BACHELOR OF SCIENCE IN CHEMISTRY

REGULATIONS

ELIGIBILITY

A candidate who has passed the Higher Secondary Examination of Tamil Nadu Higher Secondary Board or an examination of some other board accepted by the syndicate as equivalent there to with Chemistry, Physics, Mathematics and any one of the following subjects namely, Botany, Zoology or Biology shall be eligible for admission into B.Sc., course in Chemistry.

DURATION OF THE COURSE

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

OBJECTIVES OF THE COURSE

Chemistry is central to the current revolutions in Science. No educated person today can understand the modern world without a basic knowledge of Chemistry. The existence of a large number of chemical factories, mines and related industries in the catchment of the University necessitates Chemistry education.

The Major objectives of B.Sc. Chemistry course are

1. To impart knowledge in fundamental aspects of all branches of Chemistry.
2. To acquire basic knowledge in the specialized areas like Polymer Chemistry, Environmental Chemistry, Dye Chemistry, Pharmaceutical Chemistry etc.
3. To create manpower in Chemical industries and help their growth.
4. To prepare candidates for a career in Chemical industries.

SCHEME OF EXAMINATIONS

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
FIRST SEMESTER							
PART I							
15UTALA101 15UHILA101 15UMMLA101 15UFRLA101	Tamil I / Hindi I / Malayalam I / French I	5	3	25	75	100	3
PART II							
15UENLA101	Foundation English I	5	3	25	75	100	3
PART III							
15UCHM101	Core I : General Chemistry I	5	3	25	75	100	5
15UCHM102	Core II : Industrial Chemistry	4	3	25	75	100	4
15UMACHA101	Allied I: Algebra and Differential calculus	5	3	25	75	100	4
15UCHMP101	Core Practical I: Volumetric analysis and Inorganic preparations	3	3	40	60	100	2
PART IV							
15UVE101	Value Education I: Yoga	2	3	25	75	100	2
		29				**700**	**23**
SECOND SEMESTER							
PART I							
15UTALA201 15UHILA201 15UMMLA201 15UFRLA201	Tamil II / Hindi II / Malayalam II / French II	5	3	25	75	100	3
PART II							
15UENLA201	Foundation English II	5	3	25	75	100	3
PART III							
15UCHM201	Core III: General Chemistry II	5	3	25	75	100	5
15UCHM202	Core IV: Pharmaceutical Chemistry	4	3	25	75	100	4
15UMACHA201	Allied II: Integral calculus and vector calculus	5	3	25	75	100	4
15UCHMP201	Core Practical II: Organic qualitative Analysis	3	3	40	60	100	2

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
PART IV							
15UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
Total		**29**				**700**	**23**
THIRD SEMESTER							
PART I							
15UTALA301 15UHILA301 15UMMLA301 15UFRLA301	Tamil III / Hindi III / Malayalam III / French III	5	3	25	75	100	3
PART II							
15UENLA301	Foundation English III	5	3	25	75	100	3
PART III							
15UCHM301	Core V: General Chemistry III	5	3	25	75	100	5
15UPHCHA301	Allied III: Physics I	3	3	25	75	100	3
15UCHMP301	Core Practical III: Inorganic qualitative analysis	4	3	40	60	100	2
15UPHCHAP301	Allied Practical I: Physics	2	3	40	60	100	2
PART IV							
15UCHSBC301	SBC I: Food Chemistry	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
NON CREDIT							
15ULS301	Career competency skills I	1	-	-	-	-	-
Total		**29**	**-**	**-**	**-**	**800**	**22**
***Diploma**							
FOURTH SEMESTER							
PART I							
15UTALA401 15UHILA401 15UMMLA401 15UFRLA401	Tamil IV / Hindi IV / Malayalam IV / French IV	5	3	25	75	100	3
PART II							
15UENLA401	Foundation English IV	5	3	25	75	100	3
PART III							
15UCHM401	Core VI: General Chemistry IV	5	3	25	75	100	5
15UPHCHA401	Allied IV: Physics II	3	3	25	75	100	3

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
15UCSCHA401	Allied V: Computer Fundamental and office automation	3	3	25	75	100	3
15UCSCHAP401	Allied V: Office automation techniques	2	3	40	60	100	2
15UPHCHAP401	Allied Practical II: Physics	2	3	40	60	100	2
PART IV							
15UCHSBC401	SBC II: Textile Chemistry	2	3	25	75	100	2
	NMEC II	2	3	25	75	100	2
NON CREDIT							
15ULS401	Career competency skills II	1	-	-	-	-	-
TOTAL		**30**				**900**	**25**
***Diploma**							
FIFTH SEMESTER							
PART III							
15UCHM501	Core VII: Inorganic Chemistry I	5	3	25	75	100	5
15UCHM502	Core VIII: Organic Chemistry I	5	3	25	75	100	5
15UCHM503	Core IX: Physical Chemistry I	5	3	25	75	100	5
15UCHM504	Core X: Analytical Chemistry	4	3	25	75	100	4
15UCHEL501	Elective I: Spectroscopy (100% Internal evaluation)	4	3	100	-	100	4
15UCHMP501	Core Practical IV: Physical Chemistry	3	3	40	60	100	2
PART IV							
15UCHSBC501	SBC III: Polymer Chemistry	2	3	40	60	100	2
15UCHE501	Extension Activity	-	-	-	-	-	2
Total		**28**				**700**	**29**
SIXTH SEMESTER							
PART III							
15UCHM601	Core XI: Inorganic Chemistry II	6	3	25	75	100	5
15UCHM602	Core XII: Organic Chemistry II	6	3	25	75	100	5
15UCHM603	Core XIII: Physical Chemistry II	5	3	25	75	100	5
15UCHEL601	Elective II: Green Chemistry and Nanochemistry	4	3	25	75	100	4

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Maximum Marks			Credit Points
				CA	CE	Total	
15UCHMP601	Core Practical V: Gravimetric estimation and organic preparation	5	3	40	60	100	3
PART IV							
15UCHSBC601	SBC IV: Agriculture Chemistry	2	3	25	75	100	2
Total		**28**				**600**	**24**
Grand Total						**4400**	**146**

***Students have to complete their diploma course during their second year (III & IV Semester).**

NMEC

- The department offers the following two subjects as Non Major Elective Course for other than the chemistry students for third and fourth semester.

S.No	Subject Code	Semester	Subjects
1.	15UCHN301	III	Applied Chemistry I
2.	15UCHN401	IV	Applied Chemistry II

DIPLOMA

(Student shall select the following Diploma Course during their third semester and complete the course at the end of fourth semester)

S.No	Subject Code	Subject	Duration
1.	15UCHD401	Water analysis and treatment	90 Hours (45 Hrs in each semester)

FOR COURSE COMPLETION

- Students shall complete the course of study under Part I (Tamil/Malayalam/French/Hindi) and Part II (English) papers in I, II, III and IV semester.
- Students shall pass Value Education such as Yoga and Environmental Studies in I and II Semester, respectively.
- Students shall complete allied subjects in I, II, III and IV Semester.
- Students shall choose and pass a Non Major Elective Course and Diploma course in III and IV semester.
- Students shall pass Skill based Courses in III, IV, V and VI semesters
- Students shall involve an extension activity in V semester.

TOTAL CREDIT DISTRIBUTION

S. No.	Components	No. papers	Marks	Credits
1	PART I :Language	4	4 X 100 = 400	4 X 3 = 12
2	PART II : Foundation English	4	4 X 100 = 400	4 X 3 = 12
3	PART III : Core Papers	13	13 X 100=1300	10 X 5 = 50 3 X 4 = 12
	Elective paper	2	2 X 100 = 200	2 X 4 = 8
	Skill Based Course (SBC)	4	4 X 100 = 400	4 X 2 = 8
	Core Practical	5	5 X 100 = 500	4 X 2 = 8 1 X 3= 3
	Allied Theory: Mathematics I & II	2	2X100=200	2 X 4 = 8
	Allied Theory: Physics Allied: Physics Practical	4	2 X 100=200 2 X 100=200	2 X 3 = 6 2 X 2 = 4
	Allied Theory: Computer Science Allied Computer Practical	2	1 X 100=100 1 X 100=100	1 X 3 = 3 1 X 2 = 2
4	PART-IV : Value Education I & II	2	2 X 100 = 200	2 X 2 = 4
	NMEC I & II	2	2 X 100 = 200	2 X 2 = 4
	PART IV: Extension Activity	-	----	1 X 2 = 2
5	Diploma	1	----	----
6	Career competency skills I & II	2	----	----
	TOTAL	**44**	**4400**	**146**

15UCHM101	**CORE I:GENERAL CHEMISTRY I**	**SEMESTER-I**

Total hours: 50

OBJECTIVES:

- To understand the basic concept of atom and periodic properties.
- To understand the nomenclature of organic compounds and bonding.
- To understand the concept of acid-base theories and solvent.
- To understand the basic principals of quantum chemistry.

CONTENTS

UNIT – I **(10 Hours)**

Atomic structure - Quantum numbers n, l, m and s - Pauli exclusion principle - Energy distribution - Hund's rule of maximum multiplicity - Aufbau's principle - Electronic configurations of elements - Stability of half-filled and completely filled orbitals. Shapes of s, p, d and f orbitals.

Periodic properties: Definition - periodicity and factors affecting the properties - Atomic radii - lonic radii - Ionisation potential - Electron affinity - Electronegativity.

UNIT – II **(10 Hours)**

Acid- Base Chemistry- Theories of acids-bases - Arrhenius, Bronsted – Lowry, Lewis, Solvent system (levelling and differentiating effect), Lux - Flood and Usanovich (definition only) Relative strength of acids and bases.

Solvents: Types of solvents – Protic and aprotic solvents - Amphi-protic amphoteric solvents - aqueous and non-aqueous solvents - liquid Ammonia. Advantages and disadvantages of liquid ammonia as solvent.

UNIT-III **(10 Hours)**

Basic organic chemistry-Classification of organic compounds - Nomenclature - Functional groups - Homologous series - IUPAC - aliphatic - alicyclic and aromatic compounds - Bonding in organic chemistry - Hybridisation - tetravalency of carbon - geometry of molecules - methane, ethane, ethylene, acetylene and benzene - Factors affecting covalent bond. Electron displacement effects - inductive - inductomeric - mesomeric - resonance – hyperconjugation and steric effects. Cleavage of bonds - Homolytic and Heterolytic fission of carbon -carbon bond – Reaction intermediates - Carbocations - Carboanions and Free radicals – Structure and stability.

UNIT-IV **(10 Hours)**

Quantum chemistry- Quantum theory and atomic spectra – Bohr's model of atom –

Limitations of Bohr model – Sommer field's model – photoelectric effect - Compton effect – de Broglie equation–Davisson and Germer experiment - Quantum theory of radiation - Planck's theory - Wave mechanical concept of the atom - de Broglie's relationship - wave nature of electron - Heisenberg's uncertainty principle - Schrodinger wave equation (without derivation) - significance of wave functions, ψ and ψ^2 - probability distribution of electrons - radial probability distribution curves.

UNIT-V **(10 Hours)**

Volumetric Analysis: Concept of Molecular weight, Formula weight, Equivalent weight-Concentrations of solutions, molarity, molality, normality, weight percentage. Preparation of standard solutions- primary and secondary standards - acid-base titrations - Redox titrations, complexometric titrations (EDTA titration), precipitation titrations - iodometry, iodimetry and permanganometry. Theory of Indicators-selection of suitable indicators- Calculation of strength of solutions and amount of substance.

TEXT BOOKS:

1. *Puri B.R., Sharma L.R.* and *Kalia K.K.* 1993. **Principles of Inorganic Chemistry**, [Twenty third], S. Chand & Co., Shoban Lal Nagin, New Delhi.
2. *Bahl B.S.* and *Arun Bahl*, 1997. **Advanced Organic Chemistry**, [Twelfth edition], Sultan Chand & Co., New Delhi.
3. *Venkateswaran V, Veeraswamy R.* and *Kulandaivelu A.R.* 1997. **Basic Principles of Practical Chemistry**, [Second edition], Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. *Lee J.D.* 2006. **Concise Inorganic Chemistry**, UK, Black well science.
2. *Morrison R.T.* and *Boyd R.N.* 1976. **Organic Chemistry** [Sixth edition], New York, Allyn & Bacon Ltd.
3. *Gopalan R., Subramanian P.S.* and *Rengarajan K.* 2003. **Elements of Analytical Chemistry**, [Third edition], Sultan Chand & Sons, New Delhi.

15UCHM102	CORE II: INDUSTRIAL CHEMISTRY	SEMESTER-I

Total hours: 40

OBJECTIVES:

- To understand the classifications and chemistry of cements.
- To understand the chemistry involving in the paints and batteries.
- To understand the manufacture and properties of glass and paper.
- To understand the basic of corrosion and polymers.

CONTENTS

UNIT-I **(8 Hours)**

Cement - Classification of cement - Manufacture of portland cement-setting - hardening of cement- Chemical constitution of Portland cement and their characteristics – Special cements and their uses. Preparation of gypsum and its role in setting of cement –Preparation and properties of plaster of paris.

UNIT-II **(8 Hours)**

Paints - Constituents - functions - mechanism of drying - varnishes and lacquers. Surface preparation for metallic coatings - electroplating (gold) and electroless plating (Nickel) - anodizing coating - phosphate coating - powder coating - antifouling coating. **Batteries** - Primary and secondary batteries - Alkaline batteries - lead acid batteries, Ni - Cd and Li batteries - Principles and applications of solar cells - Fuels cells: Hydrogen-Oxygen and Hydrocarbon-oxygen fuel cells.

UNIT-III **(8 Hours)**

Glass - Physical & chemical properties of glass. Raw materials – Characteristics and types of glass - Manufacture of glass - Special glass – Optical glass – borosilicate, flint and coloured glasses. **Papers** - Different methods of wood pulping - Manufacture - Cases of different qualities of paper products like cardboard, newsprint, writing paper, tissue paper and filter paper.

UNIT-IV **(8 Hours)**

Corrosion: Principles of chemical corrosion - Pilling Bedworth rule - Principles of electrochemical corrosion - Difference between chemical and electrochemical corrosion -Galvanic corrosion. Differential aeration corrosion. Factors influencing corrosion. Corrosion control - cathodic protection - sacrificial anodic method - corrosion inhibitors. Protective coatings.

UNIT-V **(8 Hours)**

Polymers: Natural polymer of Rubber – Types of polymers –Homopolymers-Copolymers – Addition and condensation polymers - Polymerization reactions – Mechanisms of cationic, anionic and free radical polymerization reactions – Condensation polymerization – Chemistry of Vulcanization of rubber – Manufacture of Film sheets, Rayon and Polyacrylic fibers - Uses of Polymers.

TEXT BOOKS:

1. *Chakrabarty B.N.* 1981. **Industrial Chemistry**, Oxford & IBH Publishing Co., New Delhi.
2. *Sharma B.K.* 2001. **Industrial Chemistry**, Geol Publishing House, Meerut.

REFERENCE BOOKS:

1. *Singh P.P., Joseph T.M.* and *Dhavale R.G.* 1983. **College Industrial Chemistry**, [Fourth edition], Himalaya Publishing House, Bombay.

15UMACHA101	ALLIED I: ALGEBRA AND DIFFERENTIAL CALCULUS	SEMESTER – I

Total Hours: 50

OBJECTIVES:

- To get the knowledge about matrices and various methods of solving algebraic equations.
- To learn basic concepts of differentiation which is instrumental in constructing many of Mathematical concepts and also applied in all sciences and social sciences.

CONTENTS

UNIT - I **(10 Hours)**

Characteristic Equation - Eigen Values and Eigen Vectors - Cayley-Hamilton Theorem (Statement Only) and its problems - Rank of a matrix - Problems.

UNIT - II **(10 Hours)**

Polynomial Equations - Imaginary and Irrational roots - Relation between roots and coefficients - Transformation of equations - Descarte's rule of signs - Problems.

UNIT - III **(10 Hours)**

Successive differentiation – n^{th} derivative - Leibnitz formula for n^{th} derivative - Problems.

UNIT - IV **(10 Hours)**

Partial Differentiation - Partial Derivatives of Higher orders - Homogeneous Functions - Problems.

UNIT - V **(10 Hours)**

Radius of Curvature in Cartesian and polar coordinates - Pedal Equation of a curve - Radius of curvature in p-r coordinates.

TEXT BOOK:

1. *Vittal, P.R*. 2002. **Allied Mathematics**. Margham Publications, Chennai.

REFERENCE BOOKS:

1.. *Manicavachagom Pillay, T.K. and Narayanan, S*. 2004. **Algebra - Vol - II**. Vijay Nicole Imprints Pvt. Ltd., Chennai.
2. *Singaravelu, A*. 2002**. Allied Mathematics**. Meenakshi Publishers, Chennai.

15UCHMP101	**CORE PRACTICAL I: VOLUMETRIC ANALYSIS AND INORGANIC PREPARATIONS**	**SEMESTER-I**

OBJECTIVES:

- To enable the students to acquire the quantitative skills in volumetric analysis.
- At the end of the course, the students should be able to plan experimental projects and execute them.

LIST OF EXPERIMENTS

Titrimetric Quantitative Analysis

1. Estimation of HCl by NaOH using standard oxalic acid solution (Acidimetry-Alkalimetry).
2. Estimation of oxalic acid by $KMnO_4$ using standard oxalic acid solution (Permanganometry).
3. Estimation of Iron (II) sulphate by $KMnO_4$ using standard Mohr's salt solution (Permanganometry).
4. Estimation of $KMnO_4$ by thio using standard $K_2Cr_2O_7$ solution (Permanganometry).
5. Estimation of Fe (III) by $K_2Cr_2O_7$ using a standard Mohr's salt solution with Internal and external indicators (Dichrometry).
6. Estimation of copper (II) sulphate by $K_2Cr_2O_7$ solution.
7. Estimation of Mg by EDTA solution (complexometric method).
8. Estimation of Ca by EDTA solution (complexometric method).

2. Inorganic Preparations

Tetraamine Copper(II) Sulphate
Hexammine Cobalt(II) Chloride
Tris (thiourea) Copper (I) Chloride
Ferrous Ammonium Sulphate

REFERENCE BOOKS:

1. *Venkateswaran V.* and *Kulandaivelu A.R.* 1997. **Basic Principles of Practical Chemistry**, [Second edition], Sultan Chand & Sons, New Delhi.
2. *Bassett J., et al.* 1985. **Vogel's Textbook of Quantitative Inorganic Analysis**, [Fourth edition], ELBS Longman.
3. *Bajpai D.N., Pandey O.P.* and *Giri S.* 2012. B.Sc., **Practical Chemistry**, S. Chand & company, New Delhi.

4. *J.P. Singh* and *G.R. Verma.* 1999. Practical Chemistry Vol. I & II. S. Chand & company, New Delhi.

15UVE101	VALUE EDUCATION I: YOGA மனவளக்கலையோகா	SEMESTER - I

Total Hours: 30

CONTENTS

UNIT - I **(6 Hours)**

YOGA AND PHYSICAL HEALTH

1:1Physical Structure-Three bodies- Five limitations
1:2Simplified Physical Exercises - Hand Exercises - Leg Exercises- Breathing Exercises – eye Exercises - Kapalapathi
1:3Maharasanas 1-2– massages – acu-puncture – Relaxation
1:4Yogasanas-Suriya Namaskar – Padamasana –Vajrasanas – Chakrasanas(Side) – Viruchasanas –Yoga muthra –Patchimothasanas-Ustrasanas–Vakkarasanas Salabasanas.

UNIT - II **(6 Hours)**

ART OF NURTURING THE LIFE FORCE AND MIND

2:1Maintaining the youthfulness - postponing the ageing process
2:2 Sex and spirituality– significance of sexual vital fluid – Married Life–Chastity.
2:3 Ten Stages of Mind
2:4 Mental Frequency – Methods for Concentration

UNIT - III **(6 Hours)**

SUBLIMATION

3:1 Purpose and Philosophy of life
3:2 Introspection – Analysis of Thought
3:3 Moralization of Desires
3:4 Neutralization of Anger

UNIT - IV **(6 Hours)**

HUMAN RESOURCESDEVELOPMENT

4:1 Eradication of worries
4:2 Benefits of Blessings
4:3 Greatness of Friendship
4:4 Individual Peaceand World Peace

UNIT - V **(6 Hours)**

LAW OF NATURE

5:1 Unified Force – Cause and Effect System
5:2 Purity of thought and Deed and Genetic Centre
5:3 Love and Compassion
5:4 Cultural Education –Five fold Culture

TEXT BOOK:

1. Manavalakalai Yoga – World Community Service Center
   VethathiriPathippagam,
   156, Gandhij Road, Erode – 638 001.
   PH: 0424 – 2263845.

REFERENCE BOOKS:

1. Yoga for Modern Age
2. Journey of Consciousness
2. Simplified Physical Exercises – World Community Service Center
   VethathiriPathippagam,
   156, Gandhij Road, Erode – 638 001.
   PH: 0424 – 2263845.

15UCHM201	CORE III: GENERAL CHEMISTRY II	SEMESTER-II

Total hours: 50

OBJECTIVES:

- To understand the chemistry of acids, bases and the solvents.
- To understand the chemistry of alkali and alkaline earth metals.
- To study the preparation and properties of alkynes and cycloalkanes.
- To understand the basic concepts of thermodynamics and gaseous state.

CONTENTS

UNIT-I **(10 Hours)**

Chemical bonding: Ionic bond - Lattice energy – Factors affecting lattice enery – Born-Haber cycle–Illustration and calculation only for MX and MX_2 – Fajan's rules with Illustrations–colvalent bond –MO theory: LCAO method, MO energy level diagram of H_2, He_2, N_2, O_2 and CO, bond order and stability of molecules - co-ordinate covalent bond – Metallic bond – Hydrogen bond – Octet rule–Sidwig Powell theory – Valance bond theory – Hybridization – VSEPR theory – Illustration of CH_4, H_2O, NH_3, SF_4, XeF_4, XeF_6.

UNIT –II **(10 Hours)**

Alkenes –Preparation - properties of alkenes - Electrophilic and Free radical addition. Addition of hydrogen with Mechanism – addition of halogens with Mechanism - Markownikoff's rule and Anti-Markownikoff's rule. Addition of water Oxymercuration - Demercuration, Hydroboration - oxidation - Reduction – Diels - Alder reaction. Hydroboration, ozonolysis - hydroxylation with $KMnO_4$ - allylic substitution by NBS - Epoxidation - Self-addition or polymerization – Test for unsaturation.

UNIT-III **(10 Hours)**

Alkynes –Preparation of Alkynes - Acidity of alkynes-Addition of hydrogen - Hydroboration - Hydrohalogenation - Addition of hypohalous acid Hydration - addition of water with $HgSO_4$ catalyst-Addition of alcohols and carboxylic acids. Formation of acetylides- alkylation of alkynes with mechanism - oxidation with $KMnO_4$-ozonolysis - Polymerisation to benzene - Oxidative coupling - Isomerization. **Cycloalkanes** -Preparation using Wurtz's reaction-Dieckmann's ring closure and reduction of aromatic hydrocarbons-Substitution and ring opening reactions- Rearrangements. Bayer's strain theory-Theory of stainless rings-Preparation and stability of conjugated dienes.

UNIT-IV **(10 Hours)**

Thermodynamics –Definition - System, surroundings, Isolated, Closed and Open system - Homogeneous and heterogeneous system - Intensive and extensive properties - State of a system-Independent and Dependent state variable - Thermodynamic equilibrium -Thermodynamic processes and their types – isothermal, isobaric, adiabatic, reversible and irreversible. Nature of work and heat. First law of thermodynamics - statement and equation - Internal energy – Enthalpy of the system. C_p - C_v relationship - Joule Thomson effect.

UNIT-V **(10 Hours)**

Gaseous state: Gas laws – Boyle's law, Charles law, Avogadro's law – Ideal gas equation – gas constant - Deviation of real gas from ideal behaviour – Van der Waals equation for real gases – critical phenomenon – P-V isotherm of real gases, critical temperature – Critical volume – Types of molecular velocities –RMS velocity, average and most probable velocities – Collision number and mean free path – Collision diameter – collision cross-section.

TEXT BOOKS:

1. *Bahl B.S.* and *Arun Bahl,* 1997. **Advanced Organic Chemistry**, [Twelfth edition], Sultan Chand & Co., New Delhi,
2. *Puri P. R.*, *Sharma L. R.* and *Pathania M. S.* 2010. **Principles of Physical Chemistry**, Vishal Publishing Co, Jalandhar.

REFERENCE BOOKS:

1. *Morrison R.T.* and *Boyd R.N.* 1976. **Organic Chemistry** [Sixth edition], New York, Allyn & Bacon Ltd.
2. *Pine S. H.* 1986. **Organic Chemistry**, Mc Graw- Hill International Book Company, [Fourth edition], New Delhi.
3. *Lee J.D.* 2006. **Concise Inorganic Chemistry**, Black well science, United Kingdom.

15UCHM202	CORE IV:PHARMACEUTICAL CHEMISTRY	SEMESTER-II

Total hours: 40

OBJECTIVES:

- To effectively impart knowledge about various diseases and their treatment.
- To learn about the importance of Indian medicinal plants.
- To know about the different types of drugs.

CONTENTS

UNIT-I **(8 Hours)**

Definition of the following terms: drug, pharmacophore, pharmacology, pharmacopoeia, bacteria, virus, chemotherapy and vaccine. Causes, symptoms and drug for jaundice, cholera, malaria and filarial - antidotes for poisoning. Routes of drug administration - local, enema, oral or external, parental advantages and disadvantages- Oral and parental routes-inhalation, intradermal, subcutaneous, intramuscular,intraveneous-intrathecal– intraarticular transcutaneous-transmuscusal.

UNIT-II **(8 Hours)**

Causes, detection and control of anaemia and diabetics. Diagnostic test for sugar, salt and cholesterol in serum and urine. Indian medicinal plants and uses - Tulasi, Neem, Kizhanelli, Mango, Semparuthi, Adadodai and Thoothavelai. **Antibacterial Drugs**: Sulpha drugs - examples and actions - prontosil sulphathiazole, sulphafurazole.

UNIT-III **(8 Hours)**

Antibiotics - Definition and action of penicillin, streptomycin, chloramphenicol - SAR of chloramphenicol only - Antiseptics and disinfectants - definition and distinction-Phenolic compounds, chloro compounds and cationic surfactant. **Sulphonamides:** Definition-mechanism of action-classification-SAR synthesis and use of sulpha acetamide, sulphathiazole, phthalyl sulphathiazole- sulphadiazine and sulpha pyridine-assay

UNIT-IV **(8 Hours)**

Analgesics, Antipyretics and anti inflammatory agents: Definition and actions - narcotic and non narcotic - Morphine and its derivatives, pethidine and methodone - Salicylic derivative, paracetamol, ibuprofen - disadvantages and uses. Causes and treatment of cancer. AIDS – cause of HIV – Prepagation - prevention and treatment.

UNIT-V **(8 Hours)**

Anaesthetics-Definition- local and general-Volatile nitrous oxide, ether, Chloroform, cyclo propane- trichloroethylene - uses and disadvantages- Drugs affecting CNS -

Definition, distinction and examples for transquilizers, sedatives, hypnotics, psychedelic drugs - LSD Hashish- their effects.

TEXT BOOKS:

1. G*hosh J.* and *Chand. S.* 2003. **A Text book of pharmaceutical Chemistry**, S. Chand and Co., New Delhi.
2. Lakshmi S. 1998. **A textbook of Pharmaceutical Chemistry** [First edition], Sulthan Chand & Co., New Delhi.

REFERENCE BOOKS:

1. Bentleys E.A. Raubins, 1992. **Text book of pharmaceutics** [Eighth edition], All India traveler book sellers, New Delhi.
2. Kar A., 1992. **Medicinal Chemistry**, New Age International, Wiley-Eastern Ltd., New Delhi.

12UMACHA201	ALLIED II: INTEGRAL CALCULUS AND VECTOR CALCULUS	SEMESTER – II

Total Hours: 50

OBJECTIVES:

- To learn the concepts about Integration.
- To introduce the concept of Fourier series.
- To Study in detail about Vector Differentiation and Vector Integration.

CONTENTS

UNIT – I **(10 Hours)**

Integral Calculus - Integration by parts $\int_0^{\pi/2} \sin^n x\,dx$; $\int_0^{\pi/2} Cos^n x\,dx$; $\int_0^{\pi/2} \tan^n x\,dx$ - Definite integrals – Properties – Reduction formulae – Problems.

UNIT – II **(10 Hours)**

Fourier Series: Definition – To find Fourier coefficients of Periodic functions with period 2 - Even and odd functions - Half range series – Problems.

UNIT – III **(10 Hours)**

Vector Differentiation: Definition of gradient of a Scalar point function - Directional derivative of a vector point function - Unit normal vector.

Vector point function: Divergence and Curl of a vector point function – Definitions - Solenoidal and Irrotational vector - Problems.

UNIT – IV **(10 Hours)**

Line integrals - Surface integrals and Volume integrals – Problems.

UNIT – V **(10 Hours)**

Gauss Divergence Theorem - Stoke's Theorem - Green's Theorem (Statements only) - Problems.

TEXT BOOK:

1. *Vittal, P.R*. 2002. **Allied Mathematics**. Margham Publications, Chennai.

REFERENCE BOOKS:

1. *Manicavachagom Pillay, T.* and *K. Narayanan, S*. 2004. **Algebra - Vol -II**. Vijay Nicole Imprints Pvt. Ltd., Chennai.
2. *Singaravelu, A*. 2002**. Allied Mathematics**. Meenakshi Publishers, Chennai.

15UCHMP201	CORE PRACTICAL II: ORGANIC QUALITATIVE ANALYSIS	SEMESTER – II

OBJECTIVES:

- To enable the students to develop analytical skills in organic qualitative analysis and preparative skills in organic preparations.
- To enable the students to check the purity of organic compounds by determining the melting or boiling points.
- At the end of the course, the students should be able to plan the experimental projects and execute them.

CONTENTS

LIST OF EXPERIMENTS

1. Determination of melting and boiling points of organic substances.
2. Organic analysis:
   a. Identification of acidic, basic, phenolic, and neutral organic substances.
   b. Detection of N, S and halogens.
   c. Test for aliphatic and aromatic nature of substances.
   d. Test for saturation and unsaturation.
   e. Identification of functional groups: i) Carboxylic acids ii) Phenols iii) Aldehydes iv) Ketones v) Esters vi) Carbohydrates vii) Amines viii) Amides.
   f. Preparation of derivatives for the functional groups.

REFERENCE BOOKS:

1. *Gnanapragasam N.S. , Viswanathan S.* and *Ramamurthy G.* 1998.**Organic Chemistry** – Lab manual, Co. Pvt.,
2. *Gurthu J.N.* and *Kapoor, R*. 1987. **Advanced Experimental Chemistry**, S. Chand and Co., New Delhi.

15UVE201	VALUE EDUCATION II: ENVIRONMENTAL STUDIES	SEMESTER -II

Total hours: 30

OBJECTIVES:

- To create an awareness on the environment and related issues.

CONTENTS

UNIT - I **(6 Hours)**

Environment– Definition– Scope– Structure and function of ecosystems- producers, consumers and decomposers- Energy flow in the ecosystem- Ecological succession– food chain, food webs and ecological pyramids– Concept of sustainabledevelopment.

UNIT - II **(6 Hours)**

Natural resources: Renewable- air, water, soil, land and wildlife resources. Non–renewable – Mineral coal, oil and gas. Environmental problems related to the extraction and use of naturalresources.

UNIT - III **(6 Hours)**

Biodiversity– Definition– Values– Consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of bio diversity– conservation of bio- diversity: in– situEx – situ. Bio–wealth - National and Global level.

UNIT - IV **(6 Hours)**

Environmental Pollution :Definition– causes, effects and mitigation measure s– Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution– Nuclear hazards – Solid wastes acid rain–Climate change and global warming environmental laws and regulations in India– Earth summit

UNIT - V **(6 Hours)**

Population and environment – Population explosion – Environment and human health – HIV/AIDS – Women and Child welfare – Resettlement and Rehabilitation of people, Role of information technology in environmental health – Environmental awareness.

TEXT BOOK:

1. Department of Biochemistry. Environmental Studies (Study Material). Published by K.S.Rangasamy College of Arts & Science (Autonomous). Tiruchengode.

REFERENCE BOOK:

1. *Erach Bharucha*. 2005. **Textbook of Environmental studies**. Universities press. PVT. Ltd.

15UCHM301	CORE V: GENERAL CHEMISTRY III	SEMESTER-III

Total hours: 50

OBJECTIVES:

- To understand the properties of boron and carbon family elements.
- To understand the nuclear chemistry and its applications.
- To understand the preparation and properties of alkyl halides, alcohols, thioalcohols, aldehydes, ketones and benzene.
- To understand the entropy and thermodynamic laws.

CONTENTS

UNIT-I **(10 Hours)**

Alkali metals - Li, Na, K, Rb and Cs - Occurrence with respect to oxides, halides, hydroxides and carbonates - Exceptional property of Lithium – Diagonal relationship of Li with Mg. **Alkaline earth metals** - Be, Mg, Ca, Sr and Ba - Occurrence - comparative study of the elements with respect to oxides, hydroxides, halides, sulphates and carbonates - Exceptional property of Beryllium - Diagonal relationship of Be with Al - Comparison of alkaline earth metals with alkai metals - Magnesium acting as bridge element between II-A and II-B groups.

UNIT-II **(10 Hours)**

Alkyl halides: General methods of preparation and properties - Nucleophilic substitution reactions SN1 and SN2 - Saytzeff rule. Unsaturated halides: Vinyl chloride and Allyl iodide - preparation, properties and uses. **Alcohols:** Synthesis by Grignard method and oxomercuration method. Unsaturated alcohols: preparation, properties and uses of allyl alcohol. Thioalcohols - preparation, properties and uses. Phenols - preparation, properties and uses - Kolbe's reaction - Reimer-Teiman reaction, Acidity of phenol. Napthol - Preparation and properties of α-napthol and β-naphthol.

UNIT-III **(10 Hours)**

Aldehydes and ketones: General methods of preparation - Properties of aliphatic aldehydes and ketone. Preparation, properties and uses of formaldehyde and benzaldehyde. **Benzene:** Preparation – Aromatic character- Huckel's rule of aromaticity -Aromatic electrophilic substitution reactions of benzene - Mechanism of Nitration, sulphonation, halogenations, Friedel-Craft's Alkylation and Acylation.

UNIT-IV **(10 Hours)**

Thermodynamics: Concept of entropy - Entropy change in isothermal expansion of an ideal gas - Entropy change in reversible and irreversible process - Entropy change of an ideal gas with change in P, V and T. Entropy of mixing. Second law of thermodynamics: Limitations of first law and need for second law. Cyclic process – Carnot's cycle - Carnot's theorem-Efficiency of a heat engine. Third law of thermodynamics - determination of absolute entropies - Exceptions to third law of thermodynamics – Zeroth law of thermodynamics.

UNIT-V **(10 Hours)**

Qualitative Inorganic Analysis: Dry test, flame test, Cobalt nitrate test-Wet confirmatory tests for acid radicals-Interferring acid radicals-Theory of Interference-Elimination of Interfering acid radicals. Group separation and confirmatory tests for basic radicals-Uses of complexing agents in qualitative analysis-common ion effect and solubility product-Role of solubility product in the precipitation of various cations in different groups in qualitative analysis.

TEXT BOOKS:

1. *Bahl B.S*. and *Arun Bahl*, **Advanced Organic Chemistry** [Twelfth edition], New Delhi, Sultan Chand & Co., (1997).
2. *Puri B.R., Sharma L.R.,* and *Kalia K.K*., 1993. **Principles of Inorganic Chemistry** [Twenty third editions], Nagin Chand & Co., Shoban Lal, New Delhi.

REFERENCE BOOKS:

1. *Morrison R.T*. and *Boyd R.N*., 1976. **Organic Chemistry** [Sixth edition], Allyn & Bacon Ltd., New York.
2. *Pine S. H,* 1986. **Organic Chemistry**, [Fourth edition] McGraw- Hill International Book Company, New Delhi.
3. *Lee J.D*., 2006. **Concise Inorganic Chemistry**, Blackwell Science, UK.

15UPHCHA301	ALLIED III : PHYSICS I	SEMESTER– III

Total Hours: 40

OBJECTIVES:

- To impart knowledge on the basic principles of Mechanics and Properties of matter.
- To enhance students skill by introducing application oriented concepts.

CONTENTS

UNIT - I **(8 Hours)**

Mechanics: Projectile - Range Up and down an inclined plane - Maximum Range - Impulse and impact - Laws of impact - Coefficient of restitution - Direct impact between two spheres - Compound pendulum – Theory – Determination of acceleration due to gravity.

UNIT - II **(10 Hours)**

Properties of Matter : Newton's law of gravitation – Determination of gravitational constant – Boy's method – Bending of Beams – Expressions for Bending Moment – Theory of uniform and non uniform bending – expression for the depression of free end of the cantilever - Torsion expression for couple per unit twist - Torsion pendulum –Expression for period of oscillation - Experiment to determine rigidity modulus by torsional pendulum without masses – Rigidity modulus by static torsion –Theory - Surface tension and interfacial surface tension by drop weight method.

UNIT -III **(8 Hours)**

Heat: Postulates of Kinetic theory of gases– Vander Waal's equation - Derivation of Critical constants in terms of Vander Waal's constants – Expressions for Vander Waal's constants - Thermal conductivity of a bad conductor - Lee's disc method - Joule - Thomson effect - Porous plug experiment - Theory - Liquefaction of Helium by K. Onnes method - Properties of Helium I and Helium II.

UNIT - IV **(7 Hours)**

Optics: Interference - Air wedge - Thickness of a wire - Jamin's Interferometer - Rayleigh's Interferometer - Polarization - Nicol prism as a polarizer and analyzer - Specific rotary power and its determination.

Sound: Laws of transverse vibration of strings - Sonometer - Musical sound and noise - Characteristic of musical sound.

UNIT-V **(7 Hours)**

Electricity and Magnetism : Potentiometer - Low range voltmeter and ammeter calibration - Theory of moving coil Ballistic Galvanometer – Determination of

current and voltage sensitivities - Comparison of capacitances – Magnetic susceptibility - magnetic permeability - Properties of dia, para, Ferro magnetic materials.

TEXT BOOK(S):

1. *Murugesan.R. 2007.* **Allied Physics – I,** S.Chand & Company. New Delhi.
2. Kamalakannan*, D.* and *Rangarajan. C.* 1992. **Allied Physics Part – I,** [First Edition] S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai.

REFERENCE BOOKS:

1. *Brijlal* and *Subramanian.* 2004. **Optics,** S. Chand & Company. New Delhi.
2. *Mathur, D.S.* 1991. **Heat and Thermodynamics,** [Fifth Edition] Sultan Chand & Sons, New Delhi.
3. *Murugesan. R.* 2005. **Mechanics and Mathematical Method,** [Second Edition]. S. Chand & Co., New Delhi.
4. *Murugeshan. R.* 1995. **Electricity and Magnetism,** [First Edition], S. Chand & Co., *New* Delhi.

15UCHMP301	CORE PRACTICAL III: INORGANIC QUALITATIVE ANALYSIS	SEMESTER-III

OBJECTIVES:

- To enable the students to develop analytical skills in inorganic qualitative analysis.
- To appreciate the various coloured chemical reactions of metal ions.

LIST OF EXPERIMENTS

Semi micro qualitative analysis:

1. Training sessions for three classes:

Mixture of anions containing an interfering anion and its elimination technique.

Mixture of cations of simple radicals to familiarize with the inter group separation techniques.

2. Semi micro qualitative analysis of inorganic salt mixtures containing one interfering acid radical.
3. Simple anions: Carbonate, nitrate, sulphate and chloride.
4. Interfering anions: Borate, fluoride, oxalate and phosphate.
5. Cations:

Group I cations: Lead, silver, mercurous.

Group II cations: Mercuric, copper, cadmium, bismuth, antimony, tin.

Group III cations: Aluminium, ferrous, ferric, chromium.

Group IV cations: Cobalt, nickel, manganese, zinc.

Group V cations: Barium, strontium, calcium

Group VI cations: Magnesium, ammonium.

REFERENCE BOOKS:

1. *V.V. Ramanujam*, 1974. **Inorganic Semi Micro Qualitative Analysis**, [Third edition], The National Publishing Company, Chennai.
2. G H Jeffery, J Bassett, J Mendham and R C Denney, 1989. **Vogel's Text Book of Inorganic Qualitative Analysis**, [Fifth edition], ELBS, London,

15UPHCHAP301	ALLIED PRACTICAL I : PHYSICS	SEMESTER - III

OBJECTIVES:

1. To provide basic skills in measurements using Microscope, Telescope, spectrometer, potentiometer etc.
2. They also impart knowledge in properties of matter, light and electricity.

LIST OF EXPERIMENTS: (3 Hours for each Lab)

1. Young's modulus - Non - uniform bending – Scale and telescope
2. Torsion pendulum – Rigidity modulus - without masses
3. Compound pendulum
4. Surface tension and interfacial surface tension –Drop weight method
5. Potentiometer –Calibration of low range voltmeter
6. Figure of merit of a galvanometer (table galvanometer)
7. Field along the axis of a coil - B_H (compass box)
8. Spectrometer - Dispersive power of a prism (angle of prism is given)
9. Sonometer - Frequency of a fork
10. Air wedge –Thickness of a wire.

TEXT BOOKS:

1. *Srinivasan, M. N., Balasubramanian. S* and *Ranganathan.R. 2004*. **A book for study of Practical Physics.** Sultan Chand & Sons, New Delhi.
2. *Usha Rani. Subbarayan. A*. and *Somasundaram. 2007*. **Practical Physics.** APSARA Publication, Trichy.

15UCHSBC301	SBC I: FOOD CHEMISTRY	SEMESTER-III

Total hours: 25

OBJECTIVES:

- To understand the basic concept of food adulteration and food poisoning.
- To understand the food additives and beverages.
- To understand the chemistry of edible oils.

CONTENTS

UNIT-I **(5 Hours)**

Food adulteration- Sources of food, types, advantages and disadvantages. Food adulteration- Contamination of Wheat, Rice, Alial, Milk, Butter etc. with clay stones, water and toxic chemicals –Common adulterants-Ghee adulterants and their detection. Detection of adulterated food by simple analytic techniques.

UNIT-II **(5 Hours)**

Food poison - Food poisons- Natural poisons (alkaloids – nephrotoxing)- Pesticides. (DDT, BHC, Malathion)-Chemical poisons-First aid for poison consumed victims.

UNIT-III **(5 Hours)**

Food additives-Food additives-Artificial sweetners-Saccharin-Cyclomate and aspartate. Food flavours-esters, aldehydes and heterocyclic compound. Food colours- Emulsifying agents- Preservatives learning agents-Baking powder yeast-taste makers- MSG-vinegar.

UNIT-IV **(5 Hours)**

Beverages-Soft drinks-soda-fruit juices-alcoholic beverages-Carbonation-addiction to alcohol-Cirrhosis of liver and social problems.

UNIT-V **(5 Hours)**

Edible oils - Fats, Oils, - Sources of oils-Production of refined vegetable oils-preservation - Saturated and unsaturated fatty acids- Iodine value- Role of MUFA and PUFA in preventing heart diseases-Determination of iodine value and RM value, saponification values and their significance - Estimation of iodine and RM values in edible oils.

TEXT BOOKS:

1. *Seema Yadav,* 2006, **Food Chemistry**, Anmol publishing (P) Ltd, New Delhi.
2. *Car H. Synder*, 1992, **The Extraordinary Chemistry for ordinary things**, John Wiley and Sons, New York.

REFERENCE BOOKS:

1. *Sivasankar, B*. 2005. **Food Processing and Preservation**. Prentice Hall of India (P) Ltd, New Delhi.
2. *Hosahalli Ramaswamy* and *Michele Marcotte*, 2009. **Food Processing – Principles**. CRC Press/Taylor & Francis, New York.
3. *Garrow J. S* and *James W.P.T.* 1993. **Human Nutrition and Dietetics**. [Ninth Edition]. Churchill Livingstone,Tokyo.
4. *Swaminathan M.* 1985. The Essential of Food and Nutrition, Ganesh and Company, Bangalore.
5. *Jayashree Ghosh*, 2008. **Fundamental concepts of applied chemistry**, S. Chand & Co., New Delhi.

15ULS301	CAREER COMPETENCY SKILLS I	SEMESTER – III

Total Hours: 15

OBJECTIVES:

- To enhance employability skills and to develop career competency

CONTENTS

UNIT – I **(3 Hours)**

Speed Maths: Squaring of Numbers - Multiplication of Numbers - Finding Square Roots - Finding Cube Roots - HCF, LCM - Decimals - - Averages - Powers and Roots.

UNIT – II **(3 Hours)**

Problems on ages- Ratio and proportion- Chain rule-Percentages- Simple and Compound Interest.

UNIT – III **(3 Hours)**

Time and Work- Time and Distance- Problems on Trains

UNIT – IV **(3 Hours)**

Analogies - Sentence Formation - Sentence Completion - Sentence Correction - Idioms & Phrases - Jumbled Sentences-- Reading Comprehension –Deriving conclusions

UNIT – V **(3 Hours)**

Tenses- Articles and Preposition - Change of Voice - Change of Speech - Synonyms & Antonyms - Phrasal Verbs-One Word Substitution- Odd Man Out - Spelling & Punctuation

15UCHM401	**CORE VI: GENERAL CHEMISTRY IV**	**SEMESTER-IV**

Total hours: 50

OBJECTIVES:

- To understand the properties of nitrogen and oxygen group elements.
- To understand the properties and preparations of carboxylic acids, dicarboxylic acids, ethers and nitro compounds.
- To understand the free energy functions
- To understand the principles involving in the qualitative inorganic analysis.

CONTENTS

UNIT-I **(10 Hours)**

Boron family - General Characteristics – oxidation states, metallic character and inert pair effect – electron deficiency compounds of Boron - Acid strength of trihalides of boron – Preparation properties and structure of diborane, Borazole and boron nitride. **Carbon family** - General characteristics - oxidation states, metallic character, inert pair effect and catenation. Allotropy- structure of graphite and diamond. Differences between CO_2 and SiO_2. Silicones - Preparation and applications.

UNIT-II **(10 Hours)**

Nitrogen family–General characteristics - Anomalous behaviour of nitrogen - a comparative study on hydrides, halides and oxides of nitrogen group elements. Structure and basic character of ammonia. Oxyacids of nitrogen (HNO_2, HNO_3). Preparation, properties and structure of hydrazine. **Oxygen family**-General characteristic - Anomalous behaviour of oxygen - Preparation, properties, structure and uses of sulphuric acid, Caro's acid, Marshall's acid - Classification of oxides based on oxygen content-normal oxides, peroxides, superoxides, dioxides, suboxides and mixed oxides.

UNIT-III **(10 Hours)**

Carboxylic acids -Preparation - properties - acidity of carboxylic acids - Influence of substituents on acidity. Benzoic acid - Preparation and properties. **Dicarboxylic acids:** Preparation and properties of oxalic acid and succinic acid - Action of heat on dicarboxylic acids. **Unsaturated acids**: Preparation and properties of crotonic, acrylic and cinnamic acids. Hydroxy acids: Preparation and properties of lactic acid.

UNIT-IV **(10 Hours)**

Ethers – Classification - nomenclature - preparation - properties. Diethyl ether-Preparation - properties - comparison of ethers with alcohols. **Nitrocompounds** -

Nitrobenzene - Preparations and properties. Amines - basicity of amines-distinguish primary, secondary and tertiary amines. Aromatic amine-aniline-Relative basicity of aliphatic and aromatic amines- electrophilic substitution in aniline. Diazonium salts - Diazotisation.

UNIT-V **(10 Hours)**

Free energy functions-Gibbs and Helmoltz free energy-free energy variation with T, P and V. Criteria for spontaneity and equilibrium. Gibbs-Helmoltz equations-Maxwell relations. Partial molar properties-Chemical potential-variation of chemical potential with T and P. Gibbs Duhem equation-Chemical potential in a system of ideal gases. Reaction isotherm variation of equilibrium constant with temperature-Van't Hoff equation-Vant Hoff isochore.

TEXT BOOKS:

1. *Bahl B.S, Arun Bahl*, 1997. **Advanced Organic Chemistry**, [Twelfth edition], Sultan Chand and Co., New Delhi.
2. *Puri P. R.*, *Sharma L. R.* and *Pathania M. S.* 2010. **Principles of Physical Chemistry**, Vishal Publishing Co, Jalandhar.
3. *Venkateswaran V, Veeraswamy R., Kulandaivelu A.R.,* 1997. **Basic Principles of Practical Chemistry**, [Second edition], Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. *Morrison R.T, Boyd R.N.*, **Organic Chemistry**, [Fourth edition], New York, Allyn & Bacon Ltd., (1976)
2. *Pine S. H,* 1986. **Organic Chemistry**, [Fourth edition], McGraw- Hill International Book Co., New Delhi.
3. *Lee J.D.*, 2006. **Concise Inorganic Chemistry**, Blackwell Science, UK.

15UPHCHA401	ALLIED IV: PHYSICS II	SEMESTER – IV

Total Hours: 36

OBJECTIVES:

- To impart knowledge on the basic principles of Atomic Physics, Nuclear Physics, Basic Electronics and Digital Electronics.

CONTENTS

UNIT - I **(7 Hours)**

Atomic Physics: Bohr Atom model - Spectral series of hydrogen - Vector atom model - spatial quantization - Spinning electron - Quantum numbers associated with vector atom model - coupling schemes – L - S coupling - J - J Coupling – Pauli's exclusion principle - example of electron configuration - Photo electric effect - Laws - Einstein's equation.

UNIT - II **(7 Hours)**

Nuclear Physics: Radioactivity - Properties of α, B, γ rays – Laws of radioactivity - Half - life and mean life - Nuclear models –Liquid drop model - Semi - empirical mass formula - Merits and demerits - Shell model – Evidences, Nuclear radiation detectors – Ionization chamber –G.M counter - Particle accelerator - Cyclotron - Synchrocyclotron.

UNIT - III **(8 Hours)**

LASER Physics: LASER - Characteristics of laser – Theory of laser – Population inversion – Optical pumping – Construction and working of: Ruby laser – Helium – Neon laser – Semiconductor laser – Application of laser.

Spectroscopy: Types of spectra - Emission and absorption spectra - Raman effect – Quantum theory of Raman effect – Experimental study of Raman effect – Application of Raman effect.

UNIT - IV **(7 Hours)**

Basic Electronics: Junction diode **-** Zener diode –characteristics - Half wave rectifier - Construction and characteristics of transistors (common emitter only) - Oscillators - Hartley oscillator - Astable multivibrator - Construction and characteristics of FET.

UNIT - V **(7 Hours)**

Digital Electronics: Binary, Octal, Hexadecimal numbers and their conversion – Basic logic gates, their truth tables - Laws of Boolean algebra – De Morgan's theorem - NAND / NOR as universal blocks.

TEXT BOOK:

1. *Murugesan, R. 2007.* **Allied Physics - II.** S. Chand & Company, New Delhi.

REFERENCE BOOKS:

1. *Murugesan, R.* 2007. **Modern Physics,** S. Chand & Co., New Delhi.
2. *Metha, V.K.* 2002. **Principles of Electronics,** [Eleventh Edition], S. Chand & Co., New Delhi.
3. *Avadhanula, M.N.* 2001. **An Introduction to Laser Theory and Application,** S. Chand & Co., New Delhi.
4. *Brijlal and Subramanian*. 2005. **Atomic and Nuclear Physics,** S. Chand & Co., New Delhi.

15UPHCHAP401	ALLIED PRACTICAL II: PHYSICS	SEMESTER - IV

OBJECTIVES:

1. To provide basic skills in measurements using Microscope, Telescope, spectrometer, potentiometer etc.
2. They also impart knowledge in properties of matter, light and electricity.

List of Experiments: (3 Hours for each Lab)

1. Torsion pendulum – Rigidity modulus –with masses
2. Young's modulus - Uniform bending – Scale and telescope
3. Potentiometer –Calibration of high range Ammeter
4. Thermal Conductivity – Lee's disc method
5. Spectrometer - Grating - wavelength of Mercury spectrum
6. Newton's ring –Radius of curvature
7. Zener diode –Characteristics
8. Basic logic gates - Verification of truth tables
9. NAND as universal gates
10. NOR as universal gates

TEXT BOOKS:

1. *Srinivasan, M. N., Balasubramanian. S* and *Ranganathan.R. 2004*. **A BOOK FOR STUDY of Practical Physics.** Sultan Chand & Sons, New Delhi.
2. *Usha Rani. Subbarayan. A.* and *Somasundaram. 2007*. **Practical Physics.** APSARA Publication, Trichy.

15UCSBTA401/ 15UCSCHA401	**ALLIED V:COMPUTER FUNDAMENTALS AND OFFICE AUTOMATION (For the students of B.Sc., Biotechnology and Chemistry)**	**SEMESTER - IV**

Total hours: 30

OBJECTIVE:

On completion of the course the students shall have knowledge on:

1. Computer and Internet.
2. Office Package for various Applications

CONTENTS

UNIT - I **(6 Hours)**

Introduction to Computers: History and Generations of Computers-Characteristics of Computers-Applications of Computers-Classification of Computers-Organization of Computer System-Computer Hardware-Software Definition, Role and Categories. **The Processor:** The Central Processing Unit. **Computer Memory and Storage:** What is Computer's Memory? Primary Memory (Main Memory)-Read Only Memory-Auxiliary Memory.

UNIT - II **(6 Hours)**

The Input-Output Media: Inputs and Outputs: CRT Monitors-Flat Panel Monitors-Keyboards-Graphics and Graphical Terminals-Printers. **Introduction to the Internet:** A Brief History of the Internet- TCP/IP-IP Address and Domain Name System (DNS)-Client-Server Architecture-Electronic Mail (Email)-File Transfer Protocol (FTP)-World Wide Web (WWW).

UNIT - III **(6 Hours)**

Introduction to Microsoft Office Word 2007: Working with Documents in Microsoft Word 2007-Saving the File- Formatting the Text- Alignment of Text- Applying Fonts- Spell Checking- Consulting Thesaurus- Assign a Character Style- Borders and Shading-Closing of the File-Save as Option- Printing your Document- Editing the Document- Editing Tools- Auto Correct- AutoFormat- Find and Replace- Find-Replace Text- Page Numbering- Header and Footer- Foot Notes and End Notes-Splitting Panes- Tiling of the Document- Using Mail Merge in Word 2007- Opening Screen of Microsoft Word Screen.

UNIT - IV **(6 Hours)**

Introduction to Microsoft Office Excel 2007: Understanding Spreadsheets-Creating a Worksheet in Excel 2007-Copying Formula-Formulas that Make Decisions-Styles-Functions in Excel-Using Auto calculate-References-Sum Function-Average Function- Creating Charts in Excel-Auditing a Workbook-Comments Inserting-Outlines-Worksheet Fitting on a Page-Function Wizard-Goal Seeking-Scenarios

Manager-Creating a Pivot Table Report-Typing with AutoFill-Formatting Numbers and Labels-Changing the Size of Rows and Columns-Adding and Deleting Rows and Columns-Inserting (and Removing) Page Breaks-Applying Themes-Add or Remove a Sheet Background-Convert Text to Columns-Protect Worksheet or Workbook Elements-Functions in Excel.

UNIT - V **(6 Hours)**

Working with Microsoft Office PowerPoint 2007: Creating Presentation from Template-Creating a New Presentation-PowerPoint Views-Entering the Text-Moving the Text-Changing the Color-Adding Graphics to a Slide-Reordering Slides-Duplicating Slides-Deleting Slides-Adding a Animated Cartoon to a Slide-Adding Slide Transitions-Adding Text Transitions-Viewing a Presentation-Making Slide Shows-Hiding a Slide-Notes, Handouts and Masters for Presentation-Packing Presentation to Go-Add a Caption to a Picture in a Photo Album-Overview of Creating a Photo Album-Add a Picture to a Photo Album-Change the Appearance of a Picture in a Photo Album.

TEXT BOOKS:

1. *Atul Kahate.* 2008**. Information Technology. [**Third Edition]. Tata McGraw-Hill Edition Ltd, New Delhi. (UNIT I, II)
2. *Law Point.* 2008. **Microsoft Office 2007**. [First Edition]. Ashok Lodha Publication, Kolkata. (UNIT III, IV and V)

REFERENCE BOOKS:

1. *Alexis Leon and Mathews Leon***. 1999. Introduction to Computers.** [First Edition]**.** LeonTechworld, New Delhi.
2. *Dennis, P. Curtin, Kim Foley, Kunal Sen and Cathleen Morin.* 2001**. Information Technology: The Breaking Wave.** [Nineth Reprint]. Tata McGraw-Hill Edition, New Delhi.
3. *Sanjay Saxena.* 2007. **MS-Office 2000 for Everyone**. [Second Reprint]. Vikas Publishing House Pvt Ltd., New Delhi.

15UCSBTA401/ 15UCSCHA401	**ALLIED PRACTICAL V: OFFICE AUTOMATION TECHNIQUES (For the students of B.Sc., Biotechnology and Chemistry)**	**SEMESTER - IV**

LIST OF PRACTICAL:

INTERNET

1. Creating E-mail ID and Working with Basic Options.

MS – Word

2. Creating a Personal Profile.
3. Designing a Document for Lab Requirements using following options
    - Font styles.
    - Page layout, Page Setup (Setting Margins, Changing Page Size, Changing Page Orientation and Applying Page Background).
    - Table.
4. Creating a Document for topic presentation with following options
    - Single and Double Column.
    - Page numbers.
    - Headers and Footers.
    - Date and time, Pictures and Shapes.
5. Mail Merge – Invitation to Multiple Recipients for Conducting Seminar in the Department.

MS-Excel

6. Entering Data for Stock Analysis and Formatting the Cells.
7. Working with Sorting and Filtering.
8. Creating a Chart for an Experiment with sample data.
9. Stock Maintenance for Lab Equipments.

MS- PowerPoint

10. Creating a Presentation for the given topic.
11. Creating a Presentation for the Department Profile.
12. Creating a Presentation with Animation effects.

15UCHSBC401	SBC II: TEXTILE CHEMISTRY	SEMESTER-IV

Total hours: 25

OBJECTIVES:

- To learn knowledge about the textile terminology.
- To study raw materials and characteristics of different textile fibres, yarn and fabric.

CONTENTS

UNIT-I **(5 Hours)**

General classification of fibres-Chemical structure- production- properties-uses of the following natural fibres-Natural cellulose fibres (cotton and jute)-natural protein fibre (wool and silk).

UNIT-II **(5 Hours)**

Chemical structure-production- properties- uses of the following synthetic fibres-Man made cellulose fibres (Rayon, modified cellulose fibres)-polyamide fibres (different types of nylons)- poly ester fibres.

UNIT-III **(5 Hours)**

Impurities in raw cotton and grey cloth- wool-silk-General principles of the removal-scouring- bleaching- Desizing-Kierboiling-Chemicking.

UNIT-IV **(5 Hours)**

Dyeing-Dyeing of wool and silk-fastness properties of dyed materials-dyeing of nylon, terylene and other synthetic fibres.

UNIT-V **(5 Hours)**

Finishing-finishes given to fabrics-Mechanical finishes on cotton, wool and silk-method used in process of mercerizing-Anti-creas and Anti-shrink finishes-water proofing.

TEXT BOOKS:

1. *Kapur, K.* 2011. **Text book of Applied Chemistry,** Macmillan Publishers, New Delhi.

REFERENCE BOOKS:

1. *Sadov, P, Horchagin, M.,* and *Matetshy*, A. 1978. **Chemical Technology of Fibrous Materials**, MIR Publishers, Moscow.

2. *Maryory L. Joseph*, 1977. **Introduction to Textile Science**, Holt, Rinehart and Winston, New York.

3. *Shenai, V.A.* 1980. **Chemistry of Dyes and Principles of Dyeing**, Sevak Publications, Mumbai.

15ULS401	CAREER COMPETENCY SKILLS II	SEMESTER – IV

Total Hours: 15

OBJECTIVES:

- To enhance employability skills and to develop career competency

UNIT – I **(3 Hours)**

A to Z Placement Terms-Assertiveness and Self Confidence-Career Opportunities-Skill set (Industry Expectations)

UNIT – II **(3 Hours)**

Principles of Communication (LSRW)-Describing Objects / Situations / People-Information Transfer - Picture Talk - News Paper and Book Review

UNIT – III **(3 Hours)**

Self Introduction - Situational Dialogues / Role Play (Telephonic Skills- Oral Presentations- Prepared -'Just A Minute' Sessions (JAM)

UNIT – IV **(3 Hours)**

Dress code- Body Language- - Manners and Etiquettes -Resume Writing

UNIT – V **(3 Hours)**

Presentation Skills **–** Group Discussion-Interviewing Techniques- Mock Interview

15UCHM501	CORE VII: INORGANIC CHEMISTRY I	SEMESTER-V

Total hours: 50

OBJECTIVES:

- To understand the theory of coordination compounds and its magnetic properties of the complexes.
- To understand the reactions and mechanism involving in the reactions of coordination compounds.
- To understand the chemistry of d-block elements and organometallic catalyst.
- To study the properties of noble gases and halogen compounds and their application
- To understand the Chemistry of d and f-block elements

CONTENTS

UNIT-I **(10 Hours)**

Halogen family: General characteristic of halogen family-Comparative study of elements-Oxides-Oxy acids and Hydracids. Preparation, properties and structure of interhalogen compounds - basic character of Iodine. **Noble gases**: position in the periodic table - reasons for inertness - uses. Compounds of xenon- - preparation, properties and structure of XeF_2, XeF_4, XeF_6 and XeO_3. Polyacids of Mo and W. Interstitial compounds and clathrates- water and quinol clathrates.

UNIT-II **(10 Hours)**

Transition metals (d – block elements): First, second and third row of transition series - General characteristics – Metallic character, atomic and ionic radii-oxidation states, colour, complex formation, catalytic and magnetic properties-Non-stoichiometric compounds-Magnetic properties – Types - para, dia, ferri, ferro, antifero. Curie and Neel temperature. Determination of magnetic moment by Gouy balance method.

UNIT-III **(10 Hours)**

Inner transition metals (f– block elements): Lanthanides: Properties of lanthanides. Electronic configuration-oxidation states- ionic radii, lanthanide contraction. Colour and magnetic properties. Extraction of mixture of lanthanides from monazite sand and separation of lanthanides. Uses of lanthanides. **Actinides**: Sources of actinides-preparation of transuranic elements-Electronic configuration-oxidation states-ionic radii-Colour of ions-comparison with lanthanides. Extraction of thorium from monazite sand. Production and uses of plutonium.

UNIT-IV **(10 Hours)**

Nuclear chemistry-Natural radioactivity - types and properties of radioactive rays. Modes of radioactive decay. Rate of radioactive disintegration – half-life period – average life period. Group displacement law – Definitions of isotopes, isobars and isotones. Uses of isotopes as tracers in medical, agriculture, analytical and industrial field. C^{14} dating and rock dating. Artificial radioactivity. Nuclear reactions - Nuclear fission - mechanism of fisson -liquid drop model -Atom bomb. Nuclear fusion - hydrogen bomb - stellar energy. Q value of nuclear reactions. Nuclear stability - N/P ratio - mass defect - binding energy.

UNIT-V **(10 Hours)**

Metallurgy: Occurrence of metals - various steps involved in metallurgical processes - concentration of ore-calcinations-Roasting- smelting- Electrometallurgy-the Ellingham diagram -Hydrometallurgy-Zone Refining.

TEXT BOOKS:

1. *Puri P. R.*, *Sharma L. R.* and *Pathania M. S.* 2010. **Principles of Inorganic Chemistry**, Vishal Publishing Co, Jalandhar.
2. *Madan R.D., Tuli G.D.* and *Malick S.* 1988. **Selected Topics in Inorganic Chemistry**, S.Chand & Co., New Delhi.

REFERENCE BOOKS:

1. *Soni P.L.* 1999. **Text Book of Inorganic Chemistry**, S.Chand & Co., New Delhi.
2. *Lee J.D.* 1991. **Concise Inorganic Chemistry**, [Fourth edition], ELBS, London.

15UCHM502	CORE VIII: ORGANIC CHEMISTRY I	SEMESTER-V

Total hours: 50

OBJECTIVES:

- To understand the Chemistry of Carbohydrates.
- To study the stereochemistry and conformation analysis.
- To understand the chemistry percyclic reactions.
- To understand the Chemistry of heterocyclic compounds.
- To study properties and reactions of Active methylene compounds.

CONTENTS

UNIT-I **(10 Hours)**

Carbohydrates: Classification- monosaccharides-Defining terms-epimers and anomers-glucose-chemical properties of open chain glucose-Structural elucidation-synthesis by interconversions and chain lengthening including epimerisation-Haworth & Fischer Projection (pyranose form)-mutarotation. Fructose- chemical properties of open chain glucose Structural elucidation-synthesis by interconversions (pyranose and furanose form) - Haworth & Fischer Projection-mutarotation.

UNIT-II **(10 Hours)**

Disaccharides-sucrose-structural elucidation-preparation-chemical properties. Maltose- structural elucidation-preparation-chemical properties-mutarotation. Lactose- structural elucidation-preparation-chemical properties. **Polysaccharides**-starch-preparation-properties. Cellulose-preparation-structure-derivatives.

UNIT-III **(10 Hours)**

Stereochemistry-Geometrical isomerism - cis-trans, syn -anti and E, Z notations-geometrical isomerism in maleic and fumaric acid. Methods of distinguishing geometrical isomers using melting points, dipole moment, dehydration, cyclisation.
Optical isomerism-Projection formulae: Fischer, Flying Wedge, Sawhorse and Newmann projection formulae - Optical activity- optical isomerism in lactic acid and tartaric acid D, L notations. R, S notation of optical isomers with one and two asymmetric carbon atoms: Biphehyl, allenes and spiranes.

UNIT-IV **(10 Hours)**

Conformational analysis: Conformers, configuration, dihedral angle, torsional strain, conformational analysis of ethane and n-butane-stability with energy diagram. Conformers of cyclohexane - axial and equatorial bonds - stability with energy diagram -ring flipping - conformers of mono and dimethylcyclohexane - 1, 3

and 1, 5-diaxial interactions in substituted cyclohexane-conformation and stereochemistry of cis and trans decalins.

UNIT-V **(10 Hours)**

Heterocycles – introduction – Molecular orbital picture of pyrrole, furan, thiophene and pyridine –preparation, properties and structure of pyrrole, furan, thiophene and pyridine – condensed heterocycles – Synthesis of Indole and Quinoline – Eelectrophilic and Nucleophilic substitution reactions of Indole and Quinoline.

TEXT BOOKS:

1. *Bahl A.* and *Bahl B.S.* 2014. **Advanced Organic Chemistry**, S. Chand & Co. Ltd., New Delhi.
2. *Kalsi P.S.* 2005. **Stereochemisry, Conformations and Mechanism**, New age International Publishers Ltd., [Sixth edition], New Delhi.
3. *Pine S. H.* 1986. **Organic Chemistry**, McGraw-Hill International Book Company [Fourth edition], New Delhi.

REFERENCE BOOKS:

1. *Finar I. L.* 1996. **Organic Chemistry**, Vol 1 & 2, Addison Wesley Longman Ltd. [Sixth edition], England.
2. *Morrison R.T* and *Boyd R.N.* 2011. **Organic Chemistry**, Allyn & Bacon Ltd., [Seventh edition], New York.

15UCHM503	CORE IX: PHYSICAL CHEMISTRY I	SEMESTER-V

Total hours: 50

OBJECTIVES:

- To understand the basics of colloids.
- To study the Phase rule.
- To understand the chemistry of solutions.
- To understand the basic principles of Chemical kinetics.
- To study about the catalysis and theories involving in it.

CONTENTS

UNIT-I **(10 Hours)**

Colloids: Types-Sols-Preparation, Purification, properties- Kinetic, optical and electrical, stability of colloids, Gold number, associated colloids. Emulsions – Types of emulsions, preparation, properties and applications. Gels-Types of gels, preparation, properties and applications. Donnan-Membrane equilibrium-Osmosis, Reverse Osmosis, Dialysis and desalination.

UNIT-II **(10 Hours)**

Phase Rule-Definition of phase, components and degrees of freedom - derivation of Gibbs phase rule. One component system: water and sulphur system-Reduced phase rule. Two component systems: Simple eutectic system:Pb-Ag system, KI-water system. Freezing mixture Thermal analysis and cooling curves-compound formation with congruent melting point-Zn-Mg system, $FeCl_3$-H_2O system Compound formation with incongruent melting point: Na-K system.

UNIT-III **(10 Hours)**

Ideal binary liquid mixtures- liquid-liquid mixture (Benzene and Toluene)- Raoult's law and Henry's law-activity and activity coefficients-Fractional distillation of binary miscible liquid-Non-ideal systems-Azeotropes-HCl and water system-Ethanol and water system. Partially miscible binary liquid systems: Phenol and water-Triethylamine-Nernst distribution law-Principle and applications steam distillation. **Dilute solutions and colligative properties**: Determination of molecular weight- lowering of vapour pressure- Elevation of boiling point-Depression of freezing point- Thermodynamic derivation-Abnormal molecular mass-Van't Hoff factor-Degree of dissociation and degree of association of solutes.

UNIT-IV **(10 Hours)**

Chemical kinetics-Definition-Order-rate-rate constant-half life period. Derivations of Zero, First, Second and Third order reactions- Determination of order of the reactions-Integration, graphical, half-life)- Steady state approximation-Chain reactions and explosion reaction Effect of temperature on reaction rate-temperature coefficient-concept of activation energy- Arrhenius equation. Theories of reaction rates: Bimolecular collision theory - Transition state theory - Lindemann's unimolecular theory.

UNIT-V **(10 Hours)**

Catalysis-Homogeneous and Heterogeneous catalysis-Acid-base catalysis, enzyme catalysis-Michaelis-Menten equation-Adsorption-Distinction between physical and chemical adsorption-Factors influencing adsorption -adsorption isotherm-Freundlich isotherm. Langmuir isotherm- theory and derivation-postulates of B.E.T isotherm-equation (no derivation) - determination of surface area.

TEXT BOOKS:

1. *Puri P. R.*, *Sharma L. R.* and *Pathania M. S.* 2010. **Principles of Physical Chemistry**, Vishal Publishing Co, Jalandhar.
2. *Gurdeep Raj*. 1978**. Advanced Physical Chemistry**, Krishna Prakashan Media (P) Ltd., Meerut.

REFERENCE BOOKS:

1. *Soni P.L., Dharmarha* and *Dash,* 2001. **Text Book of Physical Chemistry**, Sultan Chand & Co. Ltd., New Delhi.
2. *Bahl B. S., Tuli G. D*. and *Arun Bahl*, 1983. **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi.
4. *Atkins P.W.* 1994. Physical Chemistry, [Fifth edition], Oxford University Press, UK.

15UCHM504	CORE X: ANALYTICAL CHEMISTRY	SEMESTER – V

Total hours: 40

OBJECTIVES:

- To understand the basics principles laboratory handling.
- To study the method of errors.
- To understand the principles of gravimetric estimations.
- To understand the basic principles of Chromatographic methods.
- To study about the electroanalytical techniques.

CONTENTS

UNIT-I **(8 Hours)**

The role of Analytical chemistry-Quantitative analytical methods-Chemicals-apparatus -unit operation-selecting- handling reagents-other chemicals-cleaning-marking of laboratory ware-measuring mass and volume - calibrating volumetric glassware- Safety Measures; Handling reagents and solutions-Corrosive - Explosive - Toxic-Carcinogenic - inflammable chemicals - Disposal of wastes- waste chemicals-fumes.

UNIT-II **(8 Hours)**

Importance of analytical methods in Qualitative and Quantitative analysis: parts per million-parts per billion - Chemical and instrumental methods-advantages-limitations of chemical methods-instrumental methods-methods of analysis- steps in analysis. Errors and treatment of Analytical Chemistry-Errors- Determinant - indeterminate - Accuracy and precision Distribution of random errors - Average derivation- standard derivation- variance limit- confidence limit- Significance figures- computation rules.

UNIT-III **(8 Hours)**

Gravimetric methods of analysis: Crucibles-types-care-uses-Principles of gravimetric analysis-characteristics of precipitating agents - choice of precipitants-conditions of precipitation-specific and conditions of precipitation-specific and selective precipitants - DMG - cupferron - salicylaldehyde - ethylendediamine - use of sequestering agents - coprecipitation- postprecipitation -peptisation-differences-Drying and ignition of precipitates - reduction of error-precipitation from homogeneous solutions - calculations in gravimetric methods-use of gravimetric factor-Application of Gravimetric methods.

UNIT-IV **(8 Hours)**

Chromatographic methods: Column Chromatography- principle- types of adsorbents-preparation of the column- applications- TLC- principle- choice of

adsorbent and solvent- preparation of chromatoplates- R*f* –values- factors affecting the R*f*-values- Significance of R*f*-values- Paper Chromatography- principle- solvents used-development of Chromatogram-its applications. Ion-exchange chromatography- principle - applications.

UNIT-V **(8 Hours)**

Electro analytical method: Polarography-principle-concentration-polarization-dropping mercury electrode (DME)- advantages- disadvantages-migration-residual-limiting - diffusion currents-use of supporting electroyle-Ilkovic equation(Derivation not require)- significance-experimental assembly-current voltage curve-oxygen wave-influence of temperature on diffusion layer-Half wave potential ($E_{1/2}$)-polarography as an analytical tool in quantitative and qualitative analysis.

TEXT BOOKS:

1. *Skoog*, *West*, *Holler* and *Crouch*. 2004. **Fundamentals of Analytical Chemistry**, [Eighth edition) Brooks/Cole Publishing, CA.
2. *Khopker S.M.* 1998. **Basic concepts of Analytical Chemistry**, [Second edition], New Age Int. Pvt. Ltd, New Delhi.
3. *Gopalan R*, *Rengarajan K* and *Subramanian P.S.* 2004. **Elements of Analytical Chemistry,** [Third Edition] Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. *De, A.K.* 1994. **Environmental Chemistry**, [Third edition], Wiley Eastern, New Delhi.
2. *Willard H. H., Merritt L.L.* and *Dean J.A.* 1968. **Instrumental Methods of Analysis**, [Sixth edition], CBS Publishers and Distributors, Shahdara, New Delhi.

15UCHEL501	ELECTIVE I: SPECTROSCOPY	SEMESTER – V

Total hours: 40

OBJECTIVES:

- Provide knowledge to identify the unknown compound. The massive scope of this subject dictates that all possible visual assistance be available to the students

CONTENTS

UNIT -I **(8 Hours)**

Introduction: Electromagnetic radiation-units-Electromagnetic spectrum and absorption of radiations-Quantization of different forms of energies in molecules (translational, rotational and electronic)-Born Oppenheimer approximation.

Ultra violet and visible spectroscopy: Introduction-Beer's- Lambert's law-Instrumentation-Types of electronic transition-Transition probability-The chromophore-Auxochrome concept-Bathchomic, Hypsochromic, hyperchromic, hypochromic effects–Applications of UV- spectroscopy (any five)

UNIT -II **(8 Hours)**

Infra–red spectroscopy: Introduction-Principle-Theory of molecular vibrations-Expression for vibrational frequency (derivation not needed)-selection rules. Factors influencing vibrational frequencies-Instrumentation-Finger print region.

UNIT-III **(8 Hours)**

Nuclear magnetic resonance spectroscopy: Introduction-basic principle; Realxation process-Number and position (Chemical shift) of signals-Instrumentation, Shielding & Deshielding effects-Factors influencing chemical shift-Spin-Spin coupling –coupling constant –TMS as NMR standard - application of NMR.

UNIT-IV **(8 Hours)**

Raman spectroscopy: Introduction-Theory of Raman spectra (Stoke's and antistoke's line)-Instrumentation-Conditions for Raman spectroscopy-Beer lambert law of absorption in Raman scattering- Difference between IR and Raman spectra-Applications of Raman spectroscopy.

UNIT –V **(8 Hours)**

Mass spectroscopy: Basic principles- Instrumentation- molecular ion peak, base peak, meta stable peak, isotopic peak their uses, determination of molecular formula. Fragmentation– Nitrogen rule - Mc Lafferty rearrangements.

TEXT BOOKS:

1. *Sharma Y.R.* 2013. **Elementary Organic spectroscopy, [Fifth revised edition],** S. Chand & Co. Ltd., New Delhi.
2. *Sindhu P.S.* 1985. **Fundamentals of molecular spectroscopy**, New Age Int. Pvt. Ltd. New Delhi.

REFERENCE BOOKS:

1. *Parikh V.M.* 2002. **Absorbtion spectroscopy of organic molecules**, Mehta publishers, Pune.
2. *Williams D.W.* and *Flemming I.* 1987. **Spectroscopic methods in organic chemistry**, McGraw-Hill, U.K.
3. *Kalsi P.S.* 2007. **Spectroscope of organic compounds**, New Age Int. Pvt. Ltd. New Delhi.

15UCHMP501	CORE PRACTICAL IV: PHYSICAL CHEMISTRY	SEMESTER – V

OBJECTIVES:

- To learn the fundamentals of conductometric and potentiometric titrations
- To understand basic principles of acid hydrolysis and phase diagram.
- To know about the molecular weight determination using rast method.

LIST OF EXPERIMENTS

1. Distribution Law:

- Partition coefficient of Iodine between water and carbon tetrachloride.

2. Kinetics:

- Determination of rate constant-Acid catalysed hydrolysis of an ester (methyl acetate or ethyl acetate)
- Determination of rate constant for the reaction between potassium iodide and potassium persulphate

3. Molecular weight determination

- Rast method.

4. Heterogenous Equilibrium

- Effect of impurity on CST of Phenol-water system and determination of concentration of sodium chloride, succinic acid
- Phase diagram of a simple eutectic system and determination of unknown composition.
- Determination of transition temperature of hydrated salts-sodium thiosulphate, sodium acetate, strontium chloride and manganous chloride.

5. Electrochemistry:

Conductivity

- Determination of cell constant
- Equivalent conductance of strong and weak electrolytes
- Conductometric titration-acid base titration
- Potentiometry-Potentiometric titration - acid base titration

TEXT BOOKS:

1. *Gurthu J.N.* and *Kapoor R.* 1987. **Advanced Experimental Chemistry**, S. Chand & Co., New Delhi.
2. *Sundaram*, *Krishnan* and *Raghavan*. 1996. **Practical Chemistry (Part II),** S. Viswanathan Co. Pvt, Chennai.

REFERENCE BOOKS:

1. *David P., Shoemaker,* Garland C. W. and *Nibler J. W.* 1989. **Experiments in Physical Chemistry**, [Fifth edition], McGraw- Hill Book Company, New Delhi.

15UCHSBC501	SBC III: POLYMER CHEMISTRY	SEMESTER – V

Total hours: 25

OBJECTIVES:

- To know about the types of polymers, polymerization techniques and commercial polymers.

CONTENTS

UNIT-I **(5 Hours)**

Polymers: Basic Concept, classification of polymers on the basis of source, utility and effect of temperature – distinction among plastics(thermosetting and thermoplastic), elastomers, and fibers, Homo and hetero polymers, copolymers, properties of polymer.

UNIT-II **(5 Hours)**

Molecular Weight of polymers, Number average, weight average, sedimentation and viscosity - average molecular weights, Molecular weights and degree of polymerization. Reactions - Hydrolysis, Hydrogenation, addition, substitution, cross linking - vulcanization and cyclisation.

UNIT-III **(5 Hours)**

Polymerization techniques: Bulk, solution, suspension & emulsion polymerization - melt polycondensation. Polymer processing - Calendaring, die casting, rotational casting.

UNIT-IV **(5 Hours)**

Chemistry of commercial polymers- General methods of preparation, properties and uses of the following - Teflon, polyethylene, polystyrene, polymethylacrylate, poly amides, polycarbonates and PVC.

UNIT-V **(5 Hours)**

Advances in polymers; Bio-Polymers, biomaterials, polymers in medical field, High temperature and fire resistant polymers – Silicones - rubber - grease.

TEXT BOOKS:

1. *Gowariker V. R., Viswanathan N. V.* and *Jayadev Sreedhar.* 1986. **Polymer Science**, Halsted Press (John Wiley & Sons), New York.

REFERENCE BOOKS:

1. *Sharma.B.K.* 1989. **Polymer Chemistry**, Goel Publishing House, Meerut.
2. *Arora M.G.* and *Vadar M.S.* 1989. **Polymer Chemistry,** Anmol Publications Private Ltd, New Delhi.
3. *Stevens M.P.*1990. **Polymer Chemistry**: **An introduction**, Oxford University Press, New York.

15UCHM601	CORE XI: INORGANIC CHEMISTRY II	SEMESTER-VI

Total hours: 50

OBJECTIVES:

- To understand the crystal field splitting and reaction mechanism.
- To understand the role metal in human biological system and its functions.
- To study the nomenclature, preparation and properties of organometallic compounds.
- To understand the basic principles of Solid State Chemistry.

CONTENTS

UNIT – I **(10 Hours)**

Coordination compounds-I - Double salt - Coordination compounds- central metal ion -ligands-types of ligands– coordination number, oxidation numbers, and coordination sphere and chelation-Nomenclature of coordination compounds. - Structural and stereoisomerism - Werner's theory of complexes. EAN rule - VB theory- applications and limitations, Factors affecting stability of complexes.

UNIT-II **(10 Hours)**

Coordination compounds II -Crystal Field theory: Crystal field splitting in octahedral, tetrahedral and square planar fields– factors influencing the magnitude of crystal field splitting – CFSE calculations- magnetic properties and colour. Labile and inert complexes- stepwise and overall stability constants- Reaction mechanism– substitution reactions in octahedral complexes.

UNIT-III **(10 Hours)**

Bioinorganic chemistry-Introduction-Biological role of Sodium, Potassium, Calcium,Iodine, Copper and Zinc. Introduction to porphyrin ring systems. Structure and functions of haemoglobin and Chlorophyll. Chemistry of Vitamin B_{12}. Metalloenzymes-Carboxypeptidase and carbonic anhydrase.

UNIT-IV **(10 Hours)**

Organometallic compounds: Definition, nomenclature and classification of organometallic compounds – preparation, properties and uses of organo Li, Al, Hg and Sn compounds – synthesis and structure of Zeises salt – Sandwich compounds – preparation, properties and structure and uses of Ferrocene – Wilkinson's catalyst – Ziegleer-Natta catalyst.

UNIT-V **(10 Hours)**

Solid state - Symmetry elements in crystal systems – Bravais lattices - Unit cell – law

of rational indices (Weiss indices), Miller indices – unit cell dimension – number of atoms per unit cell – X-ray diffraction by crystals – derivation of Bragg's equation – Experimental methods of X-ray study - rotating crystal method – X-ray pattern by powder method – crystal structure of KCl and NaCl– Properties of metals, band theory, conductors, semiconductors and insulators.

TEXT BOOKS:

1. *Puri B.R., Sharma L.R.* and *Kalia K.K.* 2010. **Principles of Inorganic Chemistry**, [Twenty third edition], Shoban Lal, Nagin Chand & Co., New Delhi.
2. *Madan R.D., Tuli G.D.* and *Malick S.* 1988. **Selected Topics in Inorganic Chemistry**, S.Chand & Co., New Delhi.

REFERENCE BOOKS:

1. *Lee J.D.* 2006. **Concise Inorganic Chemistry**, Black well Science, UK.
2. *Bassett J., et al.* 1985. **Vogel's Textbook of Quantitative Inorganic Analysis**, [Fourth edition], ELBS Longman.

15UCHM602	CORE XII: ORGANIC CHEMISTRY II	SEMESTER-VI

Total hours: 50

OBJECTIVES:

- To understand the concept of organic photochemistry.
- To understand the Chemistry of amino acids.
- To understand the Chemistry of Nucleic acids.
- To understand the reaction mechanism of rearrangement.
- To understand the Chemistry of Organometallic compounds and its applications.

CONTENTS

UNIT-I **(10 Hours)**

Organic photochemistry: Photochemistry of carbonyl compounds – Norrish type-I, Norrish type-II, Paterno Buchi reaction, Photoreduction, Oxetane formation. Photochemistry of Alkenes and dienes – cis-trans isomerisation, dimerisation, cycloaddition of olefins with various substrates, Photo rearrangements – Di-pi-methane rearrangement, Fries rearrangement, Claisen rearrangement and Cope rearrangement.

UNIT-II **(10 Hours)**

Amino acids: Classification of amino acids - preparations and properties of glycine and alanine - with special reference to Gabriel phthalamide synthesis, Strecker synthesis - zwitter ion, isoelectric point. Poly peptides and proteins: Classification of proteins based on physico chemical and physiological functions. Peptides synthesis- Bergman synthesis and Curtius synthesis. End group analysis- Edman method, Sanger's method, Dansyl method. Primary structure of proteins- Secondary structure of protein with helical and sheet structures-Denaturation of proteins.

UNIT-III **(10 Hours)**

Nucleic acids: Nucleosides, nucleotides, degradation of nucleotide chain – structure and function of nucleic acids - RNA and DNA.

Alkaloids – Classification–Occurrence and Isolation–Structural elucidation of Nicotine and Papaverine. Terpenoids - Isoprene rule- Structural elucidation of geraniol and citral.

UNIT-IV **(10 Hours)**

Molecular rearrangements: Mechanism of Pinacol - pinacolone, Benzilic acid, Cope, Beckmann, Hoffmann, Curtius, Baeyer- Villiger and Fries rearrangements. Claisen condensation, Benzoin condensation, Cannizarro's reaction and Perkin reaction.

UNIT-V **(10 Hours)**

Organometallic compounds: Formation and reactions of organomagnesium, organozinc compounds, Organolithium compounds. Reduction: Mechanism of reduction with sodium borohydride, lithium aluminium hydride - Wolf Kishner reduction, MPV reduction and
Rosenmund reduction.

TEXT BOOKS:

1. *Bahl B. S.* and *Arun Bahl.* 1997. **Advanced Organic Chemistry**, [Twetfh edition], Sultan Chand and Co., New Delhi.
2. *Agarwal O. P.* 1997. **Organic Chemistry of Natural Products,** Vol I & II, Goel Publishing House, New Delhi.
3. *Jagdamba singh* and *Jaya singh*. 2012. **Photochemistry & Pericyclic reactions**, [Third edition), New Age International Limited, New Delhi.

REFERENCE BOOKS:

1. *Finar I. L.* 1996. **Organic Chemistry,** Vol 1 & 2, [Sixth edition], Addison Wesley Longman Ltd., England.
2. *Morrison R.T*. and *Boyd R.N*. 1996. **Organic Chemistry**, [Sixth edition] Allyn & Bacon Ltd, New York.

15UCHM603	CORE XIII: PHYSICAL CHEMISTRY II	SEMESTER-VI

Total hours: 50

OBJECTIVES:

- To understand the concept of electrochemistry.
- To understand the principles of solubility products.
- To study the basic principles of electrochemical cells.
- To understand the basic concept of group theory and symmetry elements.
- To study about the principles of photochemistry and radiation chemistry.

CONTENTS

UNIT-I **(10 Hours)**

Electrochemistry – I: Ohm's law-Electrolytic conductance- conduction in metals and electrolytes. Specific conductance, equivalent conductance and molar conductance– Relation between equivalent and specific conductance. Variation of equivalent conductance with dilution. Debye Huckle theory of strong electrolytes-Onsager equation (No derivation) significance and limitations. Kohlraush s law and its applications. Migration of ions -ionic mobility and its determination. Transport number - determination by Hittorf and moving boundary methods.

UNIT-II **(10 Hours)**

Electrochemistry – II: Determination of degree of dissociation of weak electrolytes, ionic product of water, solubility of sparingly soluble salts. Conductometric titrations: Strong acid-strong base, weak acid-strong base, Strong acid - weak base, mixture of strong acid and weak acid-strong base. Oswald's dilution law: dissociation constant of weak acid & weak base. p^H and p^{OH}-. Buffer solution and buffer action-Henderson equation for p^H of buffer solution–Hydrolysis of Salts.

UNIT-III **(10 Hours)**

Electrochemical cells: electrolytic cell–Reversible and irreversible cells–Conventional representation of electrochemical cells – EMF and its measurements – Gibbs Hemholtz equation and EMF–Electrode reaction–Nernst equation of electrode reaction–Derivation of cell EMF – single electrode potential–standard hydrogen electrode–reference electrodes–Standard electrode potential-sign conventions-Electrochemical series and its significance– concentration cell with and without transport number–Liquid Junction Potential – Application of EMF measurements–valency of ions, solubility product, activity coefficient, Potentiometric titration–Determination of pH using hydrogen, Quinhydrone and glass electrodes – Determination of pKa of acids by potentiometry.

UNIT-IV **(10 Hours)**

Group theory: Symmetry elements and operations- centre of symmetry-rotation axis of symmetry - plane of symmetry-improper rotation axis-point groups-point groups of simple molecules properties of group-Abelian group-cyclic group- point groups of water, ammonia, methane, benzene and SF_6.

UNIT-V **(10 Hours)**

Photochemistry and Radiation Chemistry: Photochemical reaction–Laws of photochemistry-Grothus-Drapper law, Stark Einstein law - Jablonski diagram–quantum yield – primary and secondary process – Decomposition of HI and HBr - kinetics of hydrogen chlorine reaction – Photochemical equilibrium–Photosensitisation–fluorescence, phosphorescence, non-radioactive process-Chemiluminescence.

TEXT BOOKS:

1. *Puri B.R., Sharma L.R.* and *Pathania M.S.* 1993. **Principles of Physical Chemistry**, [Twenty third edition], Shoban Lal, Nagin Chand & Co., New Delhi.
2. *Atkins P.W.* 1994. **Physical Chemistry**,[Fifth edition], Oxford University Press, UK.
3. *Raman K. V.* 1990. **Group Theory and its applications to Chemistry**, Tata McGraw- Hill Education Private Ltd, New Delhi.

REFERENCE BOOKS:

1. *Soni P. L., Dharmarha* and *Dash*. 2001. **Text Book of Physical Chemistry**, Sultan Chand & Chand & Company Ltd., New Delhi.
2. *Glasstone S.* 1969. **An Introduction to Electrochemistry**, Affiliated East West Press, New Delhi.

15UCHEL601	ELECTIVE II : GREEN CHEMISTRY AND NANOCHEMISTRY	SEMESTER-VI

Total hours: 40

OBJECTIVES:

- To understand the concept of green chemistry and its applications.
- To understand the concept of green solvents and reactions involving using green solvents.
- To study the microwave assisted and sonication assisted synthesis and its applications in organic chemistry.
- To understand the basic principles of nanochemistry, nanomaterials and the characterization techniques involved in the study of nanoparticles.

CONTENTS

UNIT-I **(8 Hours)**

Green Chemistry – Introduction: Need for green chemistry – principles of green chemistry – atom economy – Prevention or minimization of hazardous products, choice of solvents-green oxidant – hydrogen peroxide. **Tools of green chemistry:** Alternative starting materials, reagents, catalysts, solvents and processes with suitable examples.

UNIT-II **(8 Hours)**

Green solvents-definition - Water as solvent-advantages of using water as solvent-physical properties of water - specific reactions in aqueous phase - Diels-Alder reaction – Hetero Diels-Alder reaction - Claisen rearrangement - Michael reaction - Pinacol coupling. **Super critical carbon dioxide (SCC)** - introduction - properties of super critical carbon dioxide- Use of SCC for extracting natural products - Use of SCC for dry cleaning.

UNIT-III **(8 Hours)**

Microwave assisted organic synthesis (MAOS) - apparatus required – examples of MAOS - Suzuki reaction - Heck reaction - Mannich reaction - epoxide ring opening reaction-Diels-Alder cycloadditions - oxidation of Toluene - advantages and disadvantages of MAOS. **Organic reactions by sonication method** – apparatus required – examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).

UNIT-IV **(8 Hours)**

Basics of Nanochemistry: Introduction – definition – length scales – importance of nanoscale and its technology – self assembly of materials – self assembly of molecules – porous solids, nanowires, nanomachines and quantum dots.

Nanoparticles-definition-Techniques to synthesize nanoparticles – top down and bottom up approaches – common growth methods – characterization of nanoparticles – applications of nanomaterials.

UNIT-V **(8 Hours)**

Nano Materials and their Characterization: Preparation, properties and applications of carbon nanotubes, nanorods, nano fibre and nanoclay – toxic effects of nanomaterials. Characterisation techniques – scanning electron microscopy (SEM) – transmission electron microscopy (TEM) – atomic force microscopy (AFM) – scanning tunneling electron microscope (STEM) (basic principles & block diagram).

TEXT BOOKS:

1. *Sanghi R. S.* and *Srinivastava M. M.* 2003**. Green Chemistry: Environmental Friendly Alternative**s, Narosa Publishing House, New Delhi.
2. *Ahluwalia V. K.* and *Narosa.* 2011. **Green Chemistry**, New Delhi.
3. *Shanmugam S.* 2010. **Nanotechnology**, MJP Publishers, Chennai.

REFERENCE BOOKS:

1. *Salomon P.* A 2008. **Handbook on Nanochemistry**, Dominant Publishers and Distributers, New Delhi.
2. *Balaji S.* 2010. **Nanobiotechnology**, MJP Publishers, Chennai.
3. *Pradeep T*. 2007. **Nano: The Essentials,** Tata Mc-Graw Hill, New Delhi.

15UCHMP601	CORE PRACTICAL V: GRAVIMETRIC ESTIMATION AND ORGANIC PREPARATION	SEMESTER – VI

OBJECTIVES:

- To get the knowledge in gravimetric estimation.
- To understand the quantitative analysis of organic compounds and preparation of organic compounds.

LIST OF EXPERIMENTS

I. Gravimetric estimations

1. Estimation of Barium as Barium sulphate.
2. Estimation of Barium as Barium chromate.
3. Estimation of Lead as Lead chromate.
4. Estimation of Nickel as Nickel-DMG complex.
5. Estimation of Calcium as Calcium oxalate monohydrate.
6. Estimation of Iron as Iron (III) oxide.

II. Organic preparations

Preparation involving the following:

a) Oxidation of Benzaldehyde to Benzoic acid.
b) Hydrolysis of Methyl salicylate or ethyl benzoate.
c) Nitration (p-nitroacetanilide and m-dinitrobenzene).
d) Bromination (p-bromoacetanilide and tribromophenol).
e) Benzoylation (β-naphthylbenzene).

REFERENCE BOOKS:

1. *Venkateswaran V*., *Veeraswamy R* and *Kulandaivelu A.R*. 1997. **Basic Principles of Practical Chemistry**, [Second edition], Sultan Chand & Sons, New Delhi.
2. *Furniss B.S*. 1984. **Vogel's Textbook of Practical Organic Chemistry**, [Seventh edition, London, ELBS – Longman.

15UCHSBC601	SBC IV:AGRICULTURAL CHEMISTRY	SEMESTER – VI

Total hours: 25

OBJECTIVES:

- To learn about fertilizers, pesticides, fungicides and Soil Chemistry

CONTENTS

UNIT–I **(5 Hours)**

Fertilizers: Effect of Nitrogen, potassium and phosphorous on plant growth – commercial method of preparation of urea, triple superphosphate. Complex fertilizers and mixed fertilizers – their manufacture and composition. Secondary nutrients – micronutrients – their function in plants.

UNIT – II **(5 Hours)**

Manures: Bulky organic manures – Farm yard manure – handling and storage-oil cakes- blood meal – fish manures.

UNIT – III **(5 Hours)**

Pesticides and Insectides: Pesticides – classification of Insecticides, fungicides, herbicides as organic and inorganic – general methods of application and toxicity. Safety measures when using pesticides. Insecticides: Plant products – Nicotine, pyrethrin – Inorganic pesticides – borates. Organic pesticides – D.D.T. and BHC.

UNIT – IV **(5 Hours)**

Fungicides and Herbicides: Fungicide: Sulphur compounds, Copper compounds, Bordeaux mixture. Herbicides: Acaricides – Rodenticides. Attractants – Repellants. Preservation of seeds.

UNIT – V **(5 Hours)**

SOILS -Classification and properties of soils –soil water, soil temperature, soil minerals, soil acidity and soil testing.

TEXT BOOKS:

1. *Brady N.C.* 1988. **The Nature and properties of soils,** Eruasia Publishing House (P) Ltd, New Delhi.
2. *Jones.V.S.* 2004. **Fertilizers and soil** fertility, Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. *Fracer D.E.H*. 1992. Chemistry of Pesticides – D.Van Nostrand Co., New York.

15UCHN301	NMEC I: APPLIED CHEMISTRY I	SEMESTER – III

Total hours: 25

OBJECTIVES:

- The course will provide a valuable theoretical introduction about the chemicals which are used in our daily life.
- Strengthen the background of the students and provide basic knowledge in chemical substances which deals with Food Chemistry, Detergents, Flavours, effect of smoking and polymers products used in our daily life.

CONTENTS

UNIT I **(5 Hours)**

Food adulteration- Definition- common adulterants in food- types-Chemical-Bacterial- fungal- Natural contamination- Insects and Rodents contamination in stored foods- simple screening test for adulteration.

UNIT II **(5 Hours)**

Chemical hazards- Types of hazards-Risk of hazards- Hazard control – prevention. Food additives- Introduction- types- function- categories- Acidulants- Antimicrobial agent- Emulsifying- Texturing agent- Anti oxidant- Humectants- Colouring agent-Flavouring agent- Sweetener..

UNIT III **(5 Hours)**

Food pigments-Introduction- natural food - colour- artifical colours Flavours-Introduction-Flavours of some foods-Fruit flavour - Vegetable flavor- Spice flavor-Beverage flavor- Meet flavor- Milk flavor - Chees flavours.

UNIT IV **(5 Hours)**

Chemistry in daily life- Smoking is harmful- Coffee keeps you awake- Vegetables and colour- Onions make you cry- Decaffeinated coffee- How soap cleans- About commercial milk- Diesel fuels- Octanes of gasoline. Manufacture- composition - uses- Safety matches- Agarbattis-Naphthalene balls-Wax –candles-Shoe polish- Gum paste- Writing/fountain pen ink- Chalk crayons.

UNIT V **(5 Hours)**

Polymers- Introduction- classification- synthesis- Degradation- Photochemical-Biodegradation- Disposable synthetic polymers-Polymer recycling- Carrybags.

TEXT BOOKS:

1. *Jayashree Ghosh.* 2006. **Fundamental concepts of Applied chemistry,** [First edition, S.Chand and Co., New Delhi.
2. ***Chopra, H. K.*** **and** ***Panesar, P. S.*** **Food chemistry,** Narosa Publishing House, Meerut.

REFERENCE BOOKS:

1. *Belitz H. D.* and *Grosch W.* Peter Schieberle. 2004. **Food Chemistry**, Greenhaven Press, New York.
2. *Damodaran S., Parkin K. L.* and *Fennema O. R.* 2007. **Fennema's Food Chemistry**, [Fourth edition], (Food Science and Technology), Taylor & Francis, New York.

15UCHN401	NMEC II: APPLIED CHEMISTRY II	SEMESTER – IV

Total hours: 25

OBJECTIVES:

- The course will provide a valuable theoretical introduction about the nanomaterials.
- Strengthen the background of the students and provide basic knowledge about water analysis, quality, agrochemicals, pesticides, lubricants and chemicals which are used in our daily life.

CONTENTS

UNIT I **(5 Hours)**

Nano-materials: Introduction to nano-materials- Graphite- fullerenes- carbon nanotubes- nanowires-nanocones-Haeckelites-Their electronic & mechanical properties-Applications of nano-materials in i)Medicines ii) Catalysis iii) Environmental Technologies iv) Electronics& related fields v) Mechanics.

UNIT II **(5 Hours)**

Water-Water quality parameters - Definition - expression - Estimation of hardness (EDTA method) - Alkalinity(Titrimetry) - Water softening (zeolite) - Demineralisation (Ion- exchangers) and desalination - Domesticwater treatment.

UNIT III **(5 Hours)**

Chemistry of agrochemicals -Insecticides – DDT- BHC-, Malathion- parathion. Herbicides - 2,4-dichloro phenoxy acetic acid- Fungicides - Boardeaux mixture- Copper oxychloride- Rodenticides- Sodium monofluoroacetate- Zinc phosphide- Plant-growth Modifiers-Growth Regulators.

UNIT IV **(5 Hours)**

Lubricants - Definitions – classification- Characteristic properties- Problems on acid value- saponification value- Theories of lubrication- Additives of lubricants- selection of lubricant.

UNIT V **(5 Hours)**

Chemicals in daily life-chemical substances-classification of chemical substances-natural-artificial chemical properties and information of chemical substances-Packages of Chemical Substances-Usages of chemical substances-Cleaner Products (Soap, Detergent, Shampoo, Tooth paste)- Whitener- Fragrance- Insecticide- Paint- Fertilizer.

TEXT BOOKS:

1. *Jayashree Ghosh.* 2006. **Fundamental concepts of applied chemistry**, [First edition), S. Chand and Co., New Delhi.

15UCHD401	DIPLOMA: WATER ANALYSIS AND TREATMENT	SEMESTER-III/IV

Total hours: 90

OBJECTIVES:

- To learn about various methods of analysis of water and treatment.

CONTENTS

UNIT-I

Introduction - characteristics of water - alkalinity - hardness - unit of hardness - Total solids - Oxidation - transparency - Silica content. **Purification of water for drinking purpose** - potability of water - clarification - coagulation - contact & electro chemical coagulation - sterilization & disinfection of water - precipitation - aeration - ozonisation - Chlorination.

UNIT-II

Water softening methods - Clark's process - lime soda process - modified lime soda process - permutit or zeolite process - Ion exchange process - demineralization of water. **Determination of hardness of water** - Titration method - complexometric method using EDTA - expressing hardness - equivalents of calcium carbonate - problems to determine temporary & permanent hardness.

UNIT-III

Hard water and industries - industrial water treatment - boiler feed water method of softening - scales in boilers - consequences - internal conditioning methods. **Desalination of brackish water** - elecrodiaysis - Reverse osmosis - removal of Fe, Mn and Silicic acid - effluent treatment of water from paper industry, petrochemical, fertilizer industry and power station.

UNIT-IV

Water analysis - sampling of water for analysis - chemical substances affecting potability - colour, turbidity odour, taste, temperature, pH and electrical conductivity. Analysis of solids present in water - suspended solids - dissolved solids - total acidity - alkalinity - free CO_2 - free chlorine - Ca, Mg, Fe, Mn, Ag & Zn.

UNIT-V

Analysis of chemical substances affecting health - NH_3, Nitrate, Nitrite, cyanide, sulphate, sulphide, chloride, fluoride - measurement of toxic chemical substances - analysis of chemical substances indicative of pollution - Dissolved oxygen - Bio Chemical Oxygen Demand (BOD) - Chemical Oxygen Demand (COD)

REFERENCE BOOKS:

1. *Sharma B.K.* 2013. **Industrial Chemistry,** [Seventeenth edition], Goel Publishing house, Meerut.
2. *Mahajan S.P.* 1985. **Pollution control in process industries**, Tata McGraw - Hill Publishing Company Ltd., New Delhi.
3. *Varashney C.K.* 1980. **Water Pollution and Management**, Wiley Eastern Ltd., Chennai.

GUIDELINES

1. SUBMISSION OF RECORD NOTE BOOKS:

Candidates appearing for Practical Examinations shall submit Bonafide Record Note Books otherwise the candidates will not be permitted to appear for the Practical Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory and Practical)

I. A. THEORY

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Mark Distribution [CA-Total Marks: 25]

Attendance	: 05 Marks
Assignment	: 05 Marks
Internal Examinations	: 15 Marks
Total	**: 25 Marks**

B. (i) THEORY (If Internal Evaluation is for 100 Marks)

The candidate shall be declared to have passed the Examination, if the candidates secure not less than 40 marks out of 100 in the Comprehensive Examination (Internal Evaluation only).

Internal Marks Distribution [CA- Total Marks: 100]

Attendance	: 10 Marks
Assignments	: 30 Marks (3 Assignments Compulsory)
Internal Examinations	: 60 Marks
Total	**: 100 Marks**

(ii) PRACTICAL

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

Internal Marks Distribution [CA- Total Marks: 40]

Experiment	: 10 Marks
Attendance	: 5 Marks
Record	: 5 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

MARK DISTRIBUTION

CORE PRACTICAL I: VOLUMETRIC ANALYSIS AND INORGANIC PREPARATIONS (15UCHMP101)

Marks distribution: 60 Marks

Volumetric analysis	: 30 Marks
Inorganic Preparation	
Crude preparation	: 20 Marks
Recrystallization	: 10 Marks
Total marks	**: 60 Marks**

KEY FOR EVALUATION

0-2% -30 marks
2-3% -28 marks
3-4% -24 marks
4-5% -22 marks
>5% -20 marks

CORE PRACTICAL II: ORGANIC QUALITATIVE ANALYSIS (15UCHMP201)

Marks distribution: 60 Marks

Organic analysis

Procedure	: 10 Marks
Aromatic/Aliphatic	: 5 Marks
Saturated/Unsaturated	: 6 Marks
Special elements (N/S/X)	: 9 Marks
Function groups	: 10 Marks
Confirmation test	: 10 Marks
Derivative	: 10 Marks
Total marks	**: 60 Marks**

CORE PRACTICAL III: INORGANIC QUALITATIVE ANALYSIS (15UCHMP301)

Marks distribution: 60 Marks

Procedure	: 10 Marks
Group separation	: 20 Marks
Cations confirmation (4x5)	: 20 Marks
Results	: 10 Marks
Total marks	**: 60 Marks**

CORE PRACTICAL IV: PHYSICAL CHEMISTRY (15UCHMP501)

Percentage of error in Results

Experiment which is done using instrument, the instrumental error also included and then error calculated based on the precise of the instrument by examiners during examination.

CORE PRACTICAL V: GRAVIMETRIC ESTIMATION AND ORGANIC PREPARTAION (15UCHMP601)

Marks Distribution: 60 Marks

Procedure	: 10 Marks
Gravimetric estimations	: 20 Marks
Organic preparation	: 20 Marks
Crystallization	: 10 Marks
Total marks	**: 60 Marks**

KEY FOR EVALUATION

0-2% -20 marks
2-3% -18 marks
3-4% -16 marks
4-5% -12 marks
>5% -10 marks

MARK DISTRIBUTION AND ERROR PERCENTAGE FOR ALLIED PRACTICALS

ALLIED PRACTICAL I: ORGANIC ANALYSIS (15UCHBCAP101) (For B.S., Biochemistry)

Mark Distribution: 60 Marks

Procedure	: 10
Aliphatic/aromatic	: 6
Saturated/unsaturated	: 5
Special elements	: 9
Functional groups	: 10
Derivative	: 10
Results	: 10
Total marks	**: 60 Marks**

ALLIED PRACTICAL II: VOLUMETRIC ANALYSIS (15UCHBCAP201) (for B.Sc Biochemistry)

Mark distribution: 60 Marks

Procedure	: 10
Experiment	: 50
Total marks	**: 60 Marks**

KEY FOR EVALUATION

0-2 % - 50 marks
2-3% - 45 marks
3-4% - 35 marks
4-5 % - 30 marks
>5% - 20 marks

ALLIED PRACTICAL I: VOLUMETRIC AND ORGANIC ANALYSIS (15UCHBTAP101) (For B.Sc Biotechnology & Microbiology)

Mark distribution: 60 Marks

Procedure	: 10
Estimation	: 20
Organic procedure	: 10
Special elements	: 6
Functional groups	: 4
Confirmation test	: 10
Total marks	**: 60 Marks**

KEY FOR EVALUATION

0-2 % - 20 marks
2-3% - 18 marks
3-4% - 16 marks
4-5% - 12 marks
>5% - 10 marks

ALLIED PRACTICAL II: CHEMISTRY (15UCHPHAP401) (For B.Sc Physics)

Mark distribution: 60 Marks

Procedure	: 10
Experiment	: 50
Total marks	**: 60 Marks**

KEY FOR EVALUATION

0-2% - 50 marks
2-3% - 45 marks
3-4% - 35 marks
4-5% - 30 marks
>5% - 20 marks

GUIDELINES FOR CAREER COMPETENCY SKILLS
METHODOLOGY OF ASSESSMENT

1. On Line Objective Examination (Multiple Choice questions)- Semester III

- 100 questions-100 minutes
- Twenty questions from each UNIT.
- On line examination will be conducted at the end of the III Semester.

2. Viva Voce- Semester IV

- A Student has to come in proper dress code and he/she should bring 2 copies of Resume for the Viva Voce.
- A student may be asked to
  - Give Self Introduction
  - Submit the resume to the examiner(s) and answer the questions based on it.
  - Speak on any given topic for at least two minutes.
  - Give a presentation for 10 minutes on a topic of their choice.
  - Sit with other students in a Group for a Discussion.

3. QUESTION PAPER PATTERN AND MARK DISTRIBUTION THEORY

Question Paper Pattern and Mark Distribution (For 75 marks)

1. PART – A (10 x 2 = 20 Marks)
Answer ALL questions
Two questions from each UNIT
2. PART – B (5 x 5 = 25 Marks)
Answer ALL questions
One question from each UNIT with Internal Choice
3. PART – C (3 x 10 = 30 Marks)
Answer ANY THREE questions
One question from each UNIT
Open Choice – 3 out of 5 questions

Question Paper Pattern and Mark Distribution (For 100 marks)

1. PART – A (10 x 2 = 20 Marks)
Answer ALL questions
Two questions from each UNIT

2. PART – B (5 x 7 = 35 Marks)
Answer ALL questions
One question from each UNIT with Internal Choice

3. PART – C (3 x 15 = 45 Marks)
Answer ANY THREE questions
One question from each UNIT
Open Choice – 3 out of 5 questions

ALLIED COURSE OFFERED BY THE DEPARTMENT

S.No	Subject code	Subject	Class
SEMESTER – I			
1	15UCHBCA101	Allied I: Chemistry I	I-B.Sc Biochemistry
2	15UCHBCAP101	Allied Practical I: Organic analysis	I-B.Sc Biochemistry
3	15UCHBTA101/ 15UCHMBA101	Allied I : Chemistry	I-B.Sc Biotechnology/ Microbiology
4	15UCHBTAP101/ 15UCHMBAP101	Allied Practical I: Volumetric and organic analysis	I-B.Sc Biotechnology/ Microbiology
SEMESTER – II			
5	15UCHBCA201	Allied II: Chemistry II	I-B.Sc Biochemistry
6	15UCHBCAP201	Allied Practical II: Volumetric analysis	I-B.Sc Biochemistry
SEMESTER – IV			
7	15UCHPHA401	Allied IV: Chemistry	II-B.Sc Physics
8	15UCHPHAP401	Allied Practical II: Chemistry	II-B.Sc Physics