J.J. College of Arts and Science (Autonomous)
Department of Chemistry

Proposed Course Structure based on TANSCHE and UGC - LOCF
(Choice Based Credit System)
(Applicable for the Candidates admitted from academic year 2023-2024 Onwards)

B.Sc. Chemistry

Sl.No.	Course Category	Course Code	Course	Overall Credits	Total Contact Hours/ Week	Marks		
						CIA	ESE	Total
Semester I								
1	Part - I	U1R3TL1/ HL1/FL1	Language - I (Tamil/Hindi/French)	3	6	25	75	100
2	Part - II	U1R3EL1	Language - II (English)	3	6	25	75	100
3	Part - III	U1R3CHCC1	General Chemistry-I	5	5	25	75	100
4		U1R3CHCC2P	Quantitative Inorganic Estimation (Titrimetry) and Inorganic Compounds	5	5	40	60	100
5		U1R3CHDSE1	Mathematics-II	3	4	25	75	100
6	Part - IV	U1R3CHSEC1 **(NME)**	To be opted from other Department	2	2	25	75	100
7		U1R3CHFC	Foundation Course (Bridge Chemistry)	2	2	25	75	100
			Total	**23**	**30**			**700**

Sl.No.	Course Category	Course Code	Course	Overall Credits	Total Contact Hours/ Week	Marks		
						CIA	ESE	Total
Semester II								
1	Part - I	U2R3TL2/ HL2/FL2	Language - I (Tamil/Hindi/French)	3	6	25	75	100
2	Part - II	U2R3EL2	Language - II (English)	3	6	25	75	100
3	Part - III	U2R3CHCC3	General Chemistry-II	5	5	25	75	100
4		U2R3CHCC4P	Qualitative Organic Analysis and Preparation of Organic Compounds	5	5	40	60	100
5		U2R3CHDSE2	Mathematics-II	3	4	25	75	100
6	Part - IV	U2R3CHSEC2 **(NME2)**	To be opted from other Department	2	2	25	75	100
7		U2R3CHSEC 3:1 / 3:2	Cosmetic and Personal Grooming / Entrepreneurial Skills in Chemistry	2	2	25	75	100
			Total	**23**	**30**			**700**

Title of the Course :	**GENERAL CHEMISTRY-I**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**Core Course**	**Hrs/Week :05**
Course Code :	**U1R3CHCC1**	**Total Inst. Hrs: 75**
Nature of the Course :	**Skill Development**	**Sem: I Credit: 05**

Objectives: The course aims at giving an overall view of the

1. Various atomic models and atomic structure
2. Wave particle duality of matter
3. Periodic table, periodicity in properties and its applications
4. Nature of chemical bonding
5. Fundamental concepts of organic chemistry

UNIT I: Atomic structure and Periodic trends (15 Hrs)

History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number Atomic Spectra; Black-Body Radiation and Planck's quantum theory, Bohr's model of atom; The Franck-Hertz Experiment: lnterpretation of H-spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De-Broglie wavelength Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli exclusion principle and Aufbau principle.

Unit II: Introduction to Quantum mechanics (15 Hrs)

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave function, 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 (15 Hrs)

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 salvation energy; Ion polarization – 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 AB_2, AB_3, AB_4, AB_5, AB_6, AB_7. Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4: Percentage ionic character- numerical problems based on calculation of percentage ionic character.

Unit-IV: Structure and bonding-II (15 Hrs)

VB theory–application to hydrogen molecule; concept of resonance-resonance structures of some inorganic species CO_2,NO_2, CO_3^{2-}, NO^{3-}: limitations of VBT; **MO theory-** bonding, antibonding and nonbonding orbitals, bond order; MO diagrams H_2, C_2,O_2, O^{2+},O_2^{2-}, N_2, NO, HF, CO: magnetic characteristics, comparison of VB and MO theories. **Coordinate bond**: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ 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 (15 Hrs)

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 amine, 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.

Reference Book

1. Madan, R D and Sathya Prakash, Modern Inorganic Chemistry, 2nd Edn; S Chand and Company: New Delhi.
2. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000.
3. Puri, B R and Sharma, L R Principles of Physical chemistry, 38th Edn, Vishal Publishing Company: Jalandhar, 2002.
4. Bruce,P.Y and Prasad K J. R. Essential Organic Chemistry, Pearson Education: New Delhi, 2008.
5. Dash UN, Dharmarha OP, Soni P.L.Text book of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016.
6. Maron, S.H and Prutton C. P., Principles of Physical chemistry 4th Edn, The Macmillan Company: Newyork, 1972.
7. Lee,J.D. Concise Inorganic Chemistry, 4th Edn ; ELBS William Heinemann: London,1991.
8. Gurudeep Raj, Advanced Inorganic Chemistry, 26th Edn; Goel Publishing House: Meerut, 2000
9. Atkins, PW. & Paula, Physical Chemistry, 10th Edn.; Oxford University Press: New York 2014
10. Huheey,J. E. Inorganic Chemistry: Principles of structure and Reactivity, 4th Edn, Addison, Wesley Publishing Company: India,1993

Web References:

1) https://onlinecourses.nptel.ac.in
2) http://www.mikeblaber.org/oldwine/chm 1045/notes
3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.
4) https://swayarn.gov.in/course/64-atomic-structure-and-chemical-bonding
5) https://www.chemtube3d.com/

Course Outcomes

Course Name: GENERAL CHEMISTRY-I	**Course Code: U1R3CHCC1**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.	**K3**
CO-2	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.	**K4**
CO-3	Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, electronegativity, percentage ionic character and bond order	**K2**
CO-4	Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects	**K5**
CO-5	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.	**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: General Chemistry-I							**Course Code: U1R3CHCC1**								
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Quantitative Inorganic Estimation (Titrimetry) and Inorganic Compounds**	**Marks: CIA:40 + Ext:60=100**
Category of the Course:	**Core Course**	**Hrs/Week :05**
Course Code :	**U1R3CHCC2P**	**Total Inst. Hrs: 75**
Nature of the Course :	**Skill Development**	**Sem: I Credit: 05**

Objectives: This course aims at providing knowledge on

1. Laboratory safety
2. Handling glassware's
3. Quantitative estimation
4. Preparation of inorganic compound
5. Principles of Quantitative Analysis

Unit I: Chemical Laboratory Safety in Academic Institutions (20 Hrs)

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

Common Apparatus Used in Quantitative Estimation (Volumetric) (10 Hrs)

Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.

Principle of Quantitative Estimation (Volumetric) (15 Hrs)

Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators–types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.

Unit II: Quantitative Estimation(Volumetric) (20 Hrs)

Preparation of standard solution, dilution from stock solution

Permanganometry

Estimation of sodium oxalate using standard ferrous ammonium 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 (10 Hrs)

Potash alum

Tetraammine copper (II) sulphate

Hexamine cobalt (III) chloride

Mohr's Salt

Reference Books:

1. Venkateswaran V; Veeraswamy, R; Kulandivelu, A.R. Basic Principles of practical Chemistry, 2nd Edn ; Sultan Chand & Sons: New Delhi, 1997.

2. Nad, A. K., Mahapatra, B.; Ghoshal, A; An advanced course in Practical Chemistry, 3rd Edn; New Central Book Agency: Kolkata, 2007

3. Mendham, J; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; Vogels Text book of Quantitative Chemical Analysis, 6th Edn.; Pearson Education Ltd: New Delhi, 2000.

Web References:

1) http://www.federica.unina.it/agraria/nalytical-chemistry/volumetricanalysis

2)https://chemdictionary.org/titration-indicator/

Course Outcomes

Course Name: Quantitative Inorganic Estimation (Tritrimetry) and Inorganic Compounds	**Course Code: U1R3CHCC2P**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	Explain the basic principles involved in titrimetric analysis and inorganic preparations	**K2**
CO-2	Compare the methodologies of different titrimetric analysis.	**K3**
CO-3	Calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of substance present in a given solution.	**K4**
CO-4	Assess the yield of different inorganic preparations	**K3**
CO-5	Explain the basic principles involved in titrimetric analysis and inorganic preparations	**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Compounds										**Course Code:** U1R3CHCC2P				
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Food Chemistry**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**NME**	**Hrs/Week :02**
Course Code :	**U1R3CHSEC1:1**	**Total Inst. Hrs: 30**
Nature of the Course :	**Skill Development**	**Sem: I Credit: 02**

Objectives: This course aims at giving an overall view of the

1. Types of Food
2. Food Adulteration
3. Food Poison
4. Food additives
5. Food Preservation

UNIT-I: Food Adulteration (6 Hrs)

Sources of food, types, advantages and disadvantages. Food adulteration-contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.

UNIT-II: Food Poison (6 Hrs)

Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) - Chemical poisons - First aid for poison consumed victims.

UNIT-III: Food Additives (6 Hrs)

Food additives -artificial sweeteners -- Saccharin - Cyclomate and Aspartate Food flavours - esters, aldehydes and heterocyclic compounds -- Food colours – Emulsifying agents – preservatives -leavening agents. Baking powder - yeast – tastemakers – MSG - vinegar.

UNIT-IV: Beverages (6 Hrs)

Beverages – softdrink -soda-fruit juices-alcoholic beverages-examples. Carbonation-addiction to alcohol-diseases of liver and social problems.

UNIT-V: Edible Oils (6 Hrs)

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 heart diseases-determination of iodine value, RM value, saponification values and their significance.

Text Book

1. Food chemistry, H. K Chopra, P. S. Panesar, Narosa publishing house, 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, Evince pub publishing, 2022.
5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Pdmini S Ghugre, New Age international publishers, second edition, 2021

Reference Book

1. . H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4 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, H-D 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.

Course Outcomes

Course Name: Food Chemistry	**Course Code: U1R3CHSEC1:1**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	Learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.	**K3**
CO-2	Get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion	**K4**
CO-3	Get an exposure on food additives, artificial sweeteners, Saccharin, Cyclornate and Aspartate in the food industries.	**K3**
CO-4	Acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.	**K2**
CO-5	Study about fats and oils - Sources of oils - production of refined vegetable oils preservation. Saturated and unsaturated fats –MVFA and PUFA	**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: FOOD CHEMISTRY							**Course Code: U1R3CHSCE1:1**							
Course Outcomes (COs)	**PO**										**PSO**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Role of Chemistry in Daily Life**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**NME**	**Hrs/Week :02**
Course Code :	**U1R3CHSEC1:2**	**Total Inst. Hrs: 30**
Nature of the Course :	**Skill Development**	**Sem: I Credit: 02**

Objectives: This course aims at providing an overall view of the

1. Importance of Chemistry in everyday life
2. Chemistry of building materials and food
3. Chemistry of food and nutrition
4. Chemicals in food production
5. Chemistry of Drugs and pharmaceuticals

UNIT-I: (6 Hrs)

General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style.. Water -Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution

UNIT-II: (6 Hrs)

Building materials- cement, ceramics, glass and refractories -definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins - preparation and uses only.

UNIT-III: (6 Hrs)

Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes • general formulation and preparations – possible hazards of cosmetic use

UNIT-IV: (6 Hrs)

Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses

UNIT-V: (6 Hrs)

Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

Text Books

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house,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
5. Introduction to forensic chemistry Kelly M Elkins, CRC Press Taylor & Francis Group, 2019.
6. Jayashree Ghosh, fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.

Reference Books

1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourth edition, 1977.
2. W.A.Poucher, Joseph A Brink, Jr. Perfumes,Cosmetics and Soaps, Springer, 2000.
3. A.K. De, Envirorunental Chemistry, NewAge lntemational Public Co., 1990.

Course Outcomes

Course Name: Role of Chemistry in daily life	**Course Code: U1R3CHSEC1:2**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	learn about the chemicals used in everyday life as well as air pollution and water pollution	**K4**
CO-2	get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,	**K3**
CO-3	acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.	**K3**
CO-4	discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses	**K2**
CO-5	Have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications	**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Role of Chemistry in daily life										**Course Code:** U1R3CHSEC1:2					
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Bridge Chemistry**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**Foundation Course**	**Hrs/Week :02**
Course Code :	**U1R3CHFC**	**Total Inst. Hrs: 30**
Nature of the Course :	**Skill Development**	**Sem: I Credit: 02**

Course objectives: This course aims at providing an overview of the

1. Basic concepts of chemistry
2. Periodic properties of elements
3. Chemical bonding and concepts of organic chemistry
4. Know about biomolecules
5. structure of atom

Unit -I: Quantum Number and Periodic Properties (6 Hrs)

Quantum Numbers-Principal, Azimuthal, Magnetic and Spin Quantum numbers and their significance, Pauli's Exclusion principle, Hund's rule, Aufbau Principle. **Periodicity**- Periodic law, Atomic and ionic radii, ionisation potential, electron affinity and electronegativity along periods and groups.

Unit -II: Chemical Bonding (6 Hrs)

Ionic Bond-Properties of ionic compounds-factors affecting formation of ionic compound, Lattice Energy – Born – Haber Cycle, Fajan's rule. **Covalent Bond**-Lewis Theory, Octet rule, Sidgwick-Powel theory,**VSEPR Theory**-Shapes of simple inorganic molecules($BeCl_2$, NH_3, H_2O, PCl_3, XeF_4, SF_4, BrF_5, PCl_5, IF_7) Hydrogen bonding.

UNIT III: Basic Concepts in Organic Chemistry (6 Hrs)

Classification of Organic Compounds - Functional group- Nomencature- Tautomerism -Types of organic reaction-Electrophile and Nucleophile - Carbocation and Carbanion.

UNIT-IV: Alcohol, Ether and Biomoleucles (6 Hrs)

Nomenclature,Classification, Preparation and Properties of alcohols. Ether and Carbonyl Compounds. Biomolecules: Carbohydrates- Protein, Amino acids and Nucleic acids.

Unit - V: Atomic Structure (6 Hrs)

Dualism of light–Wave nature of radiation classical theory of electromagnetic, radiation. Particle nature of radiation–black body radiation and Planck's quantum theory, Photo electric effect and

Compton effect of matter – de Broglie hypothesis Heisenberg's uncertainty principle, Concept of atomic orbitals,Schrodinger Equation.

Text and Reference Book

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 21st ed, S. Chand and Company, New Delhi.
2. Sathya Prakash, Tuli G D.Basu S K and Madan R D. (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi.
3. Bahl B S. Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed. S.Chand and Company, New Delhi.
4. Tewari K S, Mehrothra S N and Vishnoi N K. (1998). Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.
5. Puri B R, Sharma L. R, (2002), Principles of Physical Chemistry, 38th ed. Vishal Publishing Company, Jalandhar

Reference Books

1. Maron SH and Prutton C P. (1972), Principles of Physical Chemistry, 4th ed. The Macmillan Company, Newyork
2. Barrow GM, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi
3. Lee J D. (1991). Concise Inorganic Chemistry, 4th ed. ELBS William Heinemann, London.
4. Huheey J E. (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India.
5. Gurudeep Raj. (2001), Advanced Inorganic Chemistry Vol-1, 26th ed., Goel Publishing House, Meerut

Course Outcomes

Course Name: Bridge Chemistry		**Course Code: U1R3CHFC**	**K-Level**
On Successful completion of the course, students will be able to			
CO-1	explain the concept of periodicity properties		**K3**
CO-2	discuss the periodic properties of sand p-block elements		**K3**
CO-3	classify hydrocarbons, types of reactions		**K2**
CO-4	explain theories of chemical bonding		**K3**
CO-5	know about structure of atom		**K2**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Bridge Chemistry											**Course Code:** U1R3CHFC1				
Course Outcomes (Cos)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**CHEMISTRY-I**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**DSE**	**Hrs/Week :05**
Course Code :	**U1R3BCDSE1**	**Total Inst. Hrs: 80**
Nature of the Course :	**Skill Development**	**Sem: I Credit: 05**

Objectives: This course aims at providing knowledge on

1. .Basics of atomic orbitals, chemical bonds, hybridization and fundamentals of organic chemistry
2. Nuclear chemistry and industrial chemistry
3. Importance of speciality drugs.
4. To learn about separation and purification techniques.
5. Understand the concepts of analytical techniques.

UNITI :Chemical Bonding and Nuclear Chemistry (16 Hrs)

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M.O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. NuclearChemistry: Fundamental particles-Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - massdefect-calculations.Nuclear fission and nuclear fusion – differences Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.

UnitII: Industrial Chemistry (16 Hrs)

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones:Synthesis, properties and uses of silicones.Fertilizers:Urea,ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triplesuperphosphate.

UNITIII: Fundamental Concepts in Organic Chemistry (16 Hrs)

Hybridization:Orbital overlap hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Polar effects: Inductive effect and consequence on Ka and K_b of organic acids and bases, electromeric, mesomeric, hyperconjugation 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.

UNITIV: Drugs and Speciality Chemicals (16 Hrs)

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.

UNITV:Analytical Chemistry (16 Hrs)

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.

Reference Book

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company,New Delhi, 20th Edition, 2007.
2. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, 6th Edition,2014.
3. Jayashreegosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition2006.

Course Outcomes

Course Name: CHEMISTRY-I	**Course Code: U1R3BCDSE1**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	State the theories of chemical bonding, nuclear reactions and its application	**K3**
CO-2	Evaluate the efficiencies and use of various fuels and fertilizers.	**K4**
CO-3	Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.	**K2**
CO-4	Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.	**K5**
CO-5	Analyse various methods to identify an appropriate method for the separation of Chemical components.	**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Chemistry-I							**Course Code: U1R3BCDSE1**								
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**General Chemistry-II**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**Core Course**	**Hrs/Week :05**
Course Code :	**U2R3CHCC3**	**Total Inst. Hrs: 75**
Nature of the Course :	**Skill Development**	**Sem: II Credit: 05**

Course objectives: This course aims at providing an overview of the

1. Chemistry of acids, bases and ionic equilibrium
2. Properties of s and p block elements
3. Chemistry of hydrocarbons
4. Application of acid and bases
5. Compounds of main block elements and hydrocarbon

UNIT-I: Acid, bases and ionic equilibria (15 Hours)

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 (15 Hours)

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, Na_2CO_3, KBr, $KClO_3$ 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: (15 Hours)

(Group 15-18) General characteristics of elements of Group 15, chemistry of H_2N-NH_2, NH_2OH, HN_3) and HNO_3 Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3) and H_3PO_4) General properties of elements of group 16 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, HCI, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICI, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of lodine: **Noble gases-** Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_5 and $XeOF_4$ uses of noble gases - clathrate compounds

UNIT-IV: Hydrocarbon Chemistry-I: Petroproducts (15 Hours)

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**: 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:** 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 (15 Hours)

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 -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.

Text Books

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 21st ed, S. Chand and Company, New Delhi.

2. Sathya Prakash, Tuli G D.Basu S K and Madan R D. (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi.

3. Bahl B S. Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed. S.Chand and Company, New Delhi.

4. Tewari K S, Mehrothra S N and Vishnoi N K. (1998). Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.

5. Puri B R, Sharma L. R, (2002), Principles of Physical Chemistry, 38th ed. Vishal Publishing Company, Jalandhar

Reference Books

1. Maron SH and Prutton C P. (1972), Principles of Physical Chemistry, 4thed. The Macmillan Company, Newyork

2. Barrow GM, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi

3. Lee J D. (1991). Concise Inorganic Chemistry, 4th ed. ELBS William Heinemann, London.

4. Huheey J E. (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India.

5. Gurudeep Raj. (2001), Advanced Inorganic Chemistry Vol-1, 26th ed., Goel Publishing House, Meerut

6. Agarwal O P. (1995), Reactions and Reagents in Organic Chemistry, 8thed, Goel Publishing House, Meerut

Website and e-learning source

https://onlinecourses nptel ac inhttp://cactus dixieedu/smblack/chem1010/lee ture_notes/48.html

http://www.auburn.edu/-deruija/pdareson pdfhttps://swayam gov.in/course/64 -atomic-structure-and-chemical-bonding
http://nptel ac in/courses/104101090/
http://nptel ac in/courses/104101090/

Course Outcomes

Course Name: General Chemistry-II	**Course Code: U2R3CHCC3**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	Explain the concept of acids, bases and ionic equilibria, periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbon	**K3**
CO-2	Discuss the periodic properties of sand p-block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids	**K3**
CO-3	Classify hydrocarbons, types of reactions, acids and bases,	**K2**
CO-4	Explain theories of acids examine the properties s and p- block elements	**K3**
CO-5	Explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements	**K2**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: General Chemistry-II							**Course Code: U2R3CHCC3**								
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Qualitative Organic Analysis and Preparation of Organic Compounds Practical**	**Marks: CIA:40 +Ext:60=100**
Category of the Course:	**Core Course**	**Hrs/Week :05**
Course Code :	**U2R3CHCC4P**	**Total Inst. Hrs: 75**
Nature of the Course :	**Skill Development**	**Sem: II Credit: 05**

Course objectives: This course aims at providing knowledge on

1. laboratory safety
2. principles of qualitative organic analysis
3. handling glass wares
4. analysis of organic compounds
5. preparation of organic compounds

UNIT I **(15 Hours)**

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 **(30 Hours)**

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

UNIT III: Preparation of Organic Compounds **(30 Hours)**

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 (Demonstration) - Separation of amino acids and proteins

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

1. Venkateswaran, V.; Veeraswamy, R., Kulandaivelu, AR. Basic Principles of Practical Chemistry, 2nd ed. Sultan Chand: New Delhi, 2012

2. Manna, A.K. Practical Organic Chemistry, Books and Allied India, 2018.

3. 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, AR. Vogel's Textbook of Practical Organic Chemistry, 5th ed.; Pearson: India, 1989

Website and e-learning source

https://www.vlab.co.in/broad-area-chemical-sciences

Course Outcomes

Course Name: Qualitative organic analysis and preparation of organic compounds		**Course Code: U2R3CHCC4P**	**K-Level**
On Successful completion of the course, students will be able to			
CO-1	Observe the physical state, odour, colour and solubility of the given organic compound.		**K4**
CO-2	identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis		**K3**
CO-3	compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone		**K3**
CO-4	Reducing and non- reducing sugars and explain the reactions behind it.		**K2**
CO-5	Exhibit a solid derivative with respect to the identified functional group.		**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Qualitative organic analysis and Preparation of organic compounds											**Course Code: U2R3CHCC4P**				
Course Outcomes (COs)	**PO**										**PSO**				
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO 2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Cosmetic and Personal Grooming**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**Skill Enhancement Course**	**Hrs/Week :02**
Course Code :	**U2R3CHSEC3:1**	**Total Inst. Hrs: 30**
Nature of the Course :	**Employability**	**Sem: II Credit: 02**

Course objectives: This course aims at familiarizing the students with

1. formulations of various types of cosmetics and their significance
2. hair, skin and dental care
3. makeup preparations and personal grooming
4. know about perfumes
5. understand about beauty treatments

Unit I **(06 Hours)**

Skin care Nutrition of the skin, skin care and cleansing of the skin; face powder ingredients, creams and lotions - cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels formulation` and advantages, astringent and skin tonics - key ingredients, skin lightness, depilatories

Unit II **(06 Hours)**

Hair care Shampoos types powder, cream, liquid, gel ingredients, conditioner -types-ingredients Dental care Tooth pastes - ingredients - mouth wash

Unit III: Make up **(06 Hours)**

Base foundation types shadow, concealers, rouge ingredients, lipstick, eyeliner, mascara, eye

Unit IV: Perfumes **(06 Hours)**

Classification Natural plant origin parts of the plant used, chief constituents, animal origin amber gries from whale, civetone from civet cat, musk from musk deer, synthetic - classification emphasizing characteristics - esters-alcohols - aldehydes – ketones

Unit V: Beauty treatments **(06 Hours)**

Facials types advantages disadvantages; face masks-types; bleach - types advantages-disadvantages; shaping the brows, eyelash tinting. perming -types; hair colouring and dyeing;

permanent waving - hair straightening, wax -types-waxing, pedicure, manicure - advantages-disadvantages

Reference Books

1. Thankamma Jacob, (1997) Foods, drugs and cometics - A consumer guide, Macmillan publication, London

2. Wilkinson J B E and Moore R J. (1997) Harry's cosmeticology, 7th ed., Chemical Publishers, London.

3. George Howard, (1987) Principles and practice of perfumes and cosmetics

Course Outcomes

Course Name: Cosmetic and Personal Grooming	**Course Code: U2R3CHSEC3:1**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	know about the composition of various cosmetic products	**K3**
CO-2	understand chemical aspects and applications of hair care and dental care and skin care products	**K2**
CO-3	understand chemical aspects and applications of perfumes and skin care products.	**K2**
CO-4	understand the methods of beauty treatments their advantages and disadvantage	**K4**
CO-5	understand the hazards of cosmetic products	**K2**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Cosmetic and Personal Grooming										**Course Code: U2R3CHSEC3:1**				
Course Outcomes (COs)	**PO**										**PSO**				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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 :	**Entrepreneurial Skills in Chemistry**	**Marks: CIA:25 + Ext:75=100**
Category of the Course:	**Skill Enhancement Course**	**Hrs/Week : 02**
Course Code :	**U2R3CHSEC3:2**	**Total Inst. Hrs : 30**
Nature of the Course :	**Employability**	**Sem: II Credit: 02**

Course objectives: This course aims at familiarizing the students with

1. domestic products
2. Food chemistry
3. Dyes and their Treatments
4. the adulterants in food and Preparation of home made products
5. entrepreneur skills

Unit-I : Domestic Products (06 Hours)

Detergent Washing Powder, Utensils Cleaning Powder, Normal Shampoo and Tooth Paste - pH, surface tension, cleaning and foaming ability

Moisturizers (Hand lotion, body lotion and after shave lotion) – pH, surface tension, Moisturising ability and abrasiveness

Tooth paste, sanitizer chemical and liquid wash and LCD screen cleaner – pH, surface tension, cleaning ability and foaming ability

UNIT –II : Food Chemistry (06 Hours)

Food adulteration-contamination of food items with clay stones, water and toxic chemicals - 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.

UNIT –III : Dyes and Treatments (06 Hours)

Classification – Natural, synthetic dyes and their characteristics – condition for dyeing, basic methods and principles of dyeing, selection of dye stuff, stripping of dyes, low temperature

dyeing, Sizing and Bleaching : sizing agents and applications, reductive and oxidative bleaching agents, Brightening agents : Optical brightening agents – Types and uses.

UNIT IV **(06 Hours)**

Hands on Experience (Students can choose any four)

Detection of adulterants in food items like coffee, tea, pepper, chili powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques.

Preparation of Jam, squash and Jelly, Gulk and cottage cheese.

Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, tooth paste/powder and disinfectants in small scale.

Extraction of oils from spices and flowers.

Testing of water samples using testing kit.

Dyeing – cotton fabrics with natural and synthetic dyes

Printing - tie and dye, batik.

Unit-V Entrepreneurial Skills **(06 Hours)**

Fundamental of Marketing – Marketing mix, Product positioning – Product life cycle – Branding – Packing – Pricing – Marketing Channels – Personal Selling, Marketing the products, e-marketing, advertisement skills, copy right and patenting.

Recommended Text :

1. George.S and Muralidharan.V (2007) Fibre to Finished Fabric - A Simple Approach, Publication Division, University of Madras, Chennai.

2. Appaswamy G P, A Handbook on Printing and Dyeing of Textiles

3. Principles of Marketing – Philip Kotler

4. Marketing Management – Rajan Sexena

Reference Books : Shyam Jha, Rapid detection of food adulterants and contaminants (Theory and Practice), Elsevier, e-Book ISBN 9087128004289, Ist Edition, 2015

Website and e-learning source: https://www.vlab.co.broad-area-chemical-sciences

Course Outcomes

Course Name: ENTREPRENEURIALSKILLSINCHEMISTRY	**Course Code: U2R3CHSEC3:2**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	know about Domestic Products	**K4**
CO-2	identify adulterated food items by doing simple chemical tests	**K2**
CO-3	understand about dyes and their treatments	**K3**
CO-4	Prepare some household products and food items	**K2**
CO-5	Develop the entrepreneurial skills	**K4**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: ENTREPRENEURIAL SKILLS IN CHEMISTRY									**Course Code: U2R3CHSEC3:2**					
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	2	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	3	2	3	3	3	2	3	2	3	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 :	**CHEMISTRY-II**	**Marks: CIA:25 + Ext:75=100**
Category of the Course :	**DSE**	**Hrs/Week :05**
Course Code :	**U2R3BCDSE2**	**Total Inst. Hrs: 80**
Nature of the Course :	**Skill Development**	**Sem: II Credit: 05**

Objectives: The course aims at giving an overall view of the

1. Nomenclature of coordination compounds and carbohydrates.
2. Amino Acids and Essential elements of biosystem
3. Understand the concepts of kinetics and catalysis
4. Provide fundamentals of electrochemistry and photo chemistry
5. Improve for water based techniques.

UNITI:Co-ordination Chemistry and Water Technology (16 Hrs)

Co-ordination Chemistry**:** Definition of terms – IUPAC Nomenclature- Werner's theory- EAN rule Pauling's theory – Postulates – Applications to $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$, $[Co(CN)_6]^{3-}$ Chelation-Biological role of Hemoglobin and Chlorophyll (elementary idea) –Applications in qualitative and quantitativeanalysis. Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method –Purification techniques–BOD and COD.

Unit II:Carbohydrates (16 Hrs)

Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.

Unit III: Amino Acids and Essential elements of biosystem (16 Hrs)

Classification- preparation and properties of alanine, preparation of dipeptides using Bergmann method-Proteins-classification – structure - Colour reactions – Biological functions –nucleosides -nucleotides – RNA and DNA– structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.

UNIT IV : Electrochemistry (16 Hrs)

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 (16 Hrs)

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).

Reference Book

1. Arun Bahl,B.S.Bahl, Advanced Organic Chemistry;S.Chand and Company,New Delhi, 23rd edition,2012.
2. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons,New Delhi, 29th edition,2007.
4. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co.,New Delhi,47th edition,2018.
5. B.K,Sharma, Industrial Chemistry; GOEL publishing house,Meeruut

Course Outcomes

Course Name: CHEMISTRY-II	**Course Code: U2R3BCDSE2**	**K-Level**
On Successful completion of the course, students will be able to		
CO-1	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.	**K3**
CO-2	Explain the preparation and property of carbohydrate.	**K4**
CO-3	Enlighten the biological role of transition metals, aminoacids and nucleicacids.	**K2**
CO-4	Apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.	**K5**
CO-5	Outline the various type of photochemical process.	**K3**

Relationship Matrix for course Outcome, Programme Outcomes and Programme Specific Outcomes

Title of the Course: Chemistry-II							**Course Code: U2R3BCDSE2**								
Course Outcomes (COs)	**PO**										**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	3	2	2	2	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
CO5	3	2	3	3	3	3	3	2	2	3	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