IV | Credits | 4 | Course | | | | | |
| T | T 4 | Semester | | D 4: | | Code | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total 5 | | | | | |
| hours per week | Pasis say | 1 | - | ah amai atuu | | 3 | | | | | |
| Prerequisites Objectives of the | Basic concepts of physical chemistry To recall the fundamentals of thermodynamics and the composition of | | | | | | | | | | |
| course | partial molar quantities. | | | | | | | | | | |
| course | | | | and statist | ical a | pproach of th | e functions | | | | |
| | | | | | | | Sermi-Dirac and | | | | |
| | Bose-Ein | _ | | 01 1110 | 21 11 011 | Bonzinan, 1 | | | | | |
| | To corre | late the th | neories | of react | ion 1 | rates for the | e evaluation of | | | | |
| | thermody | namic parai | neters | | | | | | | | |
| | To study | the mechan | ism an | d kinetics | of rea | ections. | | | | | |
| Course Outline | | | | = | | | lar properties- | | | | |
| | Chemical | potential, | Gibb | 's- Duhe | em e | quation-binar | y and ternary | | | | |
| | systems. | Determinati | on of | partial mo | lar qu | antities. Ther | modynamics of | | | | |
| | real gase | es - Fugaci | ty- de | eterminatio | n of | fugacity by | graphical and | | | | |
| | equation | of state m | ethods | -depender | ice o | f temperature | e, pressure and | | | | |
| | composit | ion. Thermo | odynar | nics of ide | eal an | d non-ideal b | oinary mixtures, | | | | |
| | Duhem | - Margulus | equa | tion appl | icatio | ns of ideal | and non-ideal | | | | |
| | mixtures. | _ | _ | | | fficients-stand | | | | | |
| | determina | ation-vapou | | • | | eezing point | | | | | |
| | | | | | | | n of statistical | | | | |
| | | namics co | | | | | mathematical | | | | |
| | probabili | ties-distribu | tion c | of disting | uishal | ole and non | -distinguishable | | | | |
| | _ | | | | | _ | es. Maxwell - | | | | |
| | | | | | | | comparison and | | | | |
| | 1 | | | | | | onal, vibrational | | | | |
| | | - | | | | | diatomic and | | | | |
| | 1 - | _ | | • | | | rms of partition cal approach to | | | | |
| | | ynamic pro | - | • | | | nergy, entropy, | | | | |
| | | Gibb's | | | | | sidual entropy, | | | | |
| | 1 2 / | | | | | | eat capacity of | | | | |
| | 1 - | | | | | | leat capacity of | | | | |
| | | nstein and D | _ | | • | | | | | | |
| | UNIT-II | I: Irreversi | ble Th | ermodyn | amics | : Theories of | conservation of | | | | |
| | | | | | - | • | heat, matter and | | | | |
| | | | | | | | ory-validity and | | | | |
| | | | | | | | ro kinetic and | | | | |
| | | | | -Application | on of | irreversible t | hermodynamics | | | | |
| | | cal systems | | logotio==== | Tl | aniag of mass | etions-effect of | | | | |
| | | | | | | | reaction rates, | | | | |
| | _ | | | | | • | en hypothesis- | | | | |
| | 1 Ommored | uiai itatli | 0115 - | -Linaciliali | allC | ı Cili istialist | n hypothesis- | | | | |

| | molecular beams, collision cross sections, effectiveness of collisions, |
|-------------------------------|--|
| | Potential energy surfaces. Transition state theory-evaluation of |
| | thermodynamic parameters of activation-applications of ARRT to |
| | reactions between atoms and molecules, time and true order-kinetic |
| | parameter evaluation. Factors determine the reaction rates in solution - |
| | primary salt effect and secondary salt effect, Homogeneous catalysis- |
| | acid- base catalysis-mechanism of acid base catalyzed reactions- |
| | Bronsted catalysis law, enzyme catalysis-Michelis-Menton catalysis. |
| | |
| | UNIT-V: Kinetics of complex and fast reactions: Kinetics of |
| | complex reactions, reversible reactions, consecutive reactions, parallel |
| | reactions, chain reactions. Chain reactions-chain length, kinetics of H ₂ |
| | - Cl ₂ & H ₂ - Br ₂ reactions (Thermal and Photochemical reactions) - |
| | Rice Herzfeld mechanism. Study of fast reactions-relaxation methods- |
| | temperature and pressure jump methods electric and magnetic field |
| | jump methods -stopped flow flash photolysis methods and pulse |
| | radiolysis. Kinetics of polymerization-free radical, cationic, anionic |
| Extended | polymerization - Polycondensation. |
| Professional | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | (10 be discussed during the Tutorial nours) |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. J. Rajaram and J.C. Kuriacose, Thermodynamics for Students of |
| Text | Chemistry, 2nd edition, S.L.N. Chand and Co., Jalandhar, 1986. |
| | 2. I.M. Klotz and R.M. Rosenberg, Chemical thermodynamics, 6th |
| | edition, W.A. BenjaminPublishers, California, 1972. |
| | 3. M.C. Gupta, Statistical Thermodynamics, New Age International, |
| | Pvt. Ltd., New Delhi, 1995. |
| | 4. K.J. Laidler, Chemical Kinetics, 3rd edition, Pearson, Reprint - |
| | 2013. |
| | 5. J. Rajaram and J.C. Kuriokose, Kinetics and Mechanisms of |
| | chemical transformation,M acmillan India Ltd, Reprint - 2011. |
| Reference Books | 1. D.A. Mcqurrie And J.D. Simon, Physical Chemistry - A |
| | Molecular Approach, Viva Books Pvt. Ltd., New Delhi, 1999. |
| | 11 / / / / / / / / / / / / / / / / / / |
| | 2. R.P. Rastogi and R.R. Misra, Classical Thermodynamics, Vikas |
| | 2. R.P. Rastogi and R.R. Misra, Classical Thermodynamics, Vikas Publishing, Pvt. Ltd., New Delhi, 1990. |
| | |
| | Publishing, Pvt. Ltd., New Delhi, 1990. |
| | Publishing, Pvt. Ltd., New Delhi, 1990. 3. S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, |
| | Publishing, Pvt. Ltd., New Delhi, 1990. 3. S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, Macmillan Publishers, New York, 1974 |
| | Publishing, Pvt. Ltd., New Delhi, 1990. 3. S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, Macmillan Publishers, New York, 1974 4. K.B. Ytsiimiriski, "Kinetic Methods of Analysis", Pergamom Press,1996. 5. Gurdeep Raj, Phase rule, Goel Publishing House, 2011. |
| Website and e-learning source | Publishing, Pvt. Ltd., New Delhi, 1990. 3. S.H. Maron and J.B. Lando, Fundamentals of Physical Chemistry, Macmillan Publishers, New York, 1974 4. K.B. Ytsiimiriski, "Kinetic Methods of Analysis", Pergamom Press,1996. |

Students will be able:

CO1: To explain the classical and statistical concepts of thermodynamics.

CO2: To compare and correlate the thermodynamic concepts to study the kinetics of chemical reactions.

CO3: To discuss the various thermodynamic and kinetic determination.

CO4: To evaluate the thermodynamic methods for real gases ad mixtures.

CO5: To compare the theories of reactions rates and fast reactions.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | INORGA | NIC CHE | MIST | RY PRAC | CTIC | AL | | | |
|-----------------------|--|---------------------------------|----------|--------------|---------------|-----------------------|-------------------|--|--|
| Course | | | | | | | | | |
| Paper No. | Core VI | | | | | | | | |
| Category | Core | Year | IV | Credits | 4 | Course | | | |
| | | Semester | VIII | | | Code | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | |
| hours per week | _ | - 1 4 5 | | | | | | | |
| Prerequisites | Basic principles of gravimetric and qualitative analysis | | | | | | | | |
| Objectives of the | | | | | _ | | n analytical tool | | |
| course | | antitative es | | | | | • | | |
| | To recall | the principl | e and t | heory in p | repar | ing standard s | solutions. | | |
| | To train t | he students | for in | proving th | neir s | kill in estima | ting the amount | | |
| | | urately pro | | | | | \mathcal{E} | | |
| | To estima | ite metal io | ns, pre | sent in the | give | n solution ac | curately without | | |
| | using inst | ruments. | | | | | - | | |
| | To detern | nine the amo | ount of | ions, pres | ent ir | ı a binary mix | ture accurately. | | |
| Course Outline | | | | | | | mixture of four | | |
| | | _ | o com | mon cation | ns an | d two rare car | tions. Cations to | | |
| | be tested. | | | | | | | | |
| | Group-I | | 'l and F | | | | | | |
| | Group-II | | | Cu, Bi an | | | | | |
| | Group-III | | | Zr, V, Cr, | Fe, T | i and U. | | | |
| | Group-IV | | - | and Mn. | | | | | |
| | Group-V | | Ba and | Sr. | | | | | |
| | Group-V | | | . 1 | | . | | | |
| | | _ | on of | metal cor | nplex | xes: Preparati | on of inorganic | | |
| | complexe | | 1. : | (T) | 11. | -4- | | | |
| | _ | tion of trist | | 11 \ | - | | | | |
| | | ation of pota | | | | | | | |
| | | ition of tetra ition of Reii | | | <i>)</i> suiț | mate | | | |
| | | | | | D chl | oridedihydrat | e | | |
| | _ | | | | | liaquachroma | | | |
| | _ | ation of sodi | | | | - | (111) | | |
| | | ation of hex | | | | | | | |
| | | : Complex | | | | | | | |
| | | | | | | nd calcium. | | | |
| | | | | _ | | control, mask | ing and | | |
| | | king agents. | | | • | • | _ | | |
| | | | | and lead | in a n | nixture (pH co | ontrol). | | |
| | | | _ | | - | ence of iron. | | | |
| | 5. Determ | ination of n | ickel i | n the prese | ence o | of iron. | | | |
| Extended | Questions | related to t | he abo | ve topics, | from | various comp | petitive | | |
| Professional | examinat | ons UPSC | | | | | TNPSC others | | |
| Component (is a | to be solv | ed | | | | | | | |
| part of internal | (To be dis | scussed duri | ing the | Tutorial h | ours) |) | | | |
| component only, | | | | | | | | | |
| Not to be included | | | | | | | | | |

| in the external | |
|------------------|--|
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. A. JeyaRajendran, Microanalytical Techniques in Chemistry: |
| Text | Inorganic Qualitative Analysis, United global publishers, 2021. |
| | 2. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis; |
| | 3rded., The National Publishing Company, Chennai, 1974. |
| | 3. Vogel's Text book of Inorganic Qualitative Analysis, 4thed., ELBS, |
| | London. |
| Reference Books | 1. G. Pass, and H. Sutcliffe, <i>Practical Inorganic Chemistry</i> ; Chapman |
| | Hall, 1965. |
| | 2. W. G. Palmer, Experimental <i>Inorganic Chemistry</i> ; Cambridge |
| | University Press, 1954. |
| | |
| | |

Students will be able:

CO1: To identify the anions and cations present in a mixture of salts.

CO2: To apply the principles of semi micro qualitative analysis to categorize acid radicals and basic radicals.

CO3: To acquire the qualitative analytical skills by selecting suitable confirmatory tests and spot tests.

CO4: To choose the appropriate chemical reagents for the detection of anions and cations.

CO5: To synthesize coordination compounds in good quality.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 - Strong, 2 - Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | MEDICI | NAL CHE | MIST | RY | | | | | |
|------------------------|--|--------------------|-----------------|-------------|---------|-----------------------------|-----------------|--|--|
| Paper No. | Elective 1 | III | | | | | | | |
| Category | Elective | Year | IV | Credits | 4 | Course | | | |
| 8 v | | Semester | VIII | - | | Code | | | |
| Instructional | Lecture | Tutorial | | Practice | | Total | | | |
| hours per week | 4 | 1 | _ | 1140000 | | 5 | | | |
| Prerequisites | • | owledge of | medici | inal chemi | istrv | | | | |
| Objectives of the | | | | | | elonment of r | harmaceutical | | |
| course | To study the chemistry behind the development of pharmaceutical materials. | | | | | | | | |
| course | | nowledge o | n mecl | nanism and | 1 actio | on of drugs. | | | |
| | _ | _ | | | | sage of drugs. | | | |
| | | | | | | ~ ~ | and treatment | | |
| | of diabete | | | | | and the upon | | | |
| | | fy and apply | the ac | tion of va | rious | antibiotics | | | |
| Course Outline | | | | | | troduction, tar | gets. Agonist | | |
| Source Summe | | | | | | eptor types, The | | | |
| | - recep | | action, | | | ergism, Drug | _ | | |
| | | nemical fact | - | _ | • | • | 5 10212001100, | | |
| | | | | | | rgets of antib | piotics action. | | |
| | | | | | | mechanism of a | | | |
| | penicllins | | | | | application o | | | |
| | _ | orin.Curren | - | | | | r pememins, | | |
| | | | | | | | assification of | | |
| | | | | | | | tiology, types, | | |
| | | | | | | classification a | | | |
| | | | • 1 | _ | - | ilorothiazide, A | | | |
| | | | | | | | assification of | | |
| | | • • | | _ | | ypertension, et | | | |
| | | _ | - | | | classification a | | | |
| | | | • 1 | _ | | ılorothiazide, A | | | |
| | | | | • | | | | | |
| | Introducti | | s, And anism | | | Anti-inflammanation, classi | fication and | | |
| | | * | | | | profen, Diclofer | | | |
| | | | - | | - | dine. Medicinal | - | | |
| | | | | | | diabetics, Drug | | | |
| | | | | | | nism of action, | | | |
| | | nellitus. Che | | | | | Treatment of | | |
| Extended | | | | | | various compe | titive | | |
| Professional | | | | | | SIR / GATE /T | | | |
| Component (is a | to be solv | | IND | 11111100 | JC-C | SIK / GATE / I. | in be onicis | | |
| part of internal | | cu scussed duri | ng the | Tutorial h | Olire | | | | |
| component only, | (10 00 dis | seusseu uull | ng me | ı uwılaı II | Juis | | | | |
| Not to be | | | | | | | | | |
| included in the | | | | | | | | | |
| external | | | | | | | | | |
| examination | | | | | | | | | |
| | | | | | | | | | |
| question paper) | | | | | | | | | |
| | | | | | | | | | |

| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
|-------------------------------------|--|
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended Text | Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, Wilson, Charles Owens: Beale, John Marlowe; Block, John H, Lipincott William, 12th edition, 2011. Graham L. Patrick, An Introduction to Medicinal Chemistry, 5th edition, Oxford University Press, 2013. Jayashree Ghosh, A text book of Pharmaceutical Chemistry, S. Chand and Co. Ltd, 1999, 1999 edn. |
| | 4. O. LeRoy, Natural and synthetic organic medicinal compounds, Ealemi, 1976. 5.S. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, New Delhi, 1993, New edn. |
| Reference Books | Foye's Princles of Medicinal Chemistry, Lipincott Williams, Seventh Edition, 2012 Burger's Medicinal Chemistry, Drug Discovery and Development, Donald J. Abraham, David P. Rotella, Alfred Burger, Academic press, 2010. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, John M. Beale Jr and John M. Block, Wolters Kluwer, 2011, 12th edn. P. Parimoo, A Textbook of Medical Chemistry, New Delhi: CBS Publishers.1995. S. Ramakrishnan, K. G. Prasannan and R. Rajan, Textbook of Medical Biochemistry, Hyderabad: Orient Longman. 3rd edition, 2001. |
| Website and e-learning source | https://www.ncbi.nlm.nih.gov/books/NBK482447/ https://training.seer.cancer.gov/treatment/chemotherapy/types.html https://www.classcentral.com/course/swayam-medicinal-chemistry- 12908 |

Students will be able:

CO1: Predict a drugs properties based on its structure.

CO2: Describe the factors that affect its absorption, distribution, metabolism, and excretion, and hence the considerations to be made in drug design.

CO3: Explain the relationship between drug's chemical structure and its therapeutic properties.

CO4: Designed to give the knowledge of different theories of drug actions at molecular level.

CO5: To identify different targets for the development of new drugs for the treatment of infectious and GIT.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | GREEN | CHEMIST | RY | | | | | | | |
|--------------------|--|-----------------|-------------|--------------|--------|-------------------|---------------------------|--|--|--|
| Course | | | | | | | | | | |
| Paper No. | Elective 1 | | 1 | | | 1 | 1 | | | |
| Category | Elective | Year | IV | Credits | 4 | Course | | | | |
| | | Semester | | | | Code | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | |
| hours per week | 4 1 - 5 | | | | | | | | | |
| Prerequisites | Basic knowledge of general chemistry | | | | | | | | | |
| Objectives of the | To discuss the principles of green chemistry. | | | | | | | | | |
| course | To propose green solutions for chemical energy storage and conversion. Propose green solutions for industrial production of Petroleum and | | | | | | | | | |
| | | | ions fo | or industri | ial p | roduction of I | Petroleum and | | | |
| | Petrochen | | 11 | .• | ,• | | 1 ' 1 1 | | | |
| | _ | solutions to | r polit | ition preve | entio | n in Industrial | chemical and | | | |
| | fuel | a Automot | ام منا مردا | usters and (| Thim. | in a in dyatniaa | | | | |
| | | | | | | oing industries. | of Surfactants, | | | |
| | | nd inorgani | | | unai | production c | or Surfactants, | | | |
| | Organic a | iid iiioi gaiii | C CIICII | iicais. | | | | | | |
| Course Outline | UNIT-I• | Introduction | - Need | for Green C | hemi | istry. Goals of G | reen Chemistry. | | | |
| Course Outline | | | | | | | terminologies, | | | |
| | | | | • | | • | ve principles of | | | |
| | | mistry with | | | | | . P | | | |
| | | | | | a #0 | namta antolyat | a and aalvanta | | | |
| | | | | | | | s and solvents | | | |
| | | | • | - | • | | reen synthesis- | | | |
| | - | _ | • | | | | : Water,Ionic | | | |
| | liquids-cr | _ | | | _ | = | et on organic | | | |
| | reaction. | Supercriti | cal c | arbon di | oxid | e- properties, | advantages, | | | |
| | drawback | s and a fev | v exan | nples of o | rgani | c reactions in | scCO ₂ . Green | | | |
| | synthesis- | adipic acid | and ca | techol. | | | | | | |
| | | | | | Gre | en Catalysis-A | Acid catalysts, | | | |
| | | | | - | | • | catalysts-Poly | | | |
| | | | | | | | eatalysts, Poly | | | |
| | supported | photosensi | tizers. | | | • | | | | |
| | UNIT-IV | : Phase tra | nsfer c | atalysis ir | gre | en synthesis-ox | kidation using | | | |
| | hydrogen | peroxide | , cro | wn ethe | rs-est | terification, s | aponification, | | | |
| | | | | | eacti | on, Displacen | nent reaction. | | | |
| | Application | ons in orgar | nic synt | hesis. | | | | | | |
| | UNIT-V: | Micro | wave | induced | gre | een synthesis | -Introduction, | | | |
| | Instrumer | ntation, Pr | rinciple | and a | _ | • | chemistry – | | | |
| | Instrumer | ntation, Ca | vitatio | n theory | - U | Iltra sound a | ssisted green | | | |
| | | and Applica | | | | | | | | |
| Extended | - | | | - | | various compe | | | | |
| Professional | | | TRB / | NET/ UC | ъС-С | SIR / GATE /T | NPSC others | | | |
| Component (is a | to be solv | | | | | | | | | |
| part of internal | (To be dis | scussed duri | ing the | Tutorial h | ours) |) | | | | |
| component only, | | | | | | | | | | |
| Not to be included | | | | | | | | | | |
| in the external | | | | | | | | | | |

| examination | |
|-------------------|---|
| | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, |
| Text | Anamalaya Publishers, 2005. |
| | 2. W. L. McCabe, J.C. Smith and P. Harriott, Unit Operations of |
| | Chemical Engineering, 7 th edition, McGraw-Hill, |
| | NewDelhi,2005. |
| | 3. J. M. Swan and D. St. C. Black, Organometallics in Organic |
| | Synthesis, Chapman Hall,1974. |
| | 4. V. K. Ahluwalia and R. Aggarwal, Organic Synthesis: Special |
| | Techniques, Narosa Publishing House, New Delhi,2001. |
| | 5. A. K. De, Environmental Chemistry, New Age Publications, |
| | 2017. |
| Reference Books | 1. Anastas, P.T. and Warner, J.K. Oxford Green Chemistry -Theory and |
| | Practical, University Press, 1998 |
| | 2. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001 |
| | 3. Cann, M.C. and Connely, M.E. Real-World Cases in Green Chemistry, |
| | American Chemical Society, Washington, 2000 |
| | 4. Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, |
| | American Chemical Society Washington, 2002. |
| | 5. Chandrakanta Bandyopadhyay, An Insight into Green Chemistry, |
| | Books and Allied (P) Ltd, 2019. |
| Website and | 2. https://www.organic-chemistry.org/ |
| e-learning source | 3. https://www.studyorgo.com/summary.php |
| | |

Students will be able:

CO1: To recall the basic chemical techniques used in conventional industrial preparations and in green innovations.

CO2: To understand the various techniques used in chemical industries and in laboratory.

CO3: To compare the advantages of organic reactions assisted by renewable energy sources and non-renewable energy sources.

CO4: To apply the principles of PTC, ionic liquid, microwave and ultrasonic assisted organic synthesis.

CO5: To design and synthesize new organic compounds by green methods.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | BIO-INC | RGANIC (| CHEN | IISTRY | | | |
|-----------------------|------------|----------------------------|-------------------|---------------|---------|---------------------------------------|-----------------------------|
| Course | | | | | | | |
| Paper No. | Elective 1 | | | | | - | |
| Category | Elective | Year | IV | Credits | 4 | Course | |
| T | | Semester | VIII | D | | Code | |
| Instructional | Lecture | Tutorial | Lab . | Practice | | Total | |
| hours per week | 4 | | <u>-</u> | | | 5 | |
| Prerequisites | | owledge of | | | | | |
| Objectives of the | | stand the rol | | | | C:1 | |
| course | | | _ | _ | | f iron, sulpur. | |
| | | the toxicity mowledge o | | | | S. | |
| | | s on various | _ | _ | | erties | |
| Course Outline | | | | | | | and storage of |
| | | | | | | = | and potassium |
| | | | | | - | | Zinc enzymes– |
| | 1 - | | _ | | | • | ymes-catalase, |
| | | | | | | | Plast ocyanin, |
| | - | | - | _ | | itamin-B12 co | = |
| | | | | | | | moglobin and |
| | | - | | | | | sinding of CO, |
| | | | | | | | _ |
| | | | | | _ | _ | redox system: |
| | 1 - | | | - | | - | chrome P-450. |
| | | | | = | | = = = = = = = = = = = = = = = = = = = | n. Iron-sulphur |
| | | | | | | ture and classi | |
| | | | | | | | nitrogen fixing |
| | _ | | _ | • | | | in nitrogenase- |
| | | | | | | | l complexes of |
| | dinitroger | _ | ı iixai nmonia | | | | d reduction of system-I and |
| | | em-II-chlor | | | • | • | system-i and |
| | | | | | | | d, Zn, Pb, As, |
| | | | | | | | betes Drugs; |
| | | | | | | Chelation the | |
| | treatment | . Diagnos | tic A | Agents: | Techi | netium Imag | ging Agents; |
| | Gadoliniu | _ | | _ | empe | _ | tical magnetic |
| | Field. | | | | | | |
| | UNIT-V: | Enzymes | -Intro | duction as | nd pr | operties -nom | nenclature and |
| | | | | | | | and the effects |
| | _ | | | _ | | _ | emperature on |
| | enzyme re | eactions. Fa | ctors c | ontributing | g to tl | ne efficiency of | f enzyme. |

| Extended Professional Component (is a Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC to be solved | others |
|--|----------------|
| | ouicis |
| | |
| part of internal (To be discussed during the Tutorial hours) | |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired Knowledge, Problem solving, Analytical ability, Professional | |
| from this course Competency, Professional Communication and Transferable skill | S |
| Recommended 1. Williams, D.R. – Introdution to Bioinorganic chemistry. | · |
| Text 2. F.M. Fiabre and D.R. Williams—The Principles of Bioinorganic | C |
| Chemistry, Royol Society of Chemistry, Monograph for Teacher | |
| 3. K.F. Purcell and Kotz., Inorganic chemistry, WB Saunders Co | |
| USA. | •• |
| 4. G.N. Mugherjea and Arabinda Das, Elements of Bioinorganic | |
| Chemistry - 1993. | |
| 5. R. Gopalan, V. Ramalingam, Concise Coordination Che | mistry. |
| S. Chand, 2001 . | ,,,, |
| Reference Books 1. M.Satake and Y.Mido, Bioinorganic Chemistry- Dis | scovery |
| Publishing House, New Delhi (1996) | J |
| 2. M.N. Hughes, 1982, The Inorganic Chemistry of Bio | logical |
| processes, II Edition, Wiley London. | C |
| 3. R. W. Hay, Bio Inorganic Chemistry, Ellis Horwood, 1987. | |
| 4. R. M. Roat-Malone, Bio Inorganic Chemistry, John Wiley, 20 | 02. |
| 5. T. M. Loehr, Iron carriers and Iron proteins, VCH, 1989. | |
| Website and 1. https://www.pdfdrive.com/instant-notes-in-inorganic-chemis | try- |
| e-learning source the-instant-notes-chemistry-series-d162097454.html | |
| 2. https://www.pdfdrive.com/shriver-and-atkins-inorganic-chenge | <u>nistry-</u> |
| <u>5th-edition-d161563417.html</u> | |
| Course I couring Outcomes (for Morning with DOs and DSOs) | |

Students will be able:

CO1: The students will be able to analyses trace elements.

CO2: Students will be able to explain the biological redox systems.

CO3: Students will gain skill in analyzing the toxicity in metals.

CO4: Students will have experience in diagnosis.

CO5: Learn about the nitrogen fixation and photosynthetic mechanism.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | MATER | IAL SCIEN | NCE | | | | | | | |
|-------------------|--|--------------|---------|-------------|--------|-----------------|----------------------------------|--|--|--|
| Course | | | | | | | | | | |
| Paper No. | Elective | | | | | ī | | | | |
| Category | Elective | Year | IV | Credits | 4 | Course | | | | |
| | | Semester | VIII | | | Code | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | |
| Prerequisites | Basic kn | owledge of | solid-s | tate chem | istry | | | | | |
| Objectives of the | To unde | rstand the | crysta | al structu | re, g | rowth metho | ds and X-ray | | | |
| course | scattering | | | | | | | | | |
| | To explain the optical, dielectric and diffusion properties of crystals. | | | | | | | | | |
| | | | sis of | semicondu | ictors | , superconduc | tivity materials | | | |
| | and magn | | | | | | | | | |
| | 1 | • | | | - | - | nanomaterials. | | | |
| | | | mporta | ance of ma | ateria | ls used for re | newable energy | | | |
| | conversion | | | | | | | | | |
| Course Outline | | | | | | | Miller indices - | | | |
| | _ | • | | | | C 1 | space groups - | | | |
| | _ | | | | _ | | ocal lattice and | | | |
| | _ | _ | _ | | - | | ystal structure— | | | |
| | _ | | | | | | charge density | | | |
| | | | | | | pplications. | | | | |
| | | | | | | | on-equilibrium | | | |
| | | | | | | | Low and high | | | |
| | _ | ds- nucleat | | _ | | _ | Crystal growth netastable state. | | | |
| | | | | | | | rowth– Gel and | | | |
| | | | | | | | ralski methods. | | | |
| | | | | | | | ort. Lorentz and | | | |
| | | | - | | | lary extinction | | | | |
| | | | | | | • | Electromagnetic | | | |
| | | - | | • | - | | - transparency, | | | |
| | 1 - | ` - | | | | | o-, electro-, and | | | |
| | | • | • | • • | | - | l polymer LED | | | |
| | | | | | | | on - electronic, | | | |
| | ionic, ori | entation, an | d spac | e charge p | olaris | sation. Effect | of temperature. | | | |
| | dielectric | constant, | dielect | ric loss. | Type | s of dielectr | ic breakdown- | | | |
| | intrinsic, | thermal, dis | charge | , electroch | nemic | al and defect b | oreakdown. | | | |
| | UNIT-IV | : Special | Mater | rials: Sup | ercor | ductivity: M | eissner effect, | | | |
| | Critical | temperature | and | critical r | nagne | etic Field, T | ype I and II | | | |
| | _ | | | • | - | | Soft and hard | | | |
| | _ | | - | - | _ | | . Magneto and | | | |
| | | | | | | _ | etic materials- | | | |
| | | _ | - | | | | eations. Ferro-, | | | |
| | | | | | | | ications. Shape | | | |
| | 1 | - | | | | | -linear optics- | | | |
| | | | enerato | ors, mixing | g of L | aser waveleng | gths by quartz, | | | |
| | ruby and | | | | | | | | | |
| | UNIT-V | Materials | for Re | enewable | Ener | gy Conversio | n: Solar Cells: | | | |

| | Organic, bilayer, bulk heterojunction, polymer, perovskite based. Solar |
|--------------------|---|
| | energy conversion: lamellar solids and thin films, dye-sensitized photo |
| | voltaic cells, coordination compounds anchored onto semiconductor |
| | surfaces - Ru(II) and Os(II) polypyridyl complexes. Photochemical |
| | activation and splitting of water, CO2 and N2. Manganese based photo |
| | systems for water-splitting. Complexes of Rh, Ru, Pd and Pt - |
| D . 1.1 | photochemical generation of hydrogen from alcohol. |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. S. Mohan and V. Arjunan, Principles of Materials Science, MJP |
| Text | Publishers, 2016. |
| | 2. Arumugam, Materials Science, Anuradha Publications, 2007. |
| | 3. Giacavazzo et. al., Fundamentals of Crystallography, International |
| | Union of Crystallography. Oxford Science Publications, 2010 |
| | 4. Woolfson, An Introduction to Crystallography, Cambridge University |
| | Press, 2012. |
| | 5. James F. Shackelford and Madanapalli K. Muralidhara, Introduction |
| | to Materials Science for Engineers. 6th ed., PEARSON Press, 2007. |
| Reference Books | 1. Suggested Readings 1. M.G. Arora, Solid State Chemistry, Anmol |
| | Publications, New Delhi, 2001. |
| | 2. R.K. Puri and V.K. Babbar, Solid State Physics, S Chand and |
| | Company Ltd, 2001. |
| | 3 C. Kittel, Solid State Physics, John-Wiley and sons, NY, 1966. |
| | 4. H.P. Meyers, Introductory Solid State Physics, Viva Books Private |
| | Limited, 1998. |
| | 5. A.R. West, Solid State Chemistry and Applications, John-Wiley and |
| *** | sons, 1987. |
| Website and | 1. http://xrayweb.chem.ou.edu/notes/symmetry.html. |
| e-learning source | 2. http://www.uptti.ac.in/classroom-content/data/unit%20cell.pdf. |
| | 3. https://bit.ly/3QyVg2R |

Students will be able:

CO1: To understand and recall the synthesis and characteristics of crystal structures, semiconductors, magnets, nanomaterials and renewable energy materials.

CO2: To integrate and assess the structure of different materials and their properties.

CO3: To analyse and identify new materials for energy applications.

CO4: To explain the importance of crystal structures, piezoelectric and pyroelectric materials, nanomaterials, hard and soft magnets, superconductors, solar cells, electrodes, LED uses, structures and synthesis.

CO5: To design and develop new materials with improved property for energy applications.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | ORGAN | IC SYNTH | ESIS | AND PE | ЮТ | OCHEMISTR | RY | | | | |
|--------------------------|-------------|---|-------|------------|--------|--------------------------------|---------------------|--|--|--|--|
| Paper No. | Core VII | - | | | | | | | | | |
| Category | Core | Year | V | Credits | 4 | Course | | | | | |
| | | Semester | IX | | | Code | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | | |
| Prerequisites | Basic kno | wledge of o | organ | ic chemist | ry | | | | | | |
| Objectives of the | To under | stand the n | nolec | ular comp | lexit | y of carbon sl | keletons and the | | | | |
| course | | presence of functional groups and their relative positions. | | | | | | | | | |
| | - | - | nthet | ically imp | orta | nt reagents for | r any successful | | | | |
| | organic s | • | | | | | | | | | |
| | | | | | ind 10 | dentifying suita | able synthons to | | | | |
| | | cessful orga | | • | oo oti | on mechanism | | | | | |
| | | | - | • | | on mechanism organic reacti | | | | | |
| | 10 gain t | iic kiiowicu, | gc or | photoenei | incai | organic reacti | ons. | | | | |
| Course Outline | UNIT-I | Planning | an | Organic | Synt | hesis and Co | ontrol elements: | | | | |
| | | _ | | _ | - | | synthetic system | | | | |
| | | • | _ | | | | arbon framework | | | | |
| | into sir | nple ration | al pi | recursors, | retr | osynthetic an | alysis, alternate | | | | |
| | | • | • | | | | ormed, available | | | | |
| | _ | | | | | | thods. Linear Vs | | | | |
| | _ | - | | - | | _ | ng concepts of | | | | |
| | | | | | | | rotective groups, | | | | |
| | | | | | | | on retrosynthetic | | | | |
| | | s of stereocl | | • | | - | ergent synthesis, | | | | |
| | | | | | | • | nthetic analysis; | | | | |
| | | | | | | | and bifunctional | | | | |
| | | | | | | | diates, available | | | | |
| | _ | | | | | - | native methods. | | | | |
| | Converge | ent and div | erger | nt synthes | sis, S | Synthesis base | d on umpolung | | | | |
| | | | | | | | l, carbonyl, thiol | | | | |
| | | | | | | | deprotection in | | | | |
| | | | | | | | lements. Use of | | | | |
| | | • | | | | ~ ~ | nts. Stereospecific | | | | |
| | control ele | ments. Func | uonal | group ane | ialion | s and transposit | 1011. | | | | |
| | IINIT-II | · Pericycl | ic R | eactions: | Woo | odward Hoffm | nann rules; The | | | | |
| | | | | | | | and correlation | | | | |
| | | | | 1 | | | ns; [2+2], [2+4], | | | | |
| | _ | • | | • | | | ons. Cheletropic | | | | |
| | _ | | | | _ | - | ns of conjugated | | | | |
| | | - | | | _ | | (1,5), (3,3) and | | | | |
| | ` ' | | | | | _ | onic sigmatropic | | | | |
| | rearrange | | 3roup | | | | Regioselectivity, | | | | |
| | stereosele | ectivity and | peris | electivity | in pe | ricyclic reactio | ns. | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| | UNIT-IV: Organic Photochemistry-I: Photochemical excitation: | | | | | | | | |
|--------------------|--|--|--|--|--|--|--|--|--|
| | Experimental techniques; electronic transitions; Jablonskii diagrams; | | | | | | | | |
| | intersystem crossings; energy transfer processes; Stern Volmer | | | | | | | | |
| | equation. | | | | | | | | |
| | Reactions of electronically excited ketones; $\pi \rightarrow \pi^*$ triplets; Norrish | | | | | | | | |
| | type-I and type-II cleavage reactions; photo reductions; Paterno-Buchi | | | | | | | | |
| | reactions; | | | | | | | | |
| | UNIT-V: Organic Photochemistry-I: Photochemistry of α,β- | | | | | | | | |
| | unsaturated ketones; cis-trans isomerisation. Photon energy transfer | | | | | | | | |
| | reactions, Photo cycloadditions, Photochemistry of aromatic | | | | | | | | |
| | compounds; photochemical rearrangements; photo-stationery state; di- | | | | | | | | |
| | π-methane rearrangement; Reaction of conjugated cyclohexadienone to | | | | | | | | |
| | | | | | | | | | |
| D-4 1-1 | 3,4-diphenyl phenols; Barton's reactions. | | | | | | | | |
| Extended | Questions related to the above topics, from various competitive | | | | | | | | |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others | | | | | | | | |
| Component (is a | to be solved | | | | | | | | |
| part of internal | (To be discussed during the Tutorial hours) | | | | | | | | |
| component only, | | | | | | | | | |
| Not to be included | | | | | | | | | |
| in the external | | | | | | | | | |
| examination | | | | | | | | | |
| question paper) | | | | | | | | | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional | | | | | | | | |
| from this course | Competency, Professional Communication and Transferable skills. | | | | | | | | |
| Recommended | 1. F. A. Carey and Sundberg, Advanced Organic Chemistry, 5thed, | | | | | | | | |
| Text | Tata McGraw-Hill, New York, 2003. | | | | | | | | |
| | 2. J. March and M. Smith, Advanced Organic Chemistry, 5 th ed., | | | | | | | | |
| | John-Wiley and sons, 2007. | | | | | | | | |
| | 3. R. E. Ireland, Organic synthesis, Prentice Hall India, Goel | | | | | | | | |
| | publishing house, 1990. | | | | | | | | |
| | 4. Clayden, Greeves, Warren, Organic Chemistry, Oxford University | | | | | | | | |
| | Press, Second Edition, 2016. | | | | | | | | |
| | 5. M. B. Smith, Organic Synthesis 3 rd edn, McGraw Hill International | | | | | | | | |
| | Edition, 2011. | | | | | | | | |
| Reference Books | 1. Gill and Wills, Pericyclic Reactions, Chapman Hall, London, 1974. | | | | | | | | |
| | 2. J.A. Joule, G.F. Smith, Heterocyclic Chemistry, Garden City Press, | | | | | | | | |
| | Great Britain, 2004. | | | | | | | | |
| | 3. W. Caruthers, Some Modern Methods of Organic Synthesis 4 th edn, | | | | | | | | |
| | Cambridge University Press, Cambridge, 2007. | | | | | | | | |
| | 4. H. O. House. Modern Synthetic reactions, W.A. Benjamin Inc, | | | | | | | | |
| | 1972. | | | | | | | | |
| | 5. Jagdamba Singh and Jaya Singh, Photochemistry and Pericyclic | | | | | | | | |
| | Reactions, New Age International Publishers, New Delhi, 2012. | | | | | | | | |
| Website and | 1. https://rushim.ru/books/praktikum/Monson.pdf | | | | | | | | |
| e-learning source | | | | | | | | | |
| | (6 NK 1 1/1 DO 1 DCO) | | | | | | | | |

Students will be able:

CO1: To recall the basic principles of organic chemistry and to understand the various reactions of organic compounds with reaction mechanisms.

CO2: To understand the versatility of various special reagents and to correlate their reactivity with various reaction conditions.

CO3: To implement the synthetic strategies in the preparation of various organic compounds.

CO4: To predict the suitability of reaction conditions in the preparation of tailor-made organic compounds.

CO5: To design and synthesize novel organic compounds with the methodologies learnt during the course.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | COORD | INATION | CHE | MISTRY | - I | | | | |
|-------------------|--|------------------|---------|--------------|---------|-----------------|--------------------------------|--|--|
| Course | C VIII | T | | | | | | | |
| Paper No. | Core VII | | 17 | C 1:4 | 1 | C | 1 | | |
| Category | Core | Year Semester | V IX | Credits | 4 | Course Code | | | |
| Instructional | Lastuna | Tutorial | | Practice | | Total | | | |
| hours per week | Lecture | 1 utoriai | Lat | Practice | | 5 | | | |
| Prerequisites | | | | | | | | | |
| Objectives of the | Basic knowledge of inorganic chemistry To gain insights into the modern theories of bonding in coordination | | | | | | | | |
| course | compounds. | | | | | | | | |
| | - | | netho | ds to det | termii | ne the stabilit | cy constants of | | |
| | complexe | | | | | | | | |
| | To under | rstand and | cons | truct cor | relatio | on diagrams a | and predict the | | |
| | | | | _ | - | in the complex | | | |
| | | | | | | electron trans | fer mechanistic | | |
| | 1 | of reactions | | | | 1 1 | 1 | | |
| C | | | | | | d square plana | • | | |
| Course Outline | | | | | | - | ls: Crystal field | | |
| | 1 | | | | | | dral and square | | |
| | 1 - | | | | | * | ffecting 10Dq - | | |
| | 1 - | | | • | | • | gy for high spin | | |
| | | | | | | = | splitting - site | | |
| | | - | | - | | | tortions and its | | |
| | _ | | | | | | level diagrams | | |
| | concept o | f Weak and | stroi | ng fields, S | Sigma | a and pi bondir | ng in octahedral, | | |
| | square pla | anar and teti | rahed | ral comple | exes. | | | | |
| | UNIT-II: | Spectral | chara | acteristics | of o | complexes: Te | rm states for d | | |
| | ions - cl | naracteristic | s of | d-d trans | sitions | s - charge tra | insfer spectra - | | |
| | selection | rules for e | electro | onic spec | tra - | Orgel correlat | tion diagrams - | | |
| | Sugano-T | anabe ener | gy le | vel diagra | ıms - | nephelauxetic | series - Racha | | |
| | parameter | r and calcula | ation | of inter-el | ectro | nic repulsion p | arameter. | | |
| | UNIT-II | I: Stability | and | d Magne | tic p | roperty of t | he complexes: | | |
| | | | | | | | of complexes, | | |
| | | | | | | | ise and overall | | |
| | | | | • | | | al factors and | | |
| | | | | | | | composition of | | |
| | | | | | | | half method, | | |
| | | | | | | | Ion exchange | | |
| | | | | | | | riation method orbit coupling, | | |
| | | | | | | | quenching of | | |
| | | agnetic mon | - | _ | | | 1 | | |
| | | | | | sms | of substitutio | n reactions of | | |
| | | | | | | | t and Labile | | |
| | | | | | | | nistic pathways | | |
| | for subst | itution reac | tions | ; acid a | nd b | ase hydrolysis | of octahedral | | |

| | complexes; Classification of metal ions based on the rate of water replacement reaction and their correlation to Crystal Field Activation Energy; Substitution reactions in square planar complexes: Trans effect, theories of trans effect and applications of trans effect in synthesis of square planar compounds; Kurnakov test. |
|------------------------------------|--|
| | UNIT-V: Electron Transfer reactions in octahedral complexes: Outer sphere electron transfer reactions and Marcus-Hush theory; inner sphere electron transfer reactions; nature of the bridging ligand in inner sphere electron transfer reactions. Photo-redox, photo-substitution and photo-isomerisation reactions in complexes and their applications. |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic |
| Text | Chemistry – Principles of structure and reactivity, 4th Edition, |
| | Pearson Education Inc., 2006 |
| | 2. G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, |
| | Pearson Education Inc., 2008 |
| | 3. D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993.4. B. N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd, 1976. |
| | 5. F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, |
| | Advanced Inorganic Chemistry, 6th ed.; Wiley Inter-science: New |
| | York, 1988. |
| Reference Books | 1. Keith F. Purcell and John C. Kotz, Inorganic Chemistry, Saunders Publications, USA, 1977. |
| | 2. Peter Atkins and Tina Overton, Shriver and Atkins' Inorganic |
| | Chemistry, 5th Edition, Oxford University Press, 2010. |
| | 3. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, P. L. |
| | Guas, John Wiley, 2002, 3rd edn. |
| | 4. Concepts and Models of Inorganic Chemistry, B. Douglas, D. |
| | McDaniel, J. Alexander, John Wiley, 1994, 3rd edn. 5. Inorganic Chemistry, D. F. Shriver, P. W. Atkins, W. H. Freeman |
| | and Co, London, 2010. |
| Website and | https://ocw.mit.edu/courses/5-04-principles-of-inorganic-chemistry-ii- |
| e-learning source | fall-2008/pages/syllabus/ |
| | |

Students will be able:

CO1: Understand and comprehend various theories of coordination compounds.

CO2: Understand the spectroscopic and magnetic properties of coordination complexes.

CO3: Explain the stability of complexes and various experimental methods to determine the stability of complexes.

CO4: Predict the electronic transitions in a complex based on correlation diagrams and UV-visible spectral details.

CO5: Comprehend the kinetics and mechanism of substitution reactions in octahedral and square planar complexes.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | PHYSIC | AL CHEM | ISTI | RY PRAC | TIC | AL | | | |
|-------------------|---|----------------|--------|--------------|-------|---------------------------------|--|--|--|
| Course | | | | | | | | | |
| Paper No. | Core IX | | 1 | | | 1 | | | |
| Category | Core | Year | V | Credits | 4 | Course | | | |
| | | Semester | IX | | | Code | | | |
| Instructional | Lecture | Tutorial | Lal | Practice | | Total | | | |
| hours per week | - | 1 | 4 | | | 5 | | | |
| Prerequisites | | owledge of p | | | | | | | |
| Objectives of the | To understand the principle of conductivity experiments through | | | | | | | | |
| course | | metric titrat | | | . • | | co · · · · · · · · · · · · · · · · · · · | | |
| | | | | | | | coefficient, and | | |
| | kinetics. | i energy o | 1 the | reaction | бу | following ps | eudo first order | | |
| | kinetics. | | | | | | | | |
| | | | | | | | | | |
| | To const | ruct the nh | iase i | diagram o | of tw | o component | system forming | | |
| | | | | _ | | - | emperatures and | | |
| | composit | | | | | | 1 | | |
| | To detern | nine the kin | etics | of adsorpt | ion c | of oxalic acid o | n charcoal. | | |
| | To deve | lop the pot | tentia | l energy | diag | gram of hydro | gen ion, charge | | |
| | density d | istribution a | and N | faxwell's | spee | d distribution | by computational | | |
| | calculation | | | | | | | | |
| Course Outline | | Conductivi | • | - | | | | | |
| | | | | | | ance of a stron | g electrolyte & | | |
| | | erification of | | - | | | | | |
| | | |)stwa | ld's Diluti | on L | .aw & Determi | nation of pKa of | | |
| | | ak acid. | 7 11 | 1. 7 | C | 1 1 . | 1 . | | |
| | | | | | | or weak electro | • | | |
| | | | | | | ingly soluble s | | | |
| | | | | _ | | weak acid vs N alides only). | аОП). | | |
| | 0. 1 1001 | phanon mi | ations | s (IIIIXtuic | OI II | andes only). | | | |
| | IINIT-II | : Kinetics | | | | | | | |
| | | | es of | acid hyd | rolv | sis of an este | r, determine the | | |
| | | | | | | | energy of the | | |
| | react | | | ont and t | 1150 | the activation | energy of the | | |
| | | | s of | the reacti | on b | etween acetor | ne and iodine in | | |
| | | | | | | | e the order with | | |
| | | ect to iodine | • | | | | | | |
| | | | | | | | | | |
| | | I: Phase dia | | | | | | | |
| | | | | | sim | ole binary syste | em | | |
| | _ | nalene-phena | | | | | | | |
| | _ | phenone- di | pheny | yl amine | | | | | |
| | Adsorpti | | 1 | 1. | 1 . | L d.4 | | | |
| | _ | | | | oai & | z determinatio | n of surface area | | |
| E . 1 1 | , | ch isotherm | | | | • | | | |
| Extended | | | | _ | | om various com | _ | | |
| Professional | examinat | ions UPSC | / IRI | 3 / NET/ U | JGC. | -CSIR / GATE | /TNPSC others | | |

| Component (is a | to be solved |
|--------------------|--|
| Component (is a | |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, |
| Text | Viva Books, New Delhi, 2009. |
| | 2. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. |
| | Viswanathan Co. Pvt., 1996. |
| | 3. V.D. Athawale and Parul Mathur, Experimental Physical Chemistry, |
| | New Age International (P) Ltd., New Delhi, 2008. |
| | 4. E.G. Lewers, Computational Chemistry: Introduction to the Theory |
| | and Applications of Molecular and Quantum Mechanics, 2 nd Ed., |
| | Springer, New York, 2011. |
| Reference Books | 1. J. B. Yadav, Advanced Practical Physical Chemistry, Goel |
| | Publishing House, 2001. |
| | 2. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in |
| | Physical Chemistry, 8th edition, McGraw Hill, 2009. |
| | 3. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. |
| | Chand and Co., 1987. |
| | 4. Shailendra K Sinha, Physical Chemistry: A laboratory Manual, |
| | Narosa Publishing House Pvt, Ltd., New Delhi, 2014. |
| | 5. F. Jensen, Introduction to Computational Chemistry, 3 rd Ed., Wiley- |
| | Blackwell. |
| Website and | https://web.iitd.ac.in/~nkurur/2015- |
| e-learning source | 16/Isem/cmp511/lab_handout_new.pdf |

Students will be able:

CO1: To recall the principles associated with various physical chemistry experiments.

CO2: To scientifically plan and perform all the experiments.

CO3: To observe and record systematically the readings in all the experiments.

CO4: To calculate and process the experimentally measured values and compare with graphical data.

CO5: To interpret the experimental data scientifically to improve students' efficiency for societal developments.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | PHARM | OCOGNO | SY A | ND PHY | ГОС | HEMISTRY | |
|-------------------|------------|---------------|-------|------------|--------|-----------------|---------------------|
| Course | | | | | | | |
| Paper No. | Elective ' | V | | | | | |
| Category | Elective | Year | V | Credits | 4 | Course | |
| | | Semester | IX | | | Code | |
| Instructional | Lecture | Tutorial | Lab | Practice | 1 | Total | |
| hours per week | 4 | 1 | - | | | 5 | |
| Prerequisites | Basic kno | wledge of o | hemi | strv | | I | |
| Objectives of the | | | | | l pro | ducts, biologi | ical functions and |
| course | | ological use | _ | | 1 | , 8 | |
| | To develo | op knowled | ge on | primary a | and s | econdary meta | abolites and their |
| | sources. | | | | | - | |
| | To under | stand the | conce | pts of iso | olatio | n methods a | nd separation of |
| | | compounds | | | | | |
| | | | | | | cosides and n | |
| | | | guio | delines o | f W | HO and di | fferent sampling |
| | technique | | | | | | |
| Course Outline | | | | | | | Herbal drugs: |
| | | | | | | | and Source of |
| | | | | | | | cultures. Study of |
| | | | | | | | mic acid pathway |
| | | | | | | | Crude drugs. |
| | | | | _ | | • | ampling of crude |
| | | | | | | | f foreign matter, |
| | | Asn value | . Pny | tochemica | al in | vestigations-C | General chemical |
| | tests. | Ev4ve e4i e | - T | | . C. | | 1ft |
| | | | | | | | ds of extraction, |
| | extraction | | Dec | oction, pe | ercora | ation, immers | sion and soxhlet |
| | | | c co1 | inter curr | ant c | steam distillat | tion, supercritical |
| | | | | | | | ctors affecting the |
| | | extraction p | | | ica c | Attaction. Pac | nois affecting the |
| | + | | | | Tern | enoids and | volatile oils: |
| | | | | | _ | | and separation |
| | | | | | | | calyptol. Volatile |
| | | | | | | | Classifications of |
| | | | | | | | Structure uses. |
| | | | | | | taraxasterol: | |
| | _ | ological appl | | • | | | |
| | UNIT-IV | : Drugs | conta | ining all | kaloi | ds: Occurrer | nce, function of |
| | alkaloids | in plants, p | harm | aceutical | appli | ications. Isola | ntion, Preliminary |
| | | | | | | | hods of structural |
| | | | | | | | mical properties, |
| | | | _ | | | | perties and uses. |
| | | | | | | | lycosides: Basic |
| | | | | | | | litative analysis. |
| | | | | | | | diac glycosides- |
| | | | | | | | les- Diosgenin, |
| | hecogenii | n. Plant pi | gmen | ts: Occur | renc | e and gene | eral methods of |

| structure determination, isolation and synthesis of quercetin and |
|--|
| cyanidin chloride. Marine drugs -Selected Drug Molecules: |
| Cardiovascular active substances, Cytotoxic compounds, antimicrobial |
| compounds, antibiotic compounds, Anti-inflammatory agents. Marine |
| toxins. |
| |
| Questions related to the above topics, from various competitive |
| examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| to be solved |
| (To be discussed during the Tutorial hours) |
| |
| |
| |
| |
| |
| Knowledge, Problem solving, Analytical ability, Professional |
| Competency, Professional Communication and Transferable skills. |
| - · |
| 1. Gurdeep R Chatwal (2016), Organic chemistry of Natural |
| products, Volume I&II, 5th edition, Himalaya publishing House. |
| 2. S.V.Bhat, B.A. Nagasampagi, M.Sivakumar (2014), Chemistry of |
| Natural Products, Revised edition, Narosa Publishers. |
| 1. Jeffrey B. Harborne (2012), Phytochemical methods: A Guide to |
| Modern Techniques of Plant Analysis, 4th edition, Indian reprint, |
| Springer. |
| 2. Ashutoshkar (2007), Pharmacognosy and Pharmacobiotechnology, 2 |
| nd edition, New age international (P) limited, New Delhi. |
| |

Students will be able:

CO1: To recall the sources of natural medicines and analysis of crude drugs.

CO2: To understand the methods of evaluation based on various parameters.

CO3: To analyze the isolated drugs

CO4: To apply various techniques to discover new alternative medicines.

CO5: To evaluate the isolated drugs for various pharmacological activities

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | BIOMOL | ECULES A | ND I | HETERO | CYC | CLIC COMPO | DUNDS |
|-----------------------|------------|---------------|----------|-----------------|--------|------------------|-------------------------------|
| Course | | | | | | | |
| Paper No. | Elective V | | . | - II | | | |
| Category | Elective | Year | V | Credits | 4 | Course | |
| | | Semester | IX | | | Code | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | |
| hours per week | 4 | 1 1 1 1 | <u> </u> | | | 5 | |
| Prerequisites | | vledge of ch | | | | 1 . | 0.1.1.1 |
| Objectives of | | | ncept | s and bio | logic | al importance | of biomolecules |
| the course | and natura | - | £ | : C | 1 1 | | |
| | | d hormones | | ions of ca | rbon | ydraies, proieii | ns, nucleic acids, |
| | | | | of alkalo | ida or | nd terpenoids. | |
| | | | | | | - | ules and natural |
| | products. | iic iiic siiu | cture | determin | ation | of biomolec | uics and natural |
| | 1 | and constr | net tl | ne structur | re of | new alkaloid | s and terpenoids |
| | | ent method | | Juanu | 01 | no umulolu | and terpenoids |
| Course Outline | | | | metaboli | sm (| of carbohydra | ates: Definition, |
| | | • | | | | • | onosaccharides: |
| | | | _ | | | • | glucose, fructose |
| | and mann | ose (struct | ure | determina | tion | not required |), physical and |
| | | | _ | | | | ccharides: Ring |
| | | • | | | | | and chemical |
| | | | | | | | charides: Starch, |
| | | | ose - | – structu | re a | nd properties | , glycolysis of |
| | carbohydra | ates. | | | | | |
| | UNIT-II: | Steroids a | nd H | [ormones: | Ste | roids-Introduct | tion, occurrence, |
| | nomenclati | | | | | | s' hydrocarbon, |
| | | | | | | | gical importance, |
| | | | | | | | ts, physiological |
| | | | | | | | ne. Hormones- |
| | | - | | | | | - androgens and |
| | | | | | | | sol structure and |
| | | | | | | aline and thyro | |
| | | | | | | - | d purification of |
| | * | | _ | amination a | | - | . Catabolism of amination and |
| | | | | | , | | eic acids. Amino |
| | | | | | | | the synthesis of |
| | | | | • | | | cyclic base and |
| | | | | | | | to nucleotides. |
| | | | | | | | A, Watson-Crick |
| | _ | id phase syn | - | | | | , |
| | | | | | | | d punification of |
| | | | | | | - | d purification of |
| | 1 - | | _ | amination a | | - | . Catabolism of amination and |
| | | | | | | | eic acids. Amino |
| | _ | | - | _ | | | the synthesis of |
| | | | | • | | | cyclic base and |
| | nacicoside | s - uncer | COIIIU. | 1111111111, 10 | riiia | non or nettle | cyclic base and |

| | nucleoside modification, conversion of nucleoside to nucleotides. Primary and secondary structure of RNA and DNA, Watson-Crick model, solid phase synthesis ofoligonucleotides. |
|---|--|
| | UNIT-V: Fused Ring Heterocyclic Compounds: Benzofused five membered rings: Indole, isoindole, benzofuran and benzothiophene, Preparation and properties. Benzofused six membered rings: Quinoline and isoquinoline: Preparation by ring closure reactions, Reactions: Mechanism of electrophilic and nucleophilic substitutions, oxidation and reduction reactions. |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to be solved (To be discussed during the Tutorial hours) |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended Text | T. K Lindhorst, Essentials of Carbohydrate Chemistry and Biochemistry, Wiley VCH, North America, 2007. |
| | I. L. Finar, Organic Chemistry Vol-2, 5 th edition, Pearson Education Asia, 1975. V. K. Ahluwalia and M. Goyal, Textbook of Heterocyclic compounds, Narosa Publishing, New Delhi,2000. M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., Jalandhar, Delhi, 2014. V. K. Ahluwalia, Steroids and Hormones, Ane books pub., New Delhi,2009. |
| Reference Books | I. L. Finar, Organic Chemistry Vol-1, 6 th edition, Pearson Education Asia,2004. Pelletier, Chemistry of Alkaloids, Van Nostrand Reinhold Co,2000. Shoppe, Chemistry of the steroids, Butterworthes,1994. I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, Hyderabad,2004. M. P. Singh. and H. Panda, Medicinal Herbs with their formulations, Daya Publishing House, Delhi,2005. |
| Website and | ps://www.organic-chemistry.org/ |
| e-learning | ps://www.studyorgo.com/summary.php |
| Source Course Learning | ps://www.clutchprep.com/organic-chemistry Outcomes (for Mapping with POs and PSOs) |
| Students will be al | , |

CO2: To integrate and assess the different methods of preparation of structurally different biomolecules and natural products.

CO3: To illustrate the applications of biomolecules and their functions in the metabolism of living organisms.

CO4: To analyse and rationalise the structure and synthesis of heterocyclic compounds.

CO5: To develop the structure of biologically important heterocyclic compounds by different methods.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | COORD | INATION | CHE | MISTRY | - II | | |
|------------------------------|------------|---------------------------|----------|-----------------|----------------|---------------------------------|-----------------------------------|
| Paper No. | Core X | | | | | | |
| Category | Core | Year | V | Credits | 4 | Course | |
| Category | Core | | X | Credits | • | Code | |
| Instructional | Lastuna | Semester | | Duastica | | | |
| Instructional | Lecture | Tutorial | Lat | Practice | | Total 5 | |
| hours per week | 4 | 1 1 6 | <u> </u> | • 1 | . , | 3 | |
| Prerequisites Chicagon falls | | owledge of i | _ | | | .4144 | 1 |
| Objectives of the | 1 | _ | | | oncep | ots and structu | ıral aspects of |
| course | | etallic comp | | | 1: | | 41 |
| | behaviou | | or or | ganometai | ilic c | ompounds and | their catalytic |
| | | | ot the | atmiatima | of | acardination ac | mnounds using |
| | | • | ci ine | structure | 01 (| coordination co | mpounds using |
| | | opic tools. | ,,,, | a and han | din a | in acandination | a amount a va a a |
| | | | | | | in coordination f selected comp | |
| Course Outline | | | | | | | |
| Course Outline | | | | | | | Classification of and 16 electron |
| | 0 | 1 | | | | | e: Ziese's salt), |
| | | | | | | | yclopentadienyl |
| | | | | | | | n metallocenes; |
| | | - | | | - | _ | diagram of CO; |
| | | | | | • | | oach of M-CO |
| | | | | | | | nergistic effect |
| | _ | | | | | | rbonyl clusters: |
| | , | | | | | | Structures based |
| | | • | _ | • | | ry or Wade's ru | |
| | | | | | | • | c compounds: |
| | | | | • | | 0 | lition, reductive |
| | | | | | | | on reaction and |
| | | | | | | | drogenation of |
| | | | | _ | | | ins using cobalt |
| | | | - | | | - | olefin (Wacker |
| | | - | , | - | | | eaction, cyclo- |
| | • / | | | | | - | sts, Monsonto |
| | process. | | • | | | • | |
| | UNIT-II | I: Inorgan | ic sp | ectroscop | y -I | : IR spectrosco | opy: Effect of |
| | | _ | _ | _ | - | -sulphato, carbo | |
| | aqua, ni | tro, thiocya | anato, | cyano, | thiou | irea, DMSO d | complexes; IR |
| | spectrosc | opy of | carbo | onyl con | mpou | ınds. NMR | spectroscopy- |
| | Introduct | ion, applica | tions | of 1H, 15 | N, 19 | 9F, 31P-NMR s | spectroscopy in |
| | structural | identificat | ion o | f inorgani | c co | mplexes, fluxio | nal molecules, |
| | quadrupo | lar nuclei- e | effect | in NMR s | pecti | oscopy. | |
| | UNIT-IV | ': Inor <mark>gani</mark> | c spe | ectroscopy | γ -II : | Introductory te | erminologies: g |
| | | | | | | and factors affe | |
| | Applicati | ons of ESF | to c | coordinatio | on co | ompounds with | one and more |
| | than one | unpaired | electi | rons – hy | perf | ine and second | dary hyperfine |
| | | | | | - | pectra of V(II), | |
| | | | | | | | copper(II) and |
| | | | | | | | Mossbauer |

| Extended | effect, Recoil energy, Mossbauer active nuclei, Doppler shift, Isomer shift, quadrupole splitting and magnetic interactions. Applications of Mössbauer spectra to Fe and Sn compounds. UNIT-V: Photo Electron Spectroscopy: Theory, Types, origin of fine structures - shapes of vibrational fine structures - adiabatic and vertical transitions, PES of homonuclear diatomic molecules (N ₂ , O ₂) and heteronuclear diatomic molecules (CO, HCl) and polyatomic molecules (H ₂ O, CO ₂ , CH ₄ , NH ₃) – evaluation of vibrational constants of the above molecules. Koopman's theorem- applications and limitations. Optical Rotatory Dispersion – Principle of CD and ORD; Δ and λ isomers in complexes, Assignment of absolute configuration using CD and ORD techniques. Questions related to the above topics, from various competitive |
|------------------------------------|--|
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended Text | J E Huheey, EA Keiter, RL Keiter and OK Medhi, Inorganic Chemistry – Principles of structure and reactivity, 4th Edition, Pearson Education Inc., 2006 G L Meissler and D ATarr, Inorganic Chemistry, 3rd Edition, Pearson Education Inc., 2008 D. Bannerjea, Co-ordination Chemistry, TATA Mcgraw Hill, 1993. B D Gupta and A K Elias, Basic Organometallic Chemistry: Concepts, Syntheses and Applications, University Press, 2013. F. A. Cotton, G. Wilkinson.; C. A. Murillo; M. Bochmann, Advanced Inorganic Chemistry, 6th ed.; Wiley Inter-science: New York, 1988. |
| Reference Books | 1. Crabtree, Robert H. The Organometallic Chemistry of the Transition Metals. 3rd ed. New York, NY: John Wiley, 2000. |
| | P Gütlich, E Bill, A X Trautwein, Mossbauer Spectroscopy and Transition Metal Chemistry: Fundamentals and Applications, 1st edition, Springer-Verlag Berlin Heidelberg, 2011. Concepts and Models of Inorganic Chemistry, B. Douglas, D. McDaniel, J. Alexander, John Wiley, 1994, 3rd edn. K. F. Purcell, J. C. Kotz, Inorganic Chemistry; Saunders: Philadelphia, 1976. R. S. Drago, Physical Methods in Chemistry; Saunders: Philadelphia, 1977. |

| Website and | https://archive.nptel.ac.in/courses/104/101/104101100/ |
|-------------------|--|
| e-learning source | |

Students will be able:

CO1: Understand and apply 18 and 16 electron rule for organometallic compounds

CO2: Understand the structure and bonding in olefin, allyl, cyclopentadienyl and carbonyl containing organometallic compounds

CO3: Understand the reactions of organometallic compounds and apply them in CO4: understanding the catalytic cycles

CO5: Identify / predict the structure of coordination complexes using spectroscopic tools such as IR, NMR, ESR, Mossbauer and optical rotatory dispersion studies to interpret the structure of molecules by various spectral techniques.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 - Strong, 2 - Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | PHYSICAL CHEMISTRY-II |
|--------------|-----------------------|
| Course | |

| Paper No. | Core XI | | | | | | | | | | |
|-------------------|--|--|-----------|-----------------|----------|------------------|----------------------------------|--|--|--|--|
| Category | Core | Year | V | Credits | 4 | Course | | | | | |
| | | Semester | X | | | Code | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | | |
| hours per week | 4 1 - 5 | | | | | | | | | | |
| Prerequisites | Basic kno | Basic knowledge of physical chemistry | | | | | | | | | |
| Objectives of the | To understand the essential characteristics of wave functions and need | | | | | | | | | | |
| course | for the quantum mechanics. | | | | | | | | | | |
| | | To know the importance of quantum mechanical models of particle in a box, rigid rotor and harmonic oscillator. | | | | | | | | | |
| | | | | | | 1 | 1 | | | | |
| | systems. | me quan | luIII | mechanics | s to | nydrogen and | d polyelectronic | | | | |
| | | arize the svi | mmet | ry in mole | cule | s and predict th | ne point groups. | | | | |
| | | | | | | | g he concepts of | | | | |
| | group the | | | | 11) 01 | | , no comorpio er | | | | |
| Course Outline | | | icle 4 | duality. U | ncert | tainty principle | e, Particle wave | | | | |
| Source Sutillity | | | | | | | perties of wave | | | | |
| | | - | | - | | - | ed, Orthogonal, | | | | |
| | | | | | | | an properties of | | | | |
| | | _ | | - | | | body radiation, | | | | |
| | | | | | | | ntum mechanics, | | | | |
| | Postulate | | ii y ai c | gen speet | 1 01111. | Ticea for quar | of | | | | |
| | | | . Scl | nrodinger | wav | e equation. Ti | me independent | | | | |
| | _ | dependent | , | | | 1 | T | | | | |
| | | | | | | | | | | | |
| | UNIT-II: Quantum models: Particle in a box-1D, two dimensional and three-dimensional, degeneracy, application to linear conjugated molecular system, free particles, ring systems. Harmonic Oscillator-wave equation and solution, anharmonicity, force constant and its significance. Rigid Rotor-wave equation and solution, calculation of rotational constants and bond length of diatomic molecules. | | | | | | | | | | |
| | UNIT-III: Applications to Hydrogen and Poly electron atoms: Hydrogen atom and hydrogen like ions, Hamiltonian-wave equation and solutions, radial and angular functions, representation of radial distribution functions. Approximation methods—variation methods: trial wave function, variation integral and application to particle in 1D box. Perturbation method - first order applications. Hatrefock self-consistent field method, Hohenberg-Kohn theorem and Kohn-Sham equation, Helium atom-electron spin, paulis exclusion principle and Slater determination. | | | | | | | | | | |
| | | | | | | | metry elements, al point groups- | | | | |
| | | | | | | | n and classes of | | | | |
| | | | | | | | direct product | | | | |
| | | _ | | | | | irreducible | | | | |
| | | | | | | | character table | | | | |
| | | C_{2h} , C_{3v} and C_{2h} | | | | ondia de don Ol | | | | | |
| | UNIT-V | : Application | ons (| of quantu | m a | | eory: Hydrogen (VB) treatment, | | | | |

| | Energy level diagram, Hydrogen molecule ion; Use of linear variation function and LCAO methods. Electronic conjugated system:Huckel method to Ethylene butadiene, cyclopropenyl, cyclo butadiene and Benzene. Applications of group theory to molecular vibrations, electronic spectra of ethylene. |
|--------------------|---|
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. R.K. Prasad, Quantum Chemistry, New Age International |
| Text | Publishers, New Delhi, 2010, 4th revised edition. |
| | 2. F. A. Cotton, Chemical Applications of Group Theory, John |
| | Wiley & Sons, 2003, 2 nd edition. |
| | 3. A. Vincent, Molecular Symmetry and Group Theory. A |
| | Programmed Introduction to Chemical Applications, John and Willy & Sons Ltd., 2013, 2 nd Edition. |
| | 4. T. Engel & Philip Reid, Quantum Chemistry and Spectroscopy, Pearson, New Delhi, 2018, 4 th edition. |
| | 5. G. K. Vemulapalli, Physical Chemistry, Prentice Hall of India Pvt. Ltd. 2001. 6. D.A. McQuarrie, Quantum Chemistry, Viva Books PW. Ltd, 2013, 2 nd edition. |
| Reference Books | 1. N. Levine, Quantum Chemistry, Allyn& Bacon Inc, 1983, 4th |
| | edition. |
| | 2. D.A. McQuarrie and J. D. Simon, Physical Chemistry, A Molecular |
| | Approach, Viva Books |
| | Pvt. Ltd, New Delhi, 2012. |
| | 3. R. P. Rastogi & V. K. Srivastava, An Introduction to Quantum |
| | Mechanics of Chemical |
| | Systems, Oxford & IBH Publishing Co., New Delhi, 1999. |
| | 4. R.L. Flurry. Jr, Symmetry Group Theory and Chemical applications, |
| | Prentice Hall. Inc, 1980 |
| | 5. J. M. Hollas, Symmetry in Molecules, Chapman and Hall, London, |
| | 2011, Reprint. |

| Website and | 1. https://nptel.ac.in/courses/104101124 |
|-------------------|--|
| e-learning source | 2. https://ipc.iisc.ac.in/~kls/teaching.html |

Students will be able:

CO1: To discuss the characteristics of wave functions and symmetry functions.

CO2: To classify the symmetry operation and wave equations.

CO3: To apply the concept of quantum mechanics and group theory to predict the electronic structure.

CO4: To specify the appropriate irreducible representations for theoretical applications.

CO5: To develop skills in evaluating the energies of molecular spectra.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 - Strong, 2 - Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POs | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the Course | ANALY | TICAL INS | STRU | JMENTA | TIO | N TECHNIQ | UES |
|------------------------|-----------|---------------|---------|-----------------------|-------------------|-----------------------------------|----------------------------|
| Paper No. | Core XI | [| | | | | |
| Category | Core | Year | V | Credits | 4 | Course | |
| Category | Corc | Semester | X | Cicuits | ' | Code | |
| Instructional | Lecture | | | Practice | | Total | |
| 1 | Lecture | 1 | 4 |) I lactice | | 5 | |
| hours per week | - | 1 | 4 | | |] 3 | |
| Prerequisites | To dogion | alamamata ana | مناها | mathada fa | | tification of an | |
| Objectives of the | | | | | | ntification of spectrumental meth | ods of analysis. |
| course | 1 | | | | - | | turbidimetry and |
| | | ity measuren | | tammants | 111 11 | idicitais dsing | tarorannery and |
| | | | | nalysis of in | orga | nic and organic | materials. |
| | | | | | | | orption techniques. |
| Course Outline | UNIT-I: | | | | | | 1 |
| | | etermination | n of t | he equival | ent c | onductance of | a weak acid at |
| | | | | | | ying Ostwald | |
| | | | | | | nstant of the a | |
| | | | | | | onductance of | |
| | | | | - | | | ining the validity |
| | | • | | | | g law at high o | • |
| | | _ | | • | | | nd CH ₃ COOH Vs |
| | | aOH. | 110 111 | | | cont of free ar | ia cii,cocii vs |
| | | | ric tit | ration of N | NH ₄ C | Cl Vs NaOH. | |
| | | | | | | COONa Vs HC | 21. |
| | | | | | | | CH ₃ COOH Vs |
| | | aOH | | | | ar o or from and | |
| | 7. D | etermination | n of p | K _a of wea | k aci | id by EMF me | thod. |
| | | otentiometri | _ | | | • | |
| | | otentiometri | | | | | |
| | | | | | | | e and Iodide Vs |
| | A | gNO_{3} | | | | | |
| | | | n of t | he pH of b | uffe | r solution by E | EMF method |
| | | sing Quinhy | | - | | • | |
| | | | | | | | ence of acid by |
| | | olarimetric 1 | | | • | 5 1 | , |
| | UNIT-II | | | | | | |
| | | | Fe. 0 | Cu and Ni | bv c | olorimetric me | ethod. |
| | | | | | - | photometric n | |
| | | | | • | | - | ole ratio of the |
| | | | | | | ilibrium const | |
| | | omplex form | | _ | 1" | | |
| | | - | | | (mo | ol/L) of ferricva | anide present in |
| | | e given solu | | | • | , | 1 |
| | | | | | | | rricyanide using |
| | | yclic voltam | | | | | - / |
| | - | | - | | d red | lox potential o | f ferri- |
| | | | | | | cyclic voltamn | |
| | | - | | - | _ | nate present in | |
| | /. L | ommanon or | uic o | inount OI | suipi | iate present III | unc given |

| | , |
|--------------------|--|
| | solution using Nephelometric turbidimeter. |
| | 8. Estimation of the amount of nitrate present in the given solution |
| | using spectrophotometric method. |
| | 9. Heavy metal analysis in textiles and textile dyes by AAS |
| | 10. Determination of caffeine in soft drinks by HPLC |
| | 11. Analysis of water quality through COD, DO, BOD |
| | measurements. |
| | 12. Assay of Riboflavin and Iron in tablet formulations by |
| | spectrophotometry |
| | 13. Estimation of chromium in steel sample by spectrophotometry |
| | 14. Determination of Stern-Volmer constant of Iodine quenching by |
| | fluorimetry |
| | 15. Determination of ascorbic acid in real samples using Differential |
| | Pulse Voltammetry and comparing with specifications |
| | 16. Separation of (a) mixture of Azo dyes by TLC (b) mixture of metal ions by Paper chromatography |
| | 17. Estimation of chlorophyll in leaves and phosphate in waste |
| | water by colorimetry. |
| | 18. Estimation of Fe(II) by 1,10 phenonthroline using |
| | spectrophotometry |
| | UNIT-III: Interpretation and identification of the given spectra of |
| | various organic compounds arrived at from the following instruments |
| | 1.UV-Visible |
| | 2.IR |
| | 3.Raman |
| | 4.NMR |
| | 5.ESR |
| | 6.Mass etc., |
| Extended | Questions related to the above topics, from various competitive |
| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others |
| Component (is a | to be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component only, | , |
| Not to be included | |
| in the external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| | 1), |
| Recommended | 1. Vogel's Text book of Practical Organic Chemistry, 5th Ed, |
| Text | ELBS/Longman, England, 2003. |
| | 2. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, <i>Vogel's</i> |
| | Textbook of Quantitative Chemical Analysis; 6th ed., ELBS, 1989. |
| | 3. J. D. Woollins, <i>Inorganic Experiments</i> ; VCH: Weinheim, |
| | 1995. |
| | 4. B. Viswanathan and P.S.Raghavan, Practical Physical Chemistry, |
| | Viva |
| | Books, New Delhi, 2009. |
| | 5.Sundaram, Krishnan, Raghavan, Practical Chemistry (Part II), S. |
| | 1000 manian, 1110 man, 100 man, 1100 man Chemistry (1 art 11), 0. |

| | Viswanathan Co. Pvt., 1996. |
|-------------------|--|
| Reference Books | 1. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – |
| | Labmanual, S. Viswanathan Co. Pvt. Ltd, 2009. |
| | 2. J. N. Gurtu and R. Kapoor, Advanced Experimental Chemistry, S. |
| | Chand and Co., 2011. |
| | 3. J. B. Yadav, Advanced Practical Physical Chemistry, Goel |
| | Publishing House, 2001. |
| | 4. G.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in |
| | Physical Chemistry, 8th edition, McGraw Hill, 2009. |
| | 5. J. N. Gurthu and R. Kapoor, Advanced Experimental Chemistry, S. |
| | Chand and Co., 1987. |
| Website and | 1 https://bit.lv/2OESE7t |
| e-learning source | 1. https://bit.ly/3QESF7t |
| | 2. https://bit.ly/3QANOnX |

Students will be able:

CO1: To recall the principles associated with various inorganic organic and physical chemistry experiments

CO2: To scientifically plan and perform all the experiments

CO3: To observe and record systematically the readings in all the experiments

CO4: To calculate and process the experimentally measured values and compare with graphical data.

CO5: To interpret the experimental data scientifically to improve students efficiency for societal developments.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | CHEMISTRY OF NATURAL PRODUCTS | | | | | | | | | | | |
|-----------------------|-------------------------------|--------------------------------------|------------|--------------|---------|------------------|-------------------|--|--|--|--|--|
| Course | T1 4° X7 | nr | | | | | | | | | | |
| Paper No. | Elective V | | T 7 | G 114 | 1 4 | | | | | | | |
| Category | Core | Year | V | Credits | 4 | Course | | | | | | |
| | | Semester | X | | | Code | | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | | | |
| hours per week | 4 | 1 | - | | | 5 | | | | | | |
| Prerequisites | | Basic knowledge of general chemistry | | | | | | | | | | |
| Objectives of | To learn th | ne basic conc | epts a | ınd biologic | al im | portance of b | oiomolecules | | | | | |
| the course | and natural | - | | | | | | | | | | |
| | To explain | various of fu | nction | s of carboh | ydrate | es, proteins, n | ucleic acids, | | | | | |
| | steroids and | d hormones. | | | | | | | | | | |
| | To understa | and the function | ons of | alkaloids ar | nd terj | penoids. | | | | | | |
| | To elucida | te the structu | are de | etermination | of 1 | biomolecules | and natural | | | | | |
| | products. | | | | | | | | | | | |
| | To extract | and construc | t the | structure of | f new | alkaloids an | d terpenoids | | | | | |
| | from differ | ent methods. | | | | | _ | | | | | |
| Course Outline | UNIT-I: A | lkaloids: Intro | oducti | on, occurre | nce, c | lassification, i | solation and | | | | | |
| | functions o | f alkaloids. Cl | assific | cation, gene | ral me | ethods of struc | ctural | | | | | |
| | elucidation | . Chemical me | ethods | of structure | e detei | rmination of C | Coniine, | | | | | |
| | Piperine, N | icotine, Papav | erine | Atropine, (| Quinir | ne, Belladine, | Cocaine, | | | | | |
| | Heptaphyll | ine, Papaverin | e and | Morphine. | | | | | | | | |
| | UNIT-II: | Terpenoids | : Int | troduction, | occi | arrence, Ison | prene rule, | | | | | |
| | | - | | | | ing structure | Structure | | | | | |
| | | | | | | ne, Squalene, | | | | | | |
| | | - | | | | rism, Structui | _ | | | | | |
| | | sis of β-carote | | | | , | , | | | | | |
| | | | | | | ocyanines: In | troduction to | | | | | |
| | anthocyanii | | | nd general | | | ynthesis of | | | | | |
| | _ | | | | | d determination | • | | | | | |
| | _ | - | | | | d determination | | | | | | |
| | _ | - | | | | on and import | | | | | | |
| | | | | | | roduction, occ | | | | | | |
| | | | | | | ral properties | | | | | | |
| | | | | | | of Uric acid a | | | | | | |
| | _ | - | | - | | menclature, o | | | | | | |
| | | | | | | istry, classific | _ | | | | | |
| | hydrocarbo | - | | | | r reactions | of sterols, | | | | | |
| | | _ | | - | | activity, bios | , | | | | | |
| | | from squalene | | 1 7 8 | | 37 | J | | | | | |
| | UNIT-V: | <u>.</u> | Oves: | Occurren | ce. | classification | , isolation, | | | | | |
| | | | • | | , | . Structural d | , | | | | | |
| | | sis of indigoiti | | | | | | | | | | |
| Extended | | | | | vario | ous competitiv | re | | | | | |
| Professional | | | | | | GATE /TNPS | | | | | | |
| Component (is a | be solved | | / 11 | | | | 2 2 3 3 3 4 5 6 6 | | | | | |
| part of internal | | ussed during t | he Tu | torial hours |) | | | | | | | |
| Part of Intellial | (10 be disc | assed during t | I U | | , | | | | | | | |

| component | |
|------------------|--|
| only, Not to be | |
| included in the | |
| external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 1, |
| Text | Himalaya Publishing House, Mumbai, 2009. |
| | 2. G. K. Chatwal, Organic Chemistry on Natural Products, Vol. 2, |
| | Himalaya Publishing House, Mumbai, 2009. |
| | 3. O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 1, |
| | Goel Publishing House, Meerut, 1997. |
| | 4. O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 2, |
| | Goel Publishing House, Meerut, 1997. |
| | 5. I. L. Finar, Organic Chemistry Vol-2, 5 th edition, Pearson |
| | Education Asia, 1975. |
| Reference | 1. I. L. Finar, Organic Chemistry Vol-1, 6 th edition, Pearson |
| Books | Education Asia, 2004. |
| 20012 | 2. Pelletier, Chemistry of Alkaloids, Van Nostrand |
| | Reinhold Co,2000. |
| | 3. Shoppe, Chemistry of the steroids, Butterworthes, 1994. |
| | 4. I. A. Khan, and A. Khanum. Role of Biotechnology in medicinal & |
| | aromatic plants, Vol 1 and Vol 10, Ukkaz Publications, |
| | Hyderabad,2004. |
| Website and | https://sites.google.com/site/chemistryebookscollection02/home/organic- |
| e-learning | chemistry/organic |
| source | - International Property of the Control of the Cont |
| Source | |

Students will be able:

CO1: To understand the biological importance of chemistry of natural products.

CO2: To scientifically plan and perform the isolation and characterization of synthesized natural products.

CO3: To elucidate the structure of alkaloids, terpenoids, carotenoids, falvanoids and anthocyanins.

CO4: To determine the structure of phytochemical constituents by chemical and physical methods.

CO5: To interpret the experimental data scientifically to improve biological activity of active components.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |

| CO 2 | M | S | S | S | S | M | S | S | S | S |
|-------------|---|---|---|---|---|---|---|---|---|---|
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

| Title of the | POLYME | R CHEMIST | RY | | | | | | | | | |
|-----------------------|------------|--|--------|----------------|-------|-----------------------------------|---------------|--|--|--|--|--|
| Course | T1 41 X7 | | | | | | | | | | | |
| Paper No. | Elective V | | * 7 | - I' | 1 | | | | | | | |
| Category | Core | Year | V | Credits | 4 | Course | | | | | | |
| T / / 1 | T | Semester | X | D 4 | | Code | | | | | | |
| Instructional | Lecture | Tutorial | Lab | Practice | | Total | | | | | | |
| hours per week | 4 | 1 1 2 | - | | | 5 | | | | | | |
| Prerequisites | | Basic knowledge of general chemistry To learn the basic concepts and bonding in polymers. | | | | | | | | | | |
| Objectives of | | 1 | | | | | | | | | | |
| the course | 1 | 7 1 | _ | • | | tions and kinet | | | | | | |
| | | and the impor | rtance | or industri | ai po | lymers and the | eir synthetic | | | | | |
| | uses. | | 1 | .: ~1.4 ~ £ ~1 | | | | | | | | |
| | | ne the molecu | | | | | | | | | | |
| Course Outline | | the degradation | | | | | aumination. | | | | | |
| Course Outline | | | | | | t and its Det lymers; cohes | | | | | | |
| | | | | | | methods, Tg | | | | | | |
| | | | | | | ecular mass o | | | | | | |
| | | • | | | | Weight averag | 1 " | | | | | |
| | | _ | | ` / | | mination of hi | | | | | | |
| | `/ | and methods. | | outur Weight | actor | | .g.: porymers | | | | | |
| | | | | cinetics of I | Polvn | nerization: Cl | hain growth | | | | | |
| | | | | | | al polymeriza | | | | | | |
| | | | | | | n. Reaction k | | | | | | |
| | | ymerization, I | | | | | 1 | | | | | |
| | | | | | | nd Polymer D | egradation: | | | | | |
| | Bulk, Solu | ition, Emulsic | n, Su | ispension, s | olid, | interfacial and | d gas phase | | | | | |
| | | | | | | on, Thermal | | | | | | |
| | | | photo | degradation, | Phot | to stabilizers, S | Solid and gas | | | | | |
| | phase poly | | | | | | | | | | | |
| | | | | | | of fibre forming | | | | | | |
| | | | | - | • | ethylene, Po | • • • • | | | | | |
| | 1 | | | | • | Chloride, Poly | | | | | | |
| | _ | nylon and | | | | setting Plasti | | | | | | |
| | | - | | | | ers: Natural | | | | | | |
| | | | | | - | ene. Conductir | _ , | | | | | |
| | | | | | | riles, poly phen nethacrylate, | | | | | | |
| | 1 " | | • | • | • | nemacryfate, sylene and po | | | | | | |
| | glycols. | s, poryurcular | ics, p | oryurcas, po | луси | Tyrene and pe | orypropyrene | | | | | |
| | | Polymer Pr | .UCESS | ing: Comr | กาเทศ | ling: Polymer | · Additives | | | | | |
| | | • | | | | ilizers, fire ret | | | | | | |
| | · · | • | | - | | g, die casting, | | | | | | |
| | | _ | | • | | ng and reinfo | - | | | | | |
| | _ | Thermofoamin | | | | - | catalysts – | | | | | |
| | _ | | _ | _ | | compounds, b | • | | | | | |
| | | | | | | eous catalysis | | | | | | |
| | centres. | , | | , | _ | J | | | | | | |
| Extended | Questions | related to the a | bove | topics, from | vario | ous competitiv | e | | | | | |

| Professional | examinations UPSC / TRB / NET/ UGC-CSIR / GATE /TNPSC others to |
|------------------|--|
| Component (is a | be solved |
| part of internal | (To be discussed during the Tutorial hours) |
| component | |
| only, Not to be | |
| included in the | |
| external | |
| examination | |
| question paper) | |
| Skills acquired | Knowledge, Problem solving, Analytical ability, Professional |
| from this course | Competency, Professional Communication and Transferable skills. |
| Recommended | 1. V.R. Gowariker, <i>Polymer Science</i> , Wiley Eastern, 1995. |
| Text | 2. G.S. Misra, <i>Introductory Polymer Chemistry</i> , New Age International |
| | (Pvt) Limited, 1996. |
| | 3. M.S. Bhatnagar, A Text Book of Polymers, vol-I & II, S.Chand & |
| | Company, New Delhi, 2004. |
| Reference | 1. F. N. Billmeyer, <i>Textbook of Polymer Science</i> , Wiley Interscience, |
| Books | 1971. |
| | 2. A. Kumar and S. K. Gupta, Fundamentals and Polymer Science and |
| | Engineering, Tata McGraw-Hill, 1978. |

Students will be able:

CO1: To understand the bonding in polymers.

CO2: To scientifically plan and perform the various polymerization reactions.

CO3: To observe and record the processing of polymers.

CO4: To calculate the molecular weight by physical and chemical methods.

CO5: To interpret the experimental data scientifically to improve the quality of synthetic polymers.

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO 1 | S | S | S | S | M | S | S | S | S | M |
| CO 2 | M | S | S | S | S | M | S | S | S | S |
| CO 3 | S | S | M | S | S | S | S | M | S | S |
| CO 4 | M | S | S | S | S | M | S | S | S | S |
| CO 5 | M | S | M | S | S | M | S | M | S | S |

3 – Strong, 2 – Medium, 1 - Low

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |
| Weightage | 15 | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

3 – Strong, 2 – Medium, 1 - Low

Title of the Course: CORE INDUSTRIAL MODULES

Paper Number: CORE X

Suggestive topics for Core Industry Modules:

1. Industrial Processes Recommended

Text:

- 1. H.A.Strobel, Chemical Instrumentation: A Systematic approach, 2nd Edition (1973)Addition Wesley, Reading, Mass
- 2. R.L.Pecsok, L.D. Shields, T.Cavins and L.C.Mcwilliam, 2nd Edition (1976), john Wiley &Sons, New York
- 3. E.W.Berg, Chemical Methods of Separations, 1st Edition (1963), McGraw Hill, New York

2. Chemometrics and quality

$control\ in\ industry Recommended$

Text:

- 4. G.D.Christian, Analytical chemistry, 5th edition (1994), John Wiley & Sons, New York
- 5. M.A. Sharat and D.L. Illuran, Chemometrics, John Wiley, New York
- 6. Canlcutt and R. Roddy, Statistics for Analytical Chemists, Chapmam and Hall, NewYork.
