BACHELOR OF SCIENCE IN CHEMISTRY
REGULATIONS

ELIGIBILITY:

A pass in Higher Secondary Examination with Mathematics, Physics, Chemistry, Biology/Computer Science as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent there to by the Academic Council, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **Bachelor of Science (CHEMISTRY)** Degree Examination of this College after a course study of three academic years.

PROGRAMME EDUCATIONAL OBJECTIVES

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical problems.
2. To enable the students to learn laboratory skills to design, safely conduct and interpret chemical research.
3. To develop the ability to effectively communicate scientific information and research results in written and oral formats.
4. To provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective.
5. To make students learn professionalism, including the ability to work in teams and apply basic ethical principles.

SCHEME OF EXAMINATIONS FOR UG COURSE

Course Code	Course	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
Part – I							
17UTL11T 17UHL11H 17UML11M 17UFL11F	Tamil -I Hindi -I Malayalam - I French -I	5	3	25	75	100	3
Part – II							
17UEG12E	English - I	5	3	25	75	100	3
Part – III							
17UCY13A	Core - I General Chemistry - I	7	3	25	75	100	5
	Core Chemistry Practical - I Inorganic Qualitative Analysis	4	-	-	-	-	-
17UPY1AA	Allied Paper - I : Physics - I	4	3	20	55	75	3
	Allied Practical - I : Physics	3	-	-	-	-	-
Part – IV							
17UFC1FA	Environmental Studies#	2	2	-	50	50	2
		30				**425**	**16**
Second Semester							
Part - I							
17UTL21T 17UHL21H 17UML21M 17UFL21F	Tamil -II Hindi -II Malayalam - II French -II	5	3	25	75	100	3
Part - II							
17UEG22E	English - II	5	3	25	75	100	3
Part - III							
17UCY23A	Core -II General Chemistry - II	7	3	25	75	100	5

10/01/2018
BoS Chairman/HoD
Department of Chemistry
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

Dr. P. K. MUTHUSWAMY
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Dr. NGP Arts and Science College
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Tamilnadu, India

17UCY23P	Core Chemistry Practical – I Inorganic Qualitative Analysis	4	3	40	60	100	4
17UPY2AA	Allied Paper - II Physics - II	4	3	20	55	75	3
17UPY2AP	Allied Practical - I Physics	3	3	20	30	50	3
Part - IV							
17UFC2FA	Value Education- Human Rights#	2	2	-	50	50	2
		30				**575**	**23**
Third Semester							
Part - I							
17UTL31T 17UHL31H 17UML31M 17UFL31F	Tamil -III Hindi -III Malayalam - III French -III	4	3	25	75	100	3
Part - II							
17UEG32E	English - III	4	3	25	75	100	3
Part - III							
17UCY33A	Core -III General Chemistry - III	6	3	25	75	100	5
	Core Chemistry Practical – II Volumetric And Organic Analysis	4	3	-	-	-	-
17UMT3AB	Allied Paper - III Mathematics- I	5	3	20	55	75	3
17UCY3SA	Skill Based Course – I Water Chemistry	3	3	20	55	75	3
Part - IV							
17UED34C	NMEC(EDC) - I Chemistry in Daily Life - I	2	2	-	50	50	2
17UFC3FA 17UFC3FB 17UFC3FC 17UFC3FD 17UFC3FE	Tamil/ Advanced Tamil (or) Yoga for human excellence/ Women's Rights/Constitution of India	2	2	-	50	50	2

		30				**550**	**21**
Fourth Semester							
Part - I							
17UTL41T 17UHL41H 17UML41M 17UFL41F	Tamil - IV Hindi - IV Malayalam - IV French -IV	4	3	25	75	100	3
Part - II							
17UEG42E	English - IV	4	3	25	75	100	3
Part - III							
17UCY43A	Core -IV General Chemistry - IV	6	3	25	75	100	5
17UCY43P	Core Chemistry Practical – II Volumetric And Organic Analysis	4	6	40	60	100	4
17UMT4AB	Allied Paper - IV Mathematics- II	5	3	20	55	75	4
17UCY4SA	Skill Based Course - II Food Chemistry	3	3	20	55	75	3
Part - IV							
	NMEC-II	2	2	-	50	50	2
17UFC4FA 17UFC4FB 17UFC4FC	Tamil/ Advanced Tamil (or) General Awareness	2	2	-	50	50	2
		30				**650**	**26**
Fifth Semester							
Part - III							
17UCY53A	Core -V Inorganic Chemistry - I	5	3	25	75	100	5
17UCY53B	Core -VI Organic Chemistry - I	4	3	25	75	100	4
17UCY53C	Core - VII Physical Chemistry - I	4	3	25	75	100	4
	Core Chemistry practical - III Gravimetric analysis and Inorganic	3	-	-	-	-	-

	preparation						
	Core Chemistry practical – IV Physical chemistry experiments	3	-	-	-	-	-
	Elective: I	4	3	20	55	75	4
	Elective-II	4	3	20	55	75	4
17UCY5SA	Skill Based Course - III Industrial Chemistry	3	3	20	55	75	3
16UCY53T	Industrial Training	Grade A to C					
		30				**525**	**24**
Sixth Semester							
Part- III							
17UCY63A	Core -VIII Inorganic Chemistry -II	5	3	25	75	100	5
17UCY63B	Core -IX Organic Chemistry - II	4	3	25	75	100	4
17UCY63C	Core - X Physical Chemistry - II	4	3	25	75	100	4
17UCY63P	Core Chemistry practical - III Gravimetric analysis and Inorganic preparation	3	3	40	60	100	3
17UCY63Q	Core Chemistry practical – IV Physical chemistry experiments	3	3	40	60	100	3
	Elective: III	4	3	20	55	75	4
17UCY63R	Core Chemistry practical - V Application oriented practical	4	3	20	55	75	2
17UCY6SA	Skill Based Course - IV Textile Chemistry	3	3	20	55	75	3
17UEX65A	Extension Activities@	-	-	-	50	50	2
		30				**775**	**30**
				Grand Total		**3500**	**140**

#- No continuous internal assessment. Only end semester examination

@- No end semester examinations. Only continuous internal assessment (CIA)

ELECTIVE – I

(Student shall select any one of the following Course as Elective - I in fifth semester)

Elective	Course Code	Name of the Course
1	17UCY5EA	Physical methods and Chemical structures (Spectroscopy and Chromatography)
2	17UCY5EB	Agricultural Chemistry
3	17UCY5EC	Pharmaceutical Chemistry

ELECTIVE - II

(Student shall select any one of the following Course as Elective – II in fifth semester)

Elective	Course Code	Name of the Course
1	17UCY5ED	Dye Chemistry
2	17UCY5EE	Nano and Green Chemistry
3	17UCY5EF	Forensic Science and Crime Investigation

ELECTIVE - III

(Student shall select any one of the following Course as Elective - III in sixth semester)

Elective	Course Code	Name of the Course
1	17UCY6ED	Polymer Chemistry
2	17UCY6EF	Dairy Chemistry
3	17UCY6EG	Leather Chemistry

NON MAJOR ELECTIVE COURSES

- The Department offers the following two papers as Non Major Elective Courses for other than the Chemistry students.
- Student shall select any one of the following subject as Non Major Elective Courses during their III and IV semester

Extra Departmental Course papers offered by Department of Chemistry

S. No.	Semester	Course Code	Course Title
1.	III	17UED34C	Chemistry in Daily life - I
2.	IV	17UED44C	Chemistry in Daily life - II

FOR PROGRAMME COMPLETION

Students have to complete the following Courses:

- Language papers (Tamil/Malayalam/French/Hindi, English) in I, II, III and IV semester.
- Environmental Studies in I semester.
- Value Education in II and III semester respectively.
- Allied papers in I, II, III and IV semesters.
- Two Non Major Elective courses in the third and fourth semester.
- Extension activity in VI semester.
- Elective papers in the fifth and sixth semesters.
- Industrial training for 15 days during IV Semester Summer Vacation and the Evaluation of the Report done by the Internal and external Examiner in the V Semester. Based on their performance of the Students Grade will be Awarded as A to C.

  A- 75marks and above

  B- 60-74 marks

  C- 40-59 marks

  Below 40 marks - (Re-Appear)

Total Credit Distribution

Courses	Credits	Total		Credits	Cumulative Total
Part I: Tamil	3	04 x 100	400	12	24
Part II: English	3	04 x 100	400	12	
Part III:					
Core	5	06 x 100=	600	30	102
Core	4	04 x 100=	400	16	
Core Practical	4	02 x 100	200	08	
Core Practical	3	02 x 100	200	06	
Core Practical	2	01 x 75 =	075	02	
Allied Theory	3	03 x 75 =	225	09	
Allied Theory	4	01 x 75 =	075	04	
Allied Practical	3	01 x 50 =	050	03	
Elective	4	03x 75 =	225	12	
Skill based Course theory	3	04 x 75 =	300	12	
Part IV:					
Value Education	2	01 x 50 =	050	02	12
Environmental	2	01 x 50 =	050	02	
Foundation Course	2	02 x 50 =	100	04	
NMEC	2	02 x 50 =	100	04	
Part V:					
Extension Activity	2	01 x 50 =	50	02	02
Total			**3500**	**140**	**140**

Earning Extra credits is not mandatory for course completion

Extra credits

Part	Course	Credit	Total credits
1	BEC/ Self study courses	1	**1**
2	Hindi / French/ Other foreign Language approved by certified Institutions	1	**1**
3	Type Writing / Short Hand Course	1	**1**
4	Diploma/certificate/CPT/ ACS Foundation/ NPTEL Course	1	**1**
5	Representation – Academic/Sports /Social Activities/ Extra Curricular / Co-Curricular activities at University/ District/ State/ National/ International	1	**1**
Total		5	**5**

Rules:

The students can earn extra credits only if they complete the above during the course period (I to V semester) and based on the following criteria. Proof of Completion must be submitted in the office of the Controller of Examinations before the commencement of the VI Semester. (Earning Extra credits are not mandatory for Course completion)

1. Student can opt BEC course/ Self study course to earn one credit. They have to Enroll and complete any one of the course during their course period before fifth semester (I sem to V sem).

Extra Credit Course (Self study paper) offered by Department of Chemistry

S. No.	Semester	Course Code	Course Title
1.	III semester	17UCYSS1	Chemistry in the service of Mankind
2.		17UCYSS2	Cosmetic Chemistry

2. Student can opt Hindi/ French/ Other foreign Language approved by certified Institutions to earn one credit. The certificate (Hindi) must be obtained from **Dakshina Bharat Hindi Prachar Sabha** and He/ she has to enroll and complete during their course period (**first to fifth semester).**
3. Student can opt for Type writing /short hand course to earn one extra credit. He/she has to enroll and complete the course during their course period to obtain certificate through **Tamil Nadu Board of Technical Education.**
4. Student can opt for Diploma/certificate/CPT/ACS Foundation/ NPTEL Course to earn one extra credit. Student who opt for Diploma/ Certificate course have to enroll any diploma/certificate course offered by Bharathiar University through our Institution. Student who opt for CPT/ ACS/CMA have to enroll and complete the foundation level during the course period. Students who opt for NPTEL course should complete the course certificate through NPTEL.
5. Award Winners in Academic/ Representation in Sports /Social Activities/ Extra Curricular/ Co-Curricular Activities at University/ District/ State/ National/ International level can earn one extra credit.

PROGRAMME OUTCOMES

On the successful completion of the programme, the following are the expected outcomes

PO Number	PO Statement
PO1	Gain knowledge in the observation, chemical techniques, experimental skills and scientific investigation.
PO2	Have an insight in all the aspects of chemistry and to build a solid foundation in the subject.
PO3	Improve lifestyle through the transforming power of chemistry.
PO4	Inspire the students to adopt scientific techniques and temper and line with scientific values.
PO5	Determine the scope of chemistry and perceive unique areas for further study.

17UCY13A	CORE – I: GENERAL CHEMISTRY – I	SEMESTER - I

PREAMBLE

- Enable the students to understand the basic concepts in qualitative inorganic analysis, bonding in molecules, electron displacement effects, hybridization, polar effects and their importance.
- Gain knowledge in wave mechanical approach of an atom, thermodynamics concepts and thermo chemistry.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Gain knowledge in the basics of chemistry and techniques for experimentation as well as proper use of chemicals and equipments. Design a demonstration that provides students with an opportunity to observe and take part in laboratory safety concerns necessary to prevent accidents. Interpret and identify the interfering ions in inorganic qualitative analysis	K1,K2,K3
CO2	Basic concepts of bondings in molecules, crystals structures and evaluate their bonding characteristics.	K1, K2, K3
CO3	Apply the concepts of bondings in organic molecules and relate their displacement reactions with mechanism.	K1, K2, K3
CO4	Compare and correlate the theories of gas laws. Fundamentals of quantum mechanics and their approach to particles.	K1, K2, K3
CO5	Basic terminologies in thermodynamics. Identify the nature of heat reactions and construct heat exchange systems.	K1, K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY13A	CORE – I: GENERAL CHEMISTRY – I	SEMESTER – I

Credits: 5
Hours/Week: 7

UNIT - I

Qualitative Analysis

Introduction - Dry reactions – heating, flame tests; Wet reactions – test tubes, centrifuge tubes, stirring rods, droppers, reagent bottles and reagents, the centrifuge, washing the precipitates, wash bottles, transferring of precipitates, heating of solutions, evaporation, dissolving of precipitates, precipitation with hydrogen sulphide, cleaning of apparatus. Interfering anions and its elimination- Classification of cations into analytical groups (group separation only).

UNIT- II

Chemical Bonding

Covalent bonding - Valence bond theory, Hybridization - Types of overlap of atomic orbitals. Valence shell electron pair repulsion theory (VSEPR) to NH_3, H_2O, ClF_3, SF_4. Bond strength and bond energy. Percentage of ionic character from dipole moment and electronegativity differences.

Ionic bonding- Factors influencing the formation of ionic bond. Ionic crystals NaCl, CsCl. Lattice energy of ionic crystals, Born-Lande equation, Born-Haber cycle, Fajans rule. Co-ordinate covalent bond- Formation of hydronium ion. Comparison between ionic, covalent and coordinate bonding.

Hydrogen bonding-Types with examples.

UNIT - III

Polar Effects

Inductive effect, comparing acid strengths – Halogen substituted acids. Basicity of amines RNH_2, R_2NH, R_3N and aniline. Mesomeric effect (-CN,CO). Resonance effect- conditions for resonance, resonance energy calculation. Hyper conjugation- Baker Nathan effect, hyper conjugative structures of toluene, ethylbenzene and iso- propylbenzene, Stability of primary, secondary and tertiary free radicals and primary, secondary and tertiary carbonium ions. Steric effect-examples and effect on reactivity.

Cycloalkanes : Nomenclature of alkanes, preparation and chemical reaction of cycloalkanes, Conformation of ethane and cyclohexane, Baeyer's strain theory and its limitations.

UNIT - IV

Gaseous State

Derivation of gas laws from kinetic theory of gases, Gay-Lussac's law, Charles law, Boyle's law, Dalton's law of partial pressure. Maxwell Boltzmann distribution of molecular velocities (derivation not needed). RMS, MP and Average velocities- Kinetic energy from Maxwell Boltzmann law-Problems.

Quantum Mechanics

de-Broglie equation, Heisenberg's uncertainty principle, Compton effect, Photoelectric effect, Schrodinger wave equation (Derivation).

UNIT - V

Thermodynamics

Definitions of terms involved, extensive and intensive properties, path functions vs state functions, exact and inexact differentials. First law of thermodynamics, adiabatic and isothermal processes, reversible and

irreversible processes - Work done, Joule- Thomson effect, Joule Thomson Coefficient – Problems.

Thermo Chemistry

Heat of neutralization, heat of solution, heat of combustion, kirchoff's equation- flame and explosion temperature, bomb calorimeter- measuring enthalpy of combustion, hess's law- bond energy- calculations of bond energy.

TEXT BOOKS

1. *G. Svehla, B. Sivasankar*, **Vogel's Qualitative Inorganic Analysis**, Pearson, 7th Edition, 2012.

2. *R. D. Madan*, **Modern Inorganic Chemistry**, S.Chand And Co., Third Revised Edition, 2011.

3. *M.K. Jain. S.C. Sharma*, **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi, 2012 .

4. *B.R. Puri, L.R. Sharma, M.S. Pathania,* **Principles of Physical Chemistry**, Vishal Publications, 2012.

5. *B. R. Puri, L. R. Sharma, K. C. Kalia,* **Principles of Inorganic Chemistry**, Vishal Publishing & Co., New Delhi, 2016.

REFERENCE BOOKS

1. *J. D. Lee,* **Concise Inorganic Chemistry**, Black Well Science, UK, 2006.

2. *R.T. Morrison, R.N. Boyd*, **Organic Chemistry**, Pearson Prentice Hall, 2012.

3. *S. Glasstone, D. Lewis*, **Elements Of Physical Chemistry**, Macmillan Ltd, London, 2004.

17UPY1AA	ALLIED PAPER – I : PHYSICS I	SEMESTER – I

PREAMBLE

To enable students to learn and apply the basic principles, theory and concepts of Mechanics, Heat and Sound.

COURSE OUTCOMES

On the successful completion of the programme, students will able to demonstrate

CO Number	CO Statement	Knowledge Level
CO1	Basic understanding of Gravitation and Elasticity and principles underlining them.	K2
CO2	Applications of Heat, Thermodynamics and Acoustics.	K3
CO3	Understanding of Solar energy and its industrial applications.	K2
CO4	Comparing and understanding principles involved in Electricity and Magnetism.	K2
CO5	Applications of Nano and Smart materials.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	M	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	M	S	S	M	S

S-Strong; M-Medium; L-Low

17UPY1AA	ALLIED PAPER – I : PHYSICS I	SEMESTER – I

Credits: 3
Hours/ week: 4

UNIT- I

Gravitation: Newton's law of Gravitation-Determination of G by Boy's method-mass and density of earth – acceleration due to gravity-Determination of g by compound pendulum.

Elasticity: Basic concepts – bending of beams – depression of cantilever-Determination of Y by uniform and non- uniform bending method-Torsion in a wire- Determination of rigidity modulus by torsional pendulum.

UNIT II

Heat and thermodynamics : Vanderwaal's equation of state-critical constants of a gas-derivation of critical constants in terms of Vanderwaal's contants – Joule – Thomson – effect – Theory of J-K effect – properties of liquid Helium I and II.

Sound: Doppler effect – applications – determination of frequency of alternating current by Sonometer – Ultrasonics – production, properties and applications

UNIT III

Solar Physics: Solar constant – measurement of solar radiations by Pyroheliometer and Pyranometer – general applications of solar energy – flat–plate collector – box type cooker - solar water heaters – solar photo – voltaic cells – general applications of solar cells.

UNIT IV

Electricity: Conversion of Galvanometer into Ammeter and voltmeter – figure of merit of a galvanometer – Ballistic Galvanometer.

Magnetism: Basic concepts of magnetic materials – magnetic properties of Dia, Para and Ferro magnetic materials – Area of (B-H) loop – Curie temperature – applications of magnetic materials.

UNIT V

Nano materials: Introduction-Nano technology-preparation techniques-properties of Nano materials- Application of Nano materials.

Smart materials: Metallic glasses - Shapememory alloys-Biomaterials-Non-Linear optical materials-Applications.

BOOKS FOR STUDY:

1. *Brij Lal and Subrahmanyam N.* 2003. **Properties of Matter**, S. Chand and Co, New Delhi.
2. *G. D. Rai* Fourth Edition reprint 2003. **Non -Conventional energy Sources** - Khanna Publication.
3. *Brijlal and Subrahmanyam 2004.* **Heat and Thermodynamics**, S.Chand & Co., New Delhi
4. *N. Subramanian and Brijlal N (2005).* ***A Text Book of Sound***, S. Chand & Co,
   New Delhi
5. Brijlal and Subramanian (2005).**Electricity and Magnetism**, S. Chand &Co.,
6. *R. Murugesan* (2005). **Electricity and Magnetism**, S. Chand & Co.,
7. *Dieter Vollath*, **Nanomaterials: An Introduction to Synthesis, Properties and Applications**, 2nd Edition

REFERENCE BOOKS:

1. *R. Murugesan* (2005). **Properties of matter**s, Chand & Co.,
2. *Sukhatme (*2008). ***Solar Energy*** **Utilization**, Tata McGraw-Hill Education.
3. *D. S. Mathur* (2004). **Heat and Thermodynamics**, Chand & Co, Newdelhi.
4. *R. L. Saighal (2005*). **A Text Book of Sound**, S. Chand & Co.,
5. *D. N. Vasudeva* (2005). **Electricity and Magnetism**- S. Chand & Co.,
6. *S.Muthukumaran, Balaji (2014).***Engineering Physics -II**, Sri Krishna hi-tech Publishing company.

17UCY23A	CORE – II: GENERAL CHEMISTRY – II	SEMESTER – II

PREAMBLE

- Learn about the chemistry of s and p block elements and noble gases.
- Understand the basic concepts about aromaticity and electrophilic substitution reaction of benzene, mechanism of nucleophilic substitution reaction, structure of crystals and their properties, importance of Second law of thermodynamics.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Identifying position of the elements in the periodic table and their properties. Comparison between the periodic behavior of elements and their properties.	K1,K2, K3
CO2	Gain knowledge in the fundamental aspects of aromatic compounds. Study on the properties of aromatic compounds and their reactions. Elaboration of the reaction mechanism based on the reactions.	K1,K2,K3
CO3	Broadening the concepts of organic reactions by comparing the reaction mechanisms.	K2, K3
CO4	Distinguish the shapes of crystals and their characteristics.	K1, K2, K3
CO5	Analyze the facts and limitations of first and second law of thermodynamics.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY23A	CORE –II: GENERAL CHEMISTRY – II	SEMESTER – II

Credits: 5
Hours /Week: 7

UNIT - I

S & P Block Elements

s-block elements-Position of alkali metals and alkaline earth metals in the periodic table and their general characteristics- Electronic configuration, physical state, atomic volume, ionic radii, density, ionization energy, electropositive character, reducing properties and oxidation state.

p-block elements - Anomalous behaviour of Li and diagonal relation between Li & Mg. Position of group III-A elements in the periodic table and general characteristics - Physical and chemical properties. Anomalous properties of B and diagonal relationship between B & Si. Chemistry of noble gases- Chemical properties of Noble gases, Chemistry of Xenon, Structure and bonding in Xenon compounds – XeF_2, XeF_4, XeF_6, $XeOF_4$, XeO_3,

UNIT - II

Benzene and Aromaticity

Structure of benzene, isomer number, resonance structure of benzene. Kekule structure, stability of phenyl ring, reactions of benzene, heat of hydrogenation and combustion, orbital picture of benzene, aromatic character- Huckel's rule, Non-benzenoid aromatic compounds.

Aromatic electrophillic substitution- nitration, sulphonation, halogenation, Friedel craft's acylation and alkylation, Reactivity and orientation of monosubstituted benzene.

UNIT - III

Alkyl and aryl halides

Nomenclature, methods of preparation, chemical reaction, mechanism of nucleophilic substitution of alkyl halides, SN^2, SN^1 reaction with energy profile diagram. Mechanism of elimination reactions of alkyl halides-E^1, E^2 and Substitution Vs Elimination. Substitution and elimination reactions - Saytzeff rule, Methods of preparation of aryl halides.

UNIT - IV

Crystalline State

Difference between crystalline and amorphous solids, symmetry in crystal systems, point groups, space lattice and unit cell, Bravias lattices, law of rational indices, miller indices, x-ray diffraction, Bragg's equation, X- ray diffraction pattern of tungsten crystal. Electron diffraction and neutron diffraction, types of crystals (Seven crystal system), structure of diamond and graphite.

UNIT - V

Thermodynamics

Second law of thermodynamics - Need for second law, different statements, entropy-definition, entropy changes in isothermal expansion of an ideal gas, entropy changes in reversible and irreversible processes, Trouton's rule, Entropy as a function of T and V, entropy as a function of T and P. Entropy of mixing of ideal gases, physical significance of entropy.

General conditions of equilibrium and spontaneity- Conditions of equilibrium and spontaneity under constraints, definition of A and G, physical significance of A and G, Temperature and pressure dependence of G, Maxwells relations., Gibbs – Helmholtz equation (Derivation).

TEXT BOOKS

1. *R. D. Madan*, **Modern Inorganic Chemistry**, S.Chand and Co., Third Revised Edition, 2011.

2. *Arun Bahl, B. S. Bahl,* **Advanced Organic Chemistry**, S.Chand and Co,New Delhi, Revised multicolor edition, 2015.

3. *B.R. Puri, L.R. Sharma, M.S. Pathania*, **Principles of Physical chemistry**, Vishal Publications, 2012.

REFERENCE BOOKS

1. *Puri B.R, Sharma L.R, Kalia K.C*, **Principles of Inorganic Chemistry**, Milestone publishers and Distributors, New Delhi, 2014.

2. *R.T. Morrison, R.N. Boyd,* **Organic chemistry**, Pearson Prentice Hall, 2012.

17UCY23P	CORE CHEMISTRY PRACTICAL – I INORGANIC QUALITATIVE ANALYSIS	SEMESTER – II

Total credits: 4
Hours /Week: 4

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.

Semi micro methods using the conventional scheme with hydrogen sulphide may be adopted.

CATIONS TO BE STUDIED: Lead, Copper, Bismuth, Cadmium, Iron, Aluminum, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

ANIONS TO BE STUDIED: Carbonate, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate, and Phosphate.

REFERENCE BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A. R, **Basic Principles of Practical Chemistry,** 2nd Edition, New Delhi, Sultan Chand and Sons, 1997.

2. G. Svehla, **Vogel's Qualitative Inorganic Analysis,** Orient Longman Ltd, Hyderabad, 1987.

17UPY2AA	ALLIED PAPER – II : PHYSICS II	SEMESTER – II

PREAMBLE

To enable the students in order to learn the basic principles, theory and concepts of Nuclear Physics and Wave Mechanics. To acquire introductory knowledge in the field of Semiconductor and Laser Physics.

COURSE OUTCOMES

On the successful completion of the programme, students will able to demonstrate

CO Number	CO Statement	Knowledge Level
CO1	Basic understanding of Photo electric effect and Wave Mechanics.	K2
CO2	Applications of Accelerators and understanding Elementary Physics.	K3
CO3	Understanding of basics of Laser Physics and Spectroscopy.	K2
CO4	Understanding Semiconductor Physics and their applications.	K2
CO5	Applications of Integrated Circuits and Digital Electronics.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	M	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	M	S	S	M	S

S-Strong; M-Medium; L-Low

17UPY2AA	ALLIED PAPER – II : PHYSICS II	SEMESTER – II

Credits: 3
Hours/ week: 4

UNIT- I

Modern physics: Photo electric effect – Einstein's photo electric equation – verification of Einstein's photo electric equation by Millikan's experiment – photo electric cells – applications

Wave mechanics: De Broglie matter waves – calculation of De Broglie wave length – Experimental study of De Broglie matter wave by G.P.Thomson experiment.

UNIT- II

Nuclear physics : characteristics of nuclear forces – nuclear structure by liquid drop model – Binding energy – mass defect – particle accelerators – cyclotron and betatron – artificial transmutations by α – particles - nuclear Fission and nuclear Fusion (basic idea only) – elementary particles – Leptons, Mesons and Baryons

UNIT III

Laser physics: Purity of spectral lines – Coherence length and time – spontaneous and induced emissions – population inversion – meta stable state – conditions for laser actions – Ruby laser – Helium – neon laser – applications of lasers – Raman effect – Raman shift – stokes and anti stokes lines – Laser Raman Spectrometer.

UNIT IV

Semiconductor Physics: Volt – Ampere Characteristics of P-N junction Diode – Zener diode – applications of Zener diodes - Volt – Principles of LED and LCD – Frequency Modulation and Amplitude modulation – basic principles of antennas – RADAR – Principle and applications.

UNIT V

Integrated Circuits and Digital Electronics: Introduction - Steps in fabrication of Monolithic IC's – General applications of IC's.

Digital Electronics: Number systems – conversion of binary into decimal – conversion of decimal to binary – binary addition and subtraction – Basic logic gates – NAND and NOR as an universal logic gates – Demorgan's theorems – Boolean algebra –applications of Demorgan's theorems.

BOOKS FOR STUDY:

1. R. Murugesan (2004)**, Modern Physics ,**S. Chand & Co.

2. *M.N.Aravamudhan*, **An Introduction to Laser Theory and application**, S.Chand *& Co.*

3. B.L. Theraja (2000).**Basic Electronics (Solid state)**, S. Chand & Co.,

4. *Malvino & Leach,* **Digital Principles and application**, Tata-McGraw Hill Publishers

5. *V.K. Metha* , **Principles of Electronics** , S. Chand & Co.,

BOOKS FOR REFERENCE

1. *Gupta and Kumar* ,**Handbook of Electronics**, S. Chand & Co.,

2. R.K. Gaur (1993), **Engineering Physics,** Dhanpat Rai & Sons.

3. Arumugam M(2010). ***Engineering Physics***, Anuradha *publishers*.

4. Bartee (1985), **Digital Computer Fundamentals,** McGraw-Hill Education (India) Pvt Limited.

17UPY2AP	ALLIED PRACTICAL – I PHYSICS	SEMESTER-II

Credits: 3
Hours/Week: 3

LIST OF EXPERIMENTS:

Any 12 Experiments

1. Young's Modulus-Uniform Bending (Microscopic Method)
2. Young's Modulus-Non-uniform Bending (Microscopic Method)
3. Compound Pendulum – determination of 'g' and 'K'
4. Torsional Pendulum – Rigidity Modulus
5. Rigidity Modulus – Static Torsion
6. Spectrometer – Refractive Index of a glass Prism
7. Spectrometer – Grating- Minimum deviation & Normal Incidence
8. Moment of a Magnet – Tan C position
9. Viscosity – Poiseuille's Method
10. Meter Bridge- Temperature Coefficient of resistance
11. Meter Bridge- Specific Resistance of a material
12. Specific Heat capacity of a Liquid – Newton's method of cooling
13. Sonometer – Frequency of a tuning fork
14. Post office box- Determination of Temperature Coefficient of Resistance
15. Post office box- Determination of Specific Resistance

17UCY33A	CORE –III : GENERAL CHEMISTRY – III	SEMESTER – III

PREAMBLE

- To know the basic concepts in quantitative as well as gravimetric analysis, some naming reactions involving carbonyl compounds, chemistry of dicarboxylic acids, phase rule and its applications.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Gain knowledge in preparation and determine the strength of the solutions	K2, K3
CO2	To understand the knowledge of gravimetric analysis and their applications.	K2,K3
CO3	Study on the reaction of carbonyl compounds with different reagents.	K2
CO4	Study on preparation, properties and reactions of dicarboxylic acids, unsaturated acids and hydroxyl acids.	K3,K4
CO5	Analyze the thermal property of the system by applying phase rule.	K3,K4

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	S
CO4	S	M	S	M	S
CO5	M	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY33A	CORE - III : GENERAL CHEMISTRY – III	SEMESTER – III

Credits: 5
Hours /Week: 6

UNIT – I

Quantitative Analysis

1. The mole concept – atomic, molecular and molar masses. Equivalent mass – Equivalent mass of an acid, equivalent mass of a base, equivalent mass of oxidizing and reducing agents.

2. Concentration terms – Normality, molarity, mole fraction, molality, percentage solution – weight composition, volume composition.

3. Principles of volumetric analysis – standard solution (primary and secondary standards) titration – types (acid, base, oxidation, reduction), equivalent point, end point, indicators – action of phenolphthalein and methyl orange, caution in volumetric titrimetry – precautions to avoid errors in titrimetric analysis, corrections for unavoidable errors.

UNIT - II

Gravimetric Analysis

Precipitation methods, colloidal state, supersaturation and precipitate formation, purity of the precipitate – post precipitation, co-precipitation, conditions of precipitation, precipitation from homogeneous solution, washing the precipitate, Ignition of the precipitate – Thermogravimetric methods of analysis, quantitative separations based on precipitation methods- fractional precipitation, organic precipitants, volatilisation or evolution methods.

UNIT III

Aldehydes and ketones

Reactions of aldehydes and ketones, nucleophilic addition of Grignard reagent, Aldol condensation, mixed aldol condensation, Perkin, Knoevenagel, Claisen, Cannizaro, Reformatsky reactions. Reactions with $LiAlH_4$ and $NaBH_4$ -Wolf Kishner reduction.

UNIT IV

Dicarboxylic acids – Oxalic, Malic, Malonic, Succinic, Maleic acid, Fumaric acid, Adipic acid – Preparation and properties.

Unsaturated acid - Acrylic acid and Crotonic acid - Preparation and properties.

Hydroxy acids -Tartaric acid, Citric acid - Preparation and properties.

Dienes - Nomenclature and classification of dienes - Isolated, conjugated and cumulated dienes. Polymerization - 1,2 and 1,4 addition, Diel's - Alder reaction.

UNIT V

Phase rule

Phase rule - Phase, degree of freedom. Phase equilibria - Condition for equilibrium, Derivation of Gibb's phase rule. Phase equilibria in one component system - Sulphur, Water and Carbon dioxide systems. Phase diagrams for two component system – Construction and thermal analysis of phase diagrams of Pb-Ag, Bi-Cd and Na-K systems.

TEXT BOOKS

1. *G. H. Jeffery, J. Bassett*, **Vogel's Text book of Quantitative Chemical Analysis**, John Wiley & Sons, 5th Edition.

2. *Arun Bahl, B. S. Bahl,* **Advanced Organic Chemistry**, S.Chand and Co,

New Delhi, Revised multicolor edition, 2015.

3. *B.R. Puri, L.R. Sharma, M.S. Pathania*, **Principles of Physical chemistry**, Vishal Publications, 2012.

REFERENCE BOOKS

1. *J. D. Lee,* **Concise Inorganic Chemistry**, Black Well Science, UK, 2006.

2. *R.T. Morrison & R.N. Boyd,* **Organic chemistry**, Pearson Prentice Hall, 2012.

3. *B.S. Bahl & Arun Bahl,* **Essentials of Physical chemistry**, S. Chand & Co, 1st Edn.

17UMT3AB	ALLIED- III : MATHEMATICS – I	SEMESTER - III

PREAMBLE

1. On completion of this course the students should gain knowledge about solving equations, solving first and second order differential equations using Laplace transforms.

2. To know about the concept of Fourier series which will be useful in their field of study.

COURSE OUTCOMES

In the successful completion of the course, student will be able to

CO Number	CO Statement	Knowledge Level
CO 1	Learn about Polynomial Equations.	K1
CO 2	Learn the concept & Manipulation of Matrices	K1
CO 3	Apply trigonometric functions to solve problems.	K2
CO 4	Learn about standard form of Laplace Transforms	K2
CO 5	Application of Laplace Transform in solving Differential Equations	K3

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	M	M	M	M	S
CO 2	M	M	M	S	S
CO 3	S	M	M	S	S
CO 4	M	S	M	S	M
CO 5	S	M	M	S	S

S- Strong; M-Medium; L-Low

17UMT3AB	ALLIED III : MATHEMATICS – I	SEMESTER - III

Credits: 3
Hours/Week: 5

UNIT-I

Theory of Equations: Polynomial Equations with real coefficients : Imaginary and irrational roots - Transformation of equation by Diminishing or increasing its roots by a constant-Reciprocal Equation.

UNIT-II

Matrices: Eigen Values and eigen vectors, Cayley-Hamilton theorem (without proof) - Verification and computation of inverse.

UNIT-III

Trigonometry: Expansion of cos nθ and sin nθ interms of powers of cosine and sine-Expansions of $\cos^n\theta$, $\sin^n\theta$ in powers of sine and cosine - hyperbolic functions.

UNIT-IV

Laplace Transforms: Definition-Standard forms of Laplace Transform - Linearity transformation- shift theorem-Transform of tf(t),f(t)/t .

UNIT-V

Inverse Laplace transforms: Inverse of standard functions -Application to solution of differential equations – Solving of simultaneous differential equation.

TEXT BOOK:

1. *Abdul Rasheed ,A.* **Allied Mathematics.** 2006.Tata McGraw-Hill Education (P) Ltd, Chennai.

REFERENCE BOOKS:

1. *Manichavasagam Pillai, T.K and Narayanan,S.* 2002. **Trigonometry.** Viswanathan Publishers and Printers Pvt.Ltd.

2. *Narayan,S and Manicavachagam Pillai,T.K.* 2002. **Ancillary Mathematics.** Viswanathan Publishers and Printers Pvt.Ltd.

17UCY3SA	SKILLED BASED COURSE – I WATER CHEMISTRY	SEMESTER – III

PREAMBLE

- To know about the sources and characteristics of water and to gain knowledge about the type of pollutants in water, the analysis of the pollutants in water, the methods of purification of water and about the water management

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To study about the sources and characteristics of water.	K1, K2
CO2	To gain knowledge in the aspects of pollution and their consequences. Identify the location of water pollution sources.	K2,K3
CO3	Examine the water quality by chemical and physical methods.	K3, K4
CO4	Applying the acquired knowledge, to determine the purification of water using various techniques.	K2, K3
CO5	To infer and solve the water management issues in various fields.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY3SA	SKILLED BASED SUBJECT – I WATER CHEMISTRY	SEMESTER III

Credits: 3
Hours /Week: 3

UNIT-I

Sources of water

Introduction - uses of water - water for industry - Sources of water - Quality of natural waters -Chemistry of water - Water in human body - Water as a solvent - main quality characteristics of water - effects of water on rocks and minerals - organic matter in water - humic material in water - colloidal material in water - Environmental phosphorus chemistry.

UNIT-II

Water pollution

Definition - water pollutants - types of water pollution - ground water pollution, surface water pollution, lake water pollution, river water pollution and sea water pollution - physical pollution of water - chemical pollution of water - biological pollution of water - physiological pollution of water.

UNIT- III

Analysis of a water pollutants

Measurement of water quality by chemical and physical examination of water - Chemical substances affecting potability - electrical conductivity - suspended solids - dissolved solids - alkalinity - measurement of toxic chemical substances - general analytical methods of determination of metals - international standards for drinking water - dissolved oxygen - biochemical oxygen demand - chemical oxygen demand.

UNIT- IV

Purification of water

Removal of coarse, dispersed and colloidal impurities from water - Coagulation of water - Contact and electrochemical coagulation - Flocculants - Sterilisation and disinfection of water - Chemical methods of sterilisation - Physical methods of sterilization. Desalination of brackish water - Reverse osmosis.

Zeolite process - Ion exchange method - Demineralization of water - Determination of hardness of water - EDTA method.

UNIT-V

Water management

Introduction - Water management - Use and conservation of water resources - Water quality management - Rain water harvesting - Water from rocks - Water management in agriculture - Rain fed system - Irrigated systems - Sea water for agriculture - Water management in industries.

TEXT BOOK

1. *B.K Sharma*, **Water pollution,** Goel publishing House, Meerut, 2003.

REFFRENCES

1. *Jain and Jain*, **Engineering Chemistry**, Dhanpat Rai Publishing Co., 1998.

2. *N. Manivasakam (Water Analyst),* **Chemical and Microbiological Analysis of Mineral Water and Packaged Drinking Water,** Principal Public Health Laboratory, Coimbatore, 2001.

17UCY43A	CORE –IV : GENERAL CHEMISTRY – IV	SEMESTER – IV

PREAMBLE

- To gain knowledge about metallurgy, acid - base concepts, synthesis of phenols, esters, amines and their properties, colligative properties of solution and the physical chemistry laws.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Study the methods involved in the extraction of different types of metals and its importance in the field of chemical metallurgy.	K1, K2
CO2	Gain knowledge in the fundamental aspects of acids and bases.	K2,K3
CO3	Understand the basic aspects of phenols and its derivatives.	K2,K3
CO4	Study on the preparation of various amines and their reactions.	K2,K3
CO5	Demonstration and determination of colligative properties.	K2, K4

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	S	S	M	S
CO3	S	S	S	S	S
CO4	S	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY43A	CORE -IV : GENERAL CHEMISTRY – IV	SEMESTER IV

Credits: 5
Hours /Week: 6

UNIT - I

Principles and Processes of Metallurgy

Minerals - ores - occurrence of metals-classification of ores-various steps involved in the metallurgical processes- concentration of ores by froth floatation-gravity separation - magnetic separation processes- calcination – roasting - smelting - alumino thermic process - purification of metals by electro refining - zone refining-van Arkel process - furnaces- different types.

UNIT II

Acids and bases:

Definitions, different approaches - Arrhenius concepts, Bronsted, Lowry concept, solvent system definition, Lewis definition. Relative strength of acids and bases. Acidity and basicity of solvolytic reaction. HSAB - Principle. Application & limitations of HSAB concept. Symbiosis, theories of hardness and softness. Electronegativity and hardness and softness. π Bonding contributions.

UNIT-III

Phenols

Monohydric Phenols - preparation and properties, acidity of phenols, (No mechanism) reaction of monohydric phenols - Esterification, Nitration, Sulphonation, Halogenation, coupling with diazonium salts, Kolbe, Reimer-Tiemann, Fries rearrangement, Hoesch-Houben reaction and Gattermann reactions. Preparation and properties of Alpha and Beta-

naphthols.

UNIT-IV

Amines and Diazo compounds

Preparation and reactions of amines, separation of a mixture of primary, secondary and tertiary amines – comparison of their basicity. Ring substitution, diazotization and coupling reaction of aromatic amines. Preparation, structure and their synthetic applications of diazomethane and diazoacetic ester.

UNIT-V

Solutions

Introduction - Solution of Gases in Gases-Henry's law-limitations of Henry's law. Solutions of liquids in liquids-solubility of partially miscible liquids. Phenol-water system. Solutions of solids in liquids-solubility- its equilibrium concept.

Dilute Solutions- Colligative properties- lowering of vapour pressure – Raoult's Law –derivation. Ideal solutions and deviations from Raoult's law. Determination of molecular mass from vapour pressure lowering. Elevation of Boiling point relation and determination of molecular mass. Depression of freezing point and determination of molecular mass from depression of freezing point. Measurement of freezing point depression – Rast's Camphor method.

Osmosis-silica garden and the egg experiment. Semipermeable membrane- Osmotic pressure- Determination of osmotic pressure by modern osmometer – isotonic solutions- Reverse osmosis.

TEXT BOOKS

1. *P.L. Soni,* **Textbook of Inorganic chemistry**, S. Chand & Co, 20th Edition.

2. *Arun Bahl, B. S. Bahl*, **Advanced Organic Chemistry**, S.Chand and Co,New Delhi, Revised multicolor edition, 2015.

3. *Arun Bhal, B.S. Bahl, G. D. Tuli,* **Essentials of Physical Chemistry**, S.Chand & Co,2014.

REFERENCE BOOKS

1. *R. D Madan, 2011*, **Modern Inorganic chemistry**, S. Chand & Co, 3rd Edn.

2. *J. D. Lee*, **Concise Inorganic Chemistry**, Black Well Science, UK, 2006.

3. *B. Mehta, Manju Mehta,* **Organic Chemistry**, Prentice Hall of India Private Limited, New Delhi, 2005.

4. *I.L.Finar, 2007,***Organic Chemistry Vol-I**, Pearson education, reprint 2007.

5. *B.R. Puri, L.R. Sharma, M.S. Pathania*, **Principles of Physical chemistry**, Vishal Publications, 2012.

6. *S. Glasstone, Devan Nostrand*, **Text book of physical chemistry**, Maxmillan Pub, 1974.

17UCY43P	CORE CHEMISTRY PRACTICAL - II VOLUMETRIC AND ORGANIC ANALYSIS	SEMESTER – IV

Credits: 4
Hours /Week: 4

I. Titrimetric Quantitative Analysis

a. Acidimetry and Alkalimetry:

1. Estimation of HCl by NaOH using a standard Oxalic acid solution.
2. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 Solution.

b. Permanganametry:

1. Estimation of Oxlaic acid by $KMnO_4$ using a standard Oxalic acid solution.
2. Estimation Iron (II) Sulphate by $KMnO_4$ using a standard Mohr's Salt solution.
3. Estimation of Calcium (II) by $KMnO_4$ using standard oxalic acid solution.

c. Dichrometry:

1. Estimation of Iron (II) by potassium dichromate using standard Mohr's salt solution.

d. Iodometry:

1. Estimation of $KMnO_4$ by Thio using a standard Potassium dichromate Solution.
2. Estimation of Copper (II) Sulphate by $K_2Cr_2O_7$ solution.

II. Organic analysis

Analysis of organic compounds

1. Preliminary tests
2. Detection of elements present
3. Aromatic or Aliphatic
4. Saturated or Unsaturated
5. Nature of the functional group
6. Confirmatory tests and Preparation of derivatives for the functional groups

The following functional group compounds may be given:

Aldehydes, Ketones, Amines (1^0 and 2^0 amines), Amides, Diamide, Carbohydrates, Phenols, Acids, Esters and Nitro compounds.

Substance to be given for organic analysis:

Cinnamic acid, benzoic acid, phthalic acid, aniline, benzamide, urea, benzaldehyde, acetophenone, phenol, cresols, glucose, toludine, nitrobenzene, ethylbenzoate.

REFERENCE BOOKS

1. *Venkateswaran. V, Veeraswmay. R, Kulandaivelu*. A.R., **Basic Principles of Practical Chemistry**, 2nd Edition, NewDelhi, Sultan Chand and Sons, 1997.
2. *Mendham. J, Denney. R.C, Bames. J.D, and Thomas,* M. **Vogel's Text book of Quantitative Analysis**, 6th Edition, Pearson Education, 1989.
3. *Gopalan.R, Subramaniam. P.S, and Rengarajan*. K, **Elements of Analytical Chemistry,** Sultan Chand and Sons, 2004**.**

17UMT4AB	ALLIED – IV MATHEMATICS – II	SEMESTER - IV

PREAMBLE:

1. On successful completion of course the students should have series of knowledge about the curvature, Beta, Gamma functions and its application.

2. To learn the partial differential equation types and integration of vectors.

COURSE OUTCOMES

In the successful completion of the course, student will be able to

CO Number	CO Statement	Knowledge Level
CO 1	Learn about Double Integrals.	K1
CO 2	Learn the concept Curvature and Radius of curvature	K1
CO 3	Solve second order differential equations	K2
CO 4	Learn about the method of forming and solving Partial Differential Equations	K2
CO 5	Understand the application of Vector Calculus	K3

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4	PO5
CO 1	M	M	M	M	S
CO 2	M	M	M	S	S
CO 3	S	M	M	S	S
CO 4	M	S	M	S	M
CO 5	S	M	M	S	S

S- Strong; M-Medium; L-Low

17UMT4AB	ALLIED PAPER – IV MATHEMATICS – II	SEMESTER - IV

Credits:4
Hours/Week: 5

UNIT - I

Multiple Integrals: Double Integrals - Evaluation of double integrals - Triple Integral - Applications of double and triple integration.

UNIT - II

Differential Calculus: Introduction – Curvature and Radius of curvature - Gamma and Beta Function: Gamma function – Beta Function – Relation between Gamma and Beta Function.

UNIT - III

Differential Equations: Linear differential equations of second order with constant coefficient whose R.H.S is of the form ve^{mx}, where v is any function of x - Linear equations with variable coefficients.

UNIT - IV

Formation of partial differential equations by elimination of arbitrary constants and functions -Definitions of general, particular and complete solutions - Solving standard forms $f(p, q) = 0$, $f(x,p,q) = 0$, $f(y,p,q) = 0$, $f(z, p, q) = 0$, $f(x,p) = f(y,q)$ - Lagrange's Differential equations $Pp+Qq = R$.

UNIT - V

Scalar and vector fields -Differentiation of vectors - Gradient, Divergence and Curl -Integration of vectors - Line integral - Surface integral – Volume integral.

TEXT BOOK:

1. *Duraipandian, P and Udhyabaskaran, S.* **Allied Mathematics Volume II**, S.Chand and Company Ltd, New Delhi.

REFERENCE BOOK:

1. *Abdul Rasheed ,A.* **Allied Mathematics**,Vijay Nicole imprints (P) Ltd,Chennai.

2. *Narayan,S and Manicavachagam Pillai,T.K.* 2002.**Ancillary Mathematics.** Viswanathan Publishers and Printers Pvt. Ltd.

3. *Kandasamy. P and Thilagavathi. K*. 2004. **Allied Mathematics II**. S.Chand and Company Ltd, New Delhi.

17UCY4SA	SKILLED BASED SUBJECT – II FOOD CHEMISTRY	SEMESTER – IV

PREAMBLE

➢ To have an idea about food adulteration, gain knowledge about food preservation techniques, understand the chemistry of vinegar, fruit juices and vegetable acids; get an idea about beverages and to understand the calorific value of foods.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To understand the food adulteration and the toxic chemicals present in foods.	K1, K2
CO2	To have an insight knowledge in the food preservation techniques. To demonstrate and examine the advantages of food preservation.	K2,K3
CO3	Demonstrate the chemical reactions and examine the changes occurring in food processing.	K2,K3
CO4	Demonstrate and analyze the adulteration in beverages.	K1, K2
CO5	To understand and determine the calorific value of foods.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY4SA	SKILLED BASED COURSE – II FOOD CHEMISTRY	SEMESTER IV

Credits:3
Hours /Week: 3

UNIT - I

Food Adulteration and Hygiene

Definition – Food standards – Food Standards in India – Standards for ensuring quality of Products – Common adulterants in different foods – Contamination of foods with toxic chemicals, pesticides and insecticides. Contamination of food with harmful micro-organisms – Bacterial infections – Fungal contaminations of foods – Toxicants naturally occurring in some foods – Insect and rodent contamination of stored foods.

UNIT - II

Preservation of Food

Introduction - Chemical Preservatives - Cold Storage - Foods preserved in Tinned Iron and Glass Containers - Inspection of Tinned foods - The action of Tinned foods on the container. Poisonous Metals in foods - Detection and determination of Tin, Lead and Copper, Zinc and Aluminium in foods - Arsenic in foods - The Gutzeit test for Arsenic – Examination of glucose for the presence of Arsenic, Antimony in beverages.

UNIT - III

Vinegar, Fruit Juices and Vegetable Acids

Preparation and properties of Vinegar. Examination of Vinegar – Determination of Total Solids and examination of residue, Total acidity,

Mineral acids in Vinegar, Colour reactions for the detection of mineral acids, Hydrogen ion Concentration, pH Value, Methods of determining pH, detection of mineral acids in Vinegar by pH Value, Alcohol in Vinegar. Fruit Juices and Vegetable Acids: Examination of Lime Juice, Lemon Squash, etc.,

UNIT - IV

Beverages

Tea - Nature and Properties of Tea - Adulteration of Tea - Tea Infusions. Coffee - Nature and Properties of Coffee - Adulteration of Coffee with Chicory. Cocoa and Chocolate - Nature and properties of Cocoa and Chocolate - Adulteration of Cocoa. Alcoholic Beverages - Introduction - Determination of Alcohol - Proof Spirit - Denaturing of Alcohol.

UNIT - V

The Calorific Value of Foods

Introduction - The Bomb Calorimeter - Determination of the Calorific Value of a Substance, Outline of Method - Determination of the Water Equivalent of the Apparatus - Determination of the Calorific Value of Olive Oil and of Cooked Potato.

TEXT BOOKS

1. *C. Kenneth Tinkler and Helen Masters*, **Applied Chemistry**, Vol. II, 2nd Edition, London, 2005.

2. *M. Swaminathan*, **Advanced Text Book on Food and Nutrition,** Vol. II, 2nd Edition, 2003.

3. *B. Sri Lakshmi*, **Nutrition science**, New Age International Pvt. Ltd., New Delhi, 2002.

REFERENCE BOOKS

1. *M. Swaminathan*, **Handbook of Food and Nutrition**, The Bangalore Printing and Publishing Co. Ltd, 5th Edition,2003.

2. *B. Sri Lakshmi*, **Food Science**, New Age International Pvt. Ltd., 3rd Edition, New Delhi, 2003.

3. *S. D. Venkataiah*, **Nutrition Education**, Anmol Publication Pvt. Ltd., 2004.

17UCY53A	CORE –V: INORGANIC CHEMISTRY – I	SEMESTER – V

PREAMBLE

- To gain knowledge about the nuclear reactions, radio activity, coordination compounds and its structures

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To apply the knowledge of nuclear chemistry to detect the isotopes using spectrographs. Broadening the knowledge about radioactivity and application radioactive isotopes in various fields.	K3, K4
CO2	To understand the concepts about nuclear fission and fusion reactions and problems arising due to nuclear wastes.	K3
CO3	Acquire knowledge about fundamentals of coordination chemistry which includes classification of ligands, detection of complexes. To analyze the stability of complexes using EAN rule.	K2, K3
CO4	Analyzing the stability and energy of complexes by applying CFT and VBT concepts to octahedral, square planar and octahedral complexes. To understand about application and limitations of CFT.	K3
CO5	Analyze the physical and chemical properties of different types of inorganic and organic solvents.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	M

S – Strong; M - Medium; L – Low

17UCY53A	CORE – V INORGANIC CHEMISTRY – I	SEMESTER V

Credits: 5
Hours /Week: 5

UNIT - I

Nuclear Chemistry - I

Introduction – Nuclear stability and n/p ratio. Magic numbers. Packing fraction. Mass defect and binding energies. Definition for isotopes, isobars and isotones. Detection of isotopes - mass spectrographs- Thomson's, Dempster's and Aston's mass spectrographs- Importance of discovery of isotopes. Radioactivity –emission of alpha, beta and gamma rays. Radioactive disintegration -first order kinetics - half-life period. Radioactive disintegration series. Uses of radioactive isotopes – medicine – agriculture – C^{14} dating – dating of Universe.

UNIT - II

Nuclear Chemistry - II

Nuclear reactions – fission, fusion, spallation, capture and particle-particle reactions - nuclear fission-nuclear reactors- Atom bomb- nuclear fusion - Stellar energy- Hydrogen bomb. Artificial transmutation of elements. Artificial radioactivity. Atomic power projects in India- Disposal of nuclear wastes. Problems.

UNIT - III

Coordination Chemistry- I

Definition of some terms – classification of ligands – Chelation – Coordination number and stereochemistry of complexes – Nomenclature of coordination compounds – Detection and structure determination of complexes - Werner's Coordination theory – Sidgwick's electronic

interpretation of coordination – Sidgwick's concept of Effective Atomic Number - EAN concept and EAN rule.

UNIT - IV

Coordination Chemistry- II

Valence bond theory – Formation of Octahedral complexes on the basis of VBT – Formation of tetrahedral and square planar complexes on the basis of VBT – Limitations of VBT. Crystal field Theory and its importance features – Crystal Field Splitting of d-orbitals – Factors affecting the magnitude of Δ_o – Application of CFT – Distortion of octahedral complexes and Jahn-Teller theorem. Causes of distortion with examples – Crystal Field Stabilisation Energies (CFSE's) – Uses of CFSE's values – Limitations of CFT.

UNIT - V

Solvents

Classification of solvents - Solubility of compounds. Effect of temperature on solubility -role of H_2O as solvent, chemical structure and solubility - General behaviour - Properties of ionizing solvents - Types of reactions in solvents - Specific non aqueous solvents - Protonic solvents, NH_3, HF. Aprotic solvents - SO_2, BrF_3. molten salt, carbonic solvents - Ethanol, ether.

TEXT BOOKS

1. *R. D. Madhan, G. D. Tuli, and S. M. Malik*, **Selected Topics in Inorganic Chemistry**, S. Chand & Co., New Delhi, 2006.
2. *B. R. Puri, L. R. Sharma, K. K. Kalia,* **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi, 2008.
3. *R. D. Madan*, **Modern Inorganic Chemistry,** S. Chand & Co., New Delhi, 2004.

4. *U. N. Dash*, **Nuclear Chemistry**, S. Chand & Co., New Delhi, 2010.
5. *H.J Arniker., 2001* **Essentials of Nuclear Chemistry**, New Age International P.Ltd Publishers, 4th Edn.
6. *P.L.Soni, Mohan katyal,* **Textbook of Inorganic Chemistry,** S. Chand & Co., New Delhi, 20th Edn, 2005.

REFERENCE BOOKS

1. *M. G. Arora, M. Singh,* **Nuclear Chemistry,** Anmol publications Pvt. Ltd., New Delhi, 1998.
2. *Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan*, **Advanced Inorganic Chemistry,** Vol. 1, S. Chand & Co., New Delhi, 2012.
3. *James.E.Huhey, Ellen.A.Keiter, Richard L Keiter, Okhil K.Medhi,* **Inorganic Chemistry - Principle Sturcture and Reactivity**, Pearson Publishers 9th Edn, 2011.

17UCY53B	CORE –VI ORGANIC CHEMISTRY – I	SEMESTER – V

PREAMBLE

- To study asymmetry and optical activity of organic molecules, some novel named reactions, important organic rearrangements, chemistry of amino acids, proteins and peptides, reactions and properties of heterocyclic compounds

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Understanding the fundamental aspects of stereochemistry which includes asymmetric carbon, optical isomerism , resolution and asymmertic synthesis.	K2, K3
CO2	Study on the various naming reactions and their detailed mechanistic pathway.	K2,K3
CO3	Broadening the concepts of molecular rearrangements by comparing the reaction mechanisms.	K3
CO4	To acquire the knowledge of preparation, properties and synthesis of amino acids, proteins and peptides. To analyze the structures of proteins and peptides.	K3
CO5	To analyze the heterocyclic compounds in terms of physical and chemical properties and to have insight on their preparation.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY53B	CORE -VI ORGANIC CHEMISTRY – I	SEMESTER V

Credits: 4
Hours /Week: 4

UNIT - I

Stereochemistry

Optical Isomerism, cause of optical activity, plane polarized light, specific rotation, asymmetric carbon atom**,** chirality, Optical isomerism of lactic acid and tartaric acid. Enantiomers and diastereo isomers. Resolution of Racemic mixture – mechanical separation – kinetic separation – selective adsorption – chemical method – biochemical method. Racemization, Asymmetric synthesis, Walden inversion. Specifying absolute configuration – R , S system for asymetric molecule. Optical activity of Biphenyl, Allenes and Spiranes.

UNIT - II

Specific name reactions and mechanism

Reactions, evidences and applications of – Clemmensen reduction, Friedlander synthesis, Gattermann-Koch aldehyde synthesis, Kolbe – Schmidt reaction, Michal addition, Mannich reaction and Benzoin condensation, Wolf – Kishner reduction.

UNIT - III

Molecular Rearrangements with mechanism

Reaction, evidences, mechanism, and applications of molecular rearrangement reactions - Pinacol-Pinacolone, Beckmann, Hoffmann, Curtius, Benzilic acid and Claisen Rearrangements.

UNIT - IV

Amino acids, Proteins and peptides

1. Amino acids – Nomenclature, dipolar nature of amino acids, isoelectric point, methods of preparation – amination of halo acids – Strecker synthesis – Gabrielphthalimide synthesis – Koop synthesis. Physical and chemical properties of amino acids. N-terminal and C-terminal amino acid residues.

2. Proteins, classification – according to chemical composition. Structure of proteins – primary – secondary and tertiary structure. General properties of proteins. Industrial importance of proteins. Colour test for proteins.

3. Nomenclature of peptides – determination of structure of peptides – end group analysis – synthesis of peptides.

UNIT - V

Heterocyclic compounds

Introduction- preparation – physical and chemical properties of Furan, Pyrrole, Thiophene, Pyridine, Quinoline and Isoquinoline (including elcetrophilic and nucleophilic substitution reactions).

TEXT BOOKS

1. *Arun Bahl and B.S.Bahl*, **Advanced Organic Chemistry,** S. Chand and Co., New Delhi, 2012.

2. *Gurdeep. R. Chatwal*, **Reaction Mechanism and Reagents in Organic Chemistry,** Himalaya Publishing House Delhi, 2013.

3. *M.K. Jain, S.C. Sharma*, **Modern Organic Chemistry**, Vishal Publishing Co., Delhi, 2011.

4. *Jerry March,* **Advanced Organic Chemistry,** John Wiley & Sons, New York, 4th Edn, 1930

REFERENCE BOOKS

1**.** *M.G Arora*, **Stereochemistry in Organic Compounds,** Anmol Publications Private Ltd New Delhi, 2008.

2. *Jagdamba Singh and Yadav,* **Organic Synthesis,** Vol.I and II. Pragathi and Prakasam Publishers, 1st Edition, 2005.

3. *I.L.Finar*, **Organic Chemistry,**Vol.I and II, Addison-Wesley Longman, 2009.

17UCY53C	CORE –VII PHYSICAL CHEMISTRY – I	SEMESTER – V

PREAMBLE

- To understand the fundamental concept of electrochemistry, importance of electro chemical cells, electrodes and their types, polarography and surface chemistry

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To obtain the basic concepts of electrochemistry and apply it to develop the theory and experimental approaches for the electrochemical problems.	K2, K3
CO2	To acquire basic knowledge of electrode potentials and electrochemical cells.	K3
CO3	To acquire knowledge about the types of electrodes and potentiometric titrations.	K3
CO4	To learn the use of fundamental principles of fuel cells and to know their practical utility. To acquire the basic knowledge of electrochemical processes and their application related to corrosion field.	K3
CO5	To provide the basic concepts of polarography, instrumentation- functions and their applications. To gain a knowledge on the fundamentals of sorption and their applications.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY53C	CORE-VII PHYSICAL CHEMISTRY - I	SEMESTER V

Credits: 4
Hours /Week: 4

UNIT - I

Fundamentals of Electrochemistry

Introduction - Classification of conductors - Electrolytic conductance-conductivity cell measurement of conductance of solutions - Variation of equivalent conductance and specific conductance with dilutions. Migrations of ions - Transport number - determination by moving boundary method and Hittorf's method - Kohlrausch's law – statement, appilication. Arrhenius theory of electrolytic dissociation - Ostwald's dilution law and limitations - theory of strong electrolytes: Debye-Huckel - Onsagar theory (elementary treatment only) -Debye- Falkenhagen effect and Wien effect. Applications of conductance measurements: i) Determination of $\lambda\alpha$ for weak electrolyte (ii) Determination of dissociation constant of a weak organic acid (iii) Conductometric titrations – acid-base titration.

UNIT - II

Electro Chemical Cells

Galvanic cell – Reversible and irreversible cells - Electrode potentials - The standard hydrogen electrode-kinds of electrode and their potentials - Nernst equation - Computation and measurement of cell emf. Weston - Cadmium cell - Single electrode potentials. Determination and significance of electrode potentials - Electrochemical series and its applications. Thermodynamic quantities of cell reaction.

pH scale –Problems.

UNIT - III

Electrodes and their types

Reference electrodes – Electrodes for measurement of pH – Hydrogen, quinhydrone, and glass electrodes. Buffer solutions - Buffer action, determination of pH values of Buffer mixture and Henderson's equations. Concentration cells with and without transport - Liquid junction potential - Applications of emf measurements - Redox Potentials - redox indicators - diphenyl amine - Potentiometric titrations – acid-base and redox titrations.

UNIT – IV

Fuel Cells and Corrosion

Fuel cells - Definition and importance, Hydrogen-Oxygen fuel cell, hydrocarbon - Oxygen cell. Storage cells, Lead storage cell, Nickel-Cadmium cell and Lithium ion cell (basics only). Decomposition Voltage, Over voltage, Deposition or Discharge Potential.

Corrosion –Definition, types, electrochemical nature, rusting of iron, prevention - cathodic protection and galvanizing.

UNIT - V

Polarography and Adsorption

Polarography-instrumentation- advantages and disadvantage of dropping mercury electrode-Limiting current, factors affecting limiting current-Half wave potential- Application of polarography.

Sorption – Absorption, Adsorption-Types of adsorption, adsorption of gases by solids. Adsorption isotherms –Freundlich, Langmuir. Adsorption of solutes from solutions. Application of adsorption.

TEXT BOOKS

1. *P. L. Soni. O. P. Dharmarha and U. N. Dash*, **Textbook of physical chemistry**, S.Chand & Co., New Delhi, 2013.
2. *B. R. Puri, L. R. Sharma, M. S. Pathania*, **Principles of Physical Chemistry**, S.Chand & Co., New Delhi, 2009.
3. *B.S. Bahl and G. D. Tuli, and Arun Bahl,* **Essentials of Physical Chemistry,** S. Chand publishing, Revised multicolor edition, 2012.
4. *P. C. Jain and Monika Jain,* **Engineering Chemistry**, Dhanpat Rai Publishing Co., New Delhi, 2006.
5. *Gurdeep Raj*, **Advanced Physical Chemistry,** GEOL Publishing House, Meerut, 21st Edn, 1997.

REFERENCE BOOKS

1. *Karen C. Timberlake*, **Basic Chemistry,** Los Angeles Valley College, Pearson Benjamin Cummings New York, 1st edition, 2005.
2. *Samuel Glasstone*, **Introduction to Electrochemistry,** EWP (East-West Press) Pvt. Ltd., 2002.
3. *Syed Aftab Iqbal,* **Text Book of Electrochemistry**, Discovery Publishing house Pvt. Ltd., New Delhi, 2011.

17UCY5SA	SKILLED BASED COURSE – III INDUSTRIAL CHEMISTRY	SEMESTER – V

PREAMBLE

- To gain knowledge about manufacture of sugars, have a thorough idea about Fermentation, knowledge about Glass, have knowledge about Cement and Ceramics, have a thorough idea about Paints and Pigments.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To know about different sources of sugar and commercial manufacture of sugar.	K2, K3
CO2	To acquire knowledge in the fermentation process and extend its uses in the manufacture of beverages.	K2,K3
CO3	To summarize the manufacture of glass. To compare and correlate the properties of different glasses.	K2,K3
CO4	To gain knowledge in the cement and ceramic manufacturing process. Experiment its application in real life needs.	K2, K3
CO5	Acquire knowledge in paints and pigments and its application in various fields.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY5SA	SKILLED BASED SUBJECT – III INDUSTRIAL CHEMISTRY	SEMESTER V

Credits: 3
Hours /Week: 3

UNIT-I
Sugar Industry

Introduction - manufacture of cane sugar - Extraction of juice - Purification of juice - Defection -sulphitation and carbonation. Concentration or evaporation – Crystallization - separation of crystals - Drying - Refining - Grades. Recovery of sugar from molasses. Manufacture of sucrose from Beetroot.

UNIT - II
Fermentation

Introduction - historical - conditions favourable for fermentation. Characteristics of enzymes -short account of some fermentation processes. Alcohol beverages - manufacture of beer, wines, vinegar and power alcohol. Ethyl alcohol from molasses.

UNIT-III
Glass

Introduction - Physical and chemical properties of glass - Raw materials - Methods of manufacture. Formation of the batch material – melting – shaping - annealing and finishing.
Types of Glasses - soda glass - flint glass - pyrex glass - jena glass and safety glass.

UNIT - IV
Cement and Ceramics

Cement: Manufacture of cement - Settling of cement (Portland cement)
Ceramics: Manufacturing process - Application of colours to the pottery - Earthenware's and Stonewares.

UNIT V

Pigments and Paints

Pigments: Introduction -Requirements of a pigment - Typical inorganic pigments - Applications.

Paints: Classification of paints – Distempers - Constituents of paints - Settling of paint -Requirements of a good paint - Emulsion paints - Latex paints - Paint removers - Varnishes - Solvents and thinners.

TEXT BOOKS

1. Sharma B.K., **Industrial Chemistry,** Goel Publishing House, Meerut, 2003.
2. Jain & Jain., **Engineering Chemistry,** Dhanpat Rai Publishing Company Private Ltd, New Delhi, 1998. .

REFERENCE BOOKS

1. *J.R.Kapuria,* **Paint Manufacture**, SBP Board of Consultants and Engineers PVT Ltd., New Delhi, 1996.
2. *M.M. Uppal*, **A Text Book of Engineering Chemistry**, Khanna Publishers, New Delhi, 1998.
3. *R. Gopalan, D. Venkappayya, S. Nagarajan*, **Engineering Chemistry**, Vikas Publishing House PVT Ltd., Reprint 2000.
4. *H. L. Whitc*, **Introduction to Industrial Chemistry**, A Wiley Interscience Publication (John Wiley & Sons), 1986.

17UCY63A	CORE –VIII INORGANIC CHEMISTRY – II	SEMESTER – VI

PREAMBLE

- To have an idea about metallic properties, different types of solids, different types of symmetry, reactions of complexes, bio-inorganic chemistry.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To understand the difference between amorphous and crystalline solids and their arrangement in crystal lattice.	K3
CO2	To analyze the difference between stoichiometric and non-stoichiometric defects. To understand the various theories of metallic bonding and their application in semiconductors and alloys.	K2, K3
CO3	Solving the various crystal structures using X-ray diffraction techniques and study their symmetry operations of simple molecules.	K3
CO4	To analyze the various ligand substitution reactions in octahedral and square planar geometry by applying basic aspects of coordination chemistry To understand the electron transfer reactions in inorganic complexes.	K3
CO5	Demonstrate the various porphyrin systems and enzymes with respect to their biological functions. Analyze the role of alkali and alkaline earth metals in biological system and to know about their function and toxicity.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	M	S

S – Strong; M - Medium; L – Low

17UCY63A	CORE –VIII INORGANIC CHEMISTRY – II	SEMESTER VI

Credits:5

Hours/Week: 5

UNIT - I
Solid State - I

Amorphous and crystalline solids , symmetry in crystals, elements of symmetry of a crystal, space lattice and unit cell, Bravais lattices, seven crystal system, Designation of planes in crystals – Miller indices, close packing of identical solid spheres (CCP, FCC, HCP and BCC), radius ratio rule and shape of ionic crystal. Number of particles per unit cell and density of crystals.

UNIT - II
Solid State - II

1. Defects in crystal – Stiochiometric and non Stiochiometric defects.
2. Metallic bonding- theories- electron gas theory, Valence bond theory, Molecular orbital theory (Band theory) –True metal or conductor, insulators, semi conductors- types of semi conductors- intrinsic and extrinsic, n and p- type.
3. Alloys- substitutional and interstitial solid solutions, inter metallic compounds – Hume – Rothery rule.

UNIT - III
Symmetry of Molecules

X-ray diffraction studies of crystals – Bragg's equation – Bragg method and powder method – crystal structure of NaCl and ZnS. Symmetry elements in crystals (with respect to cubic crystals).
Symmetry in molecules –symmetry elements and symmetry operation in simple molecules. (NH_3, H_2O, CO_2).

UNIT - IV
Coordination Chemistry

Ligand substitution reactions in octahedral complexes - SN_1 and SN_2 mechanisms.
Ligand substitution reactions in Square – planar complexes : trans effect – trans effect series, theories of trans effect – Electrostatic polarization theory and pi bonding theory.
Electron transfer reactions – Inner sphere and outer sphere mechanism, Complementary and non complementary electron transfer reaction.

UNIT – V
Bioinorganic chemistry

Porphyrin systems-Myoglobin and hemoglobin-Role of myoglobin and hemoglobin in biological systems – cooperativity effect – explanation of cooperativity effect in hemoglobin. Metallo enzymes – inhibition and poisoning of enzymes – role of alkali and alkaline earth metals in biological systems –sodium pump –calcium pump – biological functions and toxicity of some elements (Cr,Mn,Co,Ni,Cu,As,I^-,Hg)– biological fixation of nitrogen.

TEXT BOOKS

1. *Sathya Prakash, G.D. Tuli, S.K. Basu, R.D. Madhan,* **Advanced Inorganic Chemistry** *volume 1, S. Chand & Company, New Delhi, 2012.*

2. *Wahid Malik, G.D Tuli, R.D. Madhan,* **Selected Topics in Inorganic Chemistry**, *S. Chand & Company, New Delhi, 2006.*

3. *B.R. Puri, L.R. Sharma and K.C. Kalia,* **Principles of Inorganic Chemistry**, *Milestone Publishers, New Delhi, 2009.*

4. *Gurdeep Raj,* **Advanced Inorganic Chemistry** , *Vol.1 , Goel Publishing House, Meerut, 2011.*

5. *P. L. Soni, Mohan katyal,* **Textbook of Inorganic Chemistry,** *S. Chand & Co., New Delhi, 20th Edn, 2005.*

REFERENCE BOOKS

1. *M.G. Arora*, **Solid State Chemistry**, *Anmol Publishing House, New Delhi, 1997.recent edition*

2. *R. D. Madhan*, **Modern Inorganic Chemistry**, *S.Chand & Company, New Delhi 2011.*

3. *Asim K.Dass*, **Bioinorangic Chemistry**, *Books and Allied (p) Ltd, Kolkata, 2007.*

4. *James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi*, **Inorganic Chemistry Principles of Structure and Reactivity,** *Dorling Kindersely (India) PVT.Ltd, 4th Edn, 2013.*

17UCY63B	CORE –IX ORGANIC CHEMISTRY – II	SEMESTER – VI

PREAMBLE

- To have an idea about terpenoids, alkaloids, carbohydrates, Vitamins and Hormones and further an idea about chemotheraphy

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Study on the classification, structural elucidation and synthesis of few important terpenoids.	K2, K3
CO2	To gain the knowledge of alkaloids and to analyze the methods of structural determination and synthesis.	K3
CO3	To acquire basic knowledge about vitamins and their deficiency diseases. To study the synthesis and structural elucidation of few important vitamins and hormones.	K3
CO4	To demonstrate the various applications of mono-and disaccharides including preparation, structural elucidation, physical and chemical reactions.	K3
CO5	To analyze structural aspects, functions and mode of action of various drug molecules.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	S	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY63B	CORE – IX ORGANIC CHEMISTRY – II	SEMESTER VI

Credits:4
Hours /Week: 4

UNIT – I
Terpenoids

Introduction, classification and general methods of isolation. Isoprene rule, structural elucidation and synthesis of Geraniol, β-Carotene, Carvone and α-pinene.

UNIT - II
Alkaloids

Introduction, classification, general characteristics and general methods of determining structures and Hoffmann's exhaustive methylation. Structural elucidation and synthesis of Nicotine, Quinine, Piperine and Morphine.

UNIT - III
Vitamins and Hormones

Introduction, classification, sources of Vitamins and their deficiency diseases. Structural elucidation and synthesis of Thiamine and Riboflavin.
Hormones - Introduction, structural elucidation and synthesis of adrenaline and thyroxin.

UNIT - IV
Carbohydrates

Introduction, classification, Mono saccharides - occurrence, preparation, structural elucidation, properties and uses of Glucose and Fructose. Cyclic form of glucose and fructose. Mutarotation, interconversion of glucose to fructose and vice versa.
Disaccharides – Structure, preparation, properties and uses of sucrose and maltose. Polysaccharides – starch and cellulose - Isolation, structure and properties. Derivatives of cellulose.

UNIT - V

Chemotherapy

Designation of drugs based on physiological action – functional and formaco dynamic drugs – chemotherapeutic drugs. Definition and two examples each of antibacterial drugs- sulpha drugs and mode of action of sulpha drugs, Antimalarial drugs, Amebicidal drugs, Antiseptics, Anaesthetics, Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents - Antibiotics - Penicillin, streptomycin, and tetracyclins.

TEXT BOOKS

1. *Arun Bahl and B.S.Bahl*, **Advanced Organic Chemistry**, S. Chand and Co., New Delhi, 2012.

2. **Modern Organic Chemistry** *M. K. Jain and S. C. Sharma, Rivised Edition, Vishal Publishing Co., Delhi 2011.*

3. *Jagdamba Singh and Yadav,* **Organic Chemistry**, *Vol. I and II, Pragathi Prakasam Publishers 1st Edition. 2005.*

REFERENCE BOOKS

1. *I. L. Finar,* **Organic Chemistry**, *Vol. I , Addison-Wesley Longman, 2010.*
2. *1. I. L. Finar*, **Organic Chemistry**, *Vol.II, Addison-Wesley Longman, 2010.*
3. *Gurdeep Chatwal*, **Organic Chemistry of Natural Products**, *Himalaya Publishing House, New Delhi, 2013.*
4. *Morrison R.T. and Boyd R.N,* **Organic Chemistry** *(6th edition), New York, Allyn & Bacon Ltd., 2008.*

17UCY63C	CORE –X PHYSICAL CHEMISTRY – II	SEMESTER – VI

PREAMBLE

- To understand the basics of chemical kinetics, study the theoretical aspects of various orders and the relationship between temperature and rate of a reaction, about activation energy and complex thermal reactions and to have an idea about photochemical reactions, about catalytic reactions and importance of catalysts, know the action of colloids and their role in daily life.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To develop the knowledge on principles of chemical kinetics and rate laws of chemical reactions. To apply the principles of chemical kinetics on various experimental techniques.	K2, K3
CO2	Broadening the concepts of chemical kinetics by theoretical aspects.	K3
CO3	To study about various photochemical and photosensitized process.	K3
CO4	To understand various types of catalysis reactions and to explore their applications in industrial sector.	K3
CO5	To provide the fundamentals of colloids and their applications.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	S	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY63C	CORE – X: PHYSICAL CHEMISTRY - II	SEMESTER VI

Credits: 4
Hours /Week: 4

UNIT - I
Chemical Kinetics-I

Empirical laws and experimental aspects. Rate law, stoichiometry, order and molecularity of reactions. Setting up and solving simple differential equations for first order, second order, third order and zero order reaction. Expressions for half – life periods of first order, second order, zero order and third order reactions. Determination of order of reactions. Experimental techniques involved in the following kinetics of reaction. Volumetry, Polarimetry and Colorimetry. Typical examples for each of the techniques.

UNIT - II
Chemical Kinetics-II

Theoretical aspects: Effect of temperature on the reaction rate. The activation energy. Significance of free energy of activation. The collision theory of reaction rates and its limitations. The theory of absolute reaction rates (ARRT). Comparison of the collision theory with the absolute reaction rate theory. Lindemann theory of uni-molecular reactions.

UNIT - III
Kinetics of Photochemical Reactions

Dark reactions - Complex thermal reactions- Thermal chain reaction - H_2/Br_2 reaction. Absorption of light and photochemical processes -Laws of photochemistry - Beer Lambert law, The Stark-Einstein law of

photochemical equivalence. Kinetics of photochemical chain reaction - H_2/Br_2 reaction.

Quantum yield of photochemical reactions. Comparison of the thermal and photochemical kinetics of the H_2 / Br_2 reaction. Photosensitized reactions - photophysical process, Fluorescence, Phosphorescence and Chemiluminescence (definitions only).

UNIT - IV

Catalysis

Catalysis – types of catalysis – homogeneous catalysis – heterogeneous catalysis – Characteristics of catalytic reactions – Promoters – Catalytic poisoning – Auto catalysis – Negative catalysis – Activation energy and Catalysis – Theories of catalysis – Intermediate Compound Formation Theory, Adsorption Theory - Hydrogenation of ethylene in presence of Nickel – Acid-base catalysis – Enzyme catalysis – Mechanism of enzyme catalysis – Industrial applications of Catalysts.

UNIT - V

Colloids

Colloids - Definitions – types of colloids – sols – preparation, purification and properties – Kinetic, Optical and Electrical. Stability of colloids, gold number, associated colloids – Cleansing action of soaps and detergents. Emulsion – types of emulsions, preparation, properties and application, Gels – types of gels, preparation, properties and applications. Applications of colloids.

TEXT BOOKS

1. *Arun Bahl and B. S. Bahl, G. D. Tuli*, **Essentials of Physical Chemistry**, *S. Chand & Co., Revised multicolor edition, 2012.*
2. *B. R. Puri, L. R. Sharma, and M. S. Pathania*, **Principles of Physical Chemistry,** *S. Chand & Co., New Delhi, 2009.*
3. *P. L. Soni, O. P. Dharmarha and U. N. Dash*, **Textbook of Physical Chemistry**, *S. Chand & Co., New Delhi, 2013.*

REFERENCE BOOKS

1. *Keith J. Laidler and John H. Meiser*, **Physical Chemistry**, *CBS Publishers & Distributors, New Delhi, 2006.*
2. *Gurudeep Raj,* **Advanced Physical Chemistry,** *Goel Publishing House, Meerut, 2009.*
3. *K. K. Rohatgi Mukherjee*, **Fundamentals of Photochemistry**, *New age International Publishers, 2014.*

17UCY63P	CORE CHEMISTRY PRACTICAL – III GRAVIMETRIC ANALYSIS AND INORGANIC PREPARATION	SEMESTER VI

Credits: 3
Hours /Week: 3

I. Gravimetric Analysis

1. Estimation of Sulphate as Bariumsulphate.
2. Estimation of Barium as Barium Chromate.
3. Estimation of Lead as Lead Chromate.
4. Estimation of Calcium as Calcium Oxalate.
5. Estimation of Nickel as Nickel diethlyglyoxime.

II. Preparation of Inorganic Complexes.

1. Tetra ammine copper (II) sulphate
2. Potassiumtrioxalatochromate (III)
3. Prussian blue
4. Hexamminecobalt (II) chloride
5. Hexathiourealead (II) nitrate
6. Tristhioureacopper (I) sulphat

REFERENCE BOOKS

1. *Venkateswaran.V, Veeraswmay. R, Kulandaivelu. A.R.,* **Basic Principles of Practical** *Chemistry, 2nd Edition, NewDelhi, Sultan Chand and Sons, (1997).*
2. *Mendham. J, Denney, R.C. Bames. J.D and Thomas. M,* **Vogel's Text book of Quantitative Analysis**, *6th Edition, Pearson Education, 1989.*
3. *Gopalan.R, Subramaniam P.S and Rengarajan.* K, **Elements of Analytical Chemistry,** *Sultan Chand and Sons, 2004.*
4. *Venkateswaran. V, Veeraswamy. R, Kulandaivelu . A.R,* **Basic Principles of Practical Chemistry,** *2nd Edition, New Delhi, Sultan Chand and Sons, 1997.*
5. *G. Svehla, Vogel's* **Qualitative Inorganic Analysis**, *Orient Longman Ltd, Hyderabad, 1987.*

17UCY63Q	CORE CHEMISTRY PRACTICAL – IV PHYSICAL CHEMISTRY EXPERIMENTS	SEMESTER VI

Credits:3
Hours /Week: 3

I. Physical Chemistry Experiments

1. Determination of Partition coefficient of Iodine between Carbon tetra chloride and water.
2. Determination of rate constant of acid- catalysed hydrolysis of an ester (Methyl acetate OR Ethyl acetate)
3. Determination of K_f / Molecular weight by Rast method (Naphthalene, Diphenyl and m-dinitrobenzene as solvents).
4. Determination of Critical solution temperature of Phenol- Water system.
5. Determination of concentration of an electrolyte (NaCl/ KCl/ Succinic acid)
6. Determination of Transition temperature of the hydrated salt (Sodium acetate, Sodium thio Sulphate and $SrCl_2.6H_2O$
7. Phase diagram-Simple Eutectic system
8. Determination of Cell Constant, Specific conductivity and Equivalent conductivity of strong electrolyte
9. Determination of dissociation constant of a weak acid (Acetic acid)
10. Conductometric Titration (Strong acid Vs Strong base)
11. Potentiometric Titration (Acid-Base Titration HCl Vs NaOH)
12. Potentiometric Titration (Redox Titration FAS Vs $KMnO_4$)
13. Estimation of Copper by colorimetric method
14. Estimation of Iron by colorimetric method.
15. Estimation of Manganese by colorimetric method.

REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., **Basic Principles of Practical Chemistry**, *2nd Edition, NewDelhi, Sultan Chand and Sons, 1997.*

2. Gopalan. R, Subramaniam. P.S., and Rengarajan, K., **Elements of Analytical Chemistry,** *Sultan Chand and Sons, 2004.*

17UCY63R	CORE CHEMISTRY PRACTICAL - V APPLICATION ORIENTED PRACTICAL	SEMESTER VI

Credits: 2
Hours /Week: 4

I. **Determination of Physical Constants.**

1. Determination of Melting point
2. Determination of Boiling point.

II. Preparation of Organic dyes

1. Preparation of dyes like Methyl Orange, Methyl Red, Azo Amino benzene

III. Preparation of Organic Compounds

1. Preparation involving Acetylation, Hydrolysis, Oxidation, Halogenation, Nitration and Benzoylation

IV. Preparation of Home care products

1. Preparation of white phenyl
2. Preparation of soap oil
3. Preparation of detergent powder
4. Preparation of transparent soap
5. Preparation of moisturizing cream

IV. Estimations

1. Estimation of Hardness of water using EDTA
2. Estimation of dissolved oxygen in water
3. Estimation of alkalinity in water
4. Estimation of calcium in limestone by EDTA method
5. Estimation of Total Fatty Matter (TFM) of a soap
6. Estimation of acid value of an oil
7. Estimation of available chlorine in bleaching powder

REFERENCE BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., **Basic Principles of Practical Chemistry**, *2nd Edition, New Delhi, Sultan Chand and Sons, 1997.*

2. Mendham. J., Denney. R.C., Bames. J.D. and Thomas, M. **Vogel's Text Book of Quantitative Analysis**, *6th Edition, Pearson Education.*

3. *Sharma, K.K. and Sharma, D.S.* **Introduction to Practical Chemistry**, *Vikas Publishing House, New Delhi, 2005.*

4. *Praveen Kukreja,* **Chemistry Advanced Practical Manual,** *Vrinda Publishing (p) Ltd, New Delhi, 2006.*

17UCY6SA	SKILLED BASED SUBJECT – IV TEXTILE CHEMISTRY	SEMESTER – VI

PREAMBLE

- To understand the natural fibres, vegetable fibres, animal fibres, properties, to know about synthetic fibres , manufacture, properties, acquire knowledge about scouring and desizing, singeing processes, have a clear idea about latest bleaching techniques, have knowledge about dyeing- synthesis of dyestuffs and fastness properties

Course Outcomes

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To study the nature of fibers and its applications to materials.	K1, K2
CO2	To gain the knowledge on synthetic fibers and compare its application with natural fibers.	K1,K2
CO3	To experiment the preparatory process prior to dyeing.	K1,K2
CO4	Design a demonstration for the preparatory process of dyeing.	K2, K3
CO5	To develop the analytical ability to solve problems connected with textile technological processes.	K1, K2

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY6SA	SKILLED BASED SUBJECT – IV TEXTILE CHEMISTRY	SEMESTER VI

Credits:3
Hours /Week: 3

UNIT - I

Vegetable Fibres And Animal Fibres

Definition –classification of textile fibres- essential and desirable properties of textile fibres-Cotton fibre –Physical and Chemical properties, Jute – Purification; physical and chemical properties of jute, silk and wool.

UNIT - II

Regenerated And Synthetic Fibres

Rayon –different types of rayon and their sources-manufacture of viscose rayon- physical and chemical properties- acetate rayon –manufacture – properties, enprammonium rayon –manufacture and properties. Manufacture – properties and uses of polyamides- polyester- polypropylene and polyacrylonitrile.

UNIT - III

Preparatory Process Prior To Dyeing

Scouring: Objective of scouring –process of caustic scouring on open kier machine with sine diagram, scouring with NaOH and Na_2CO_3 - Precautions to be taken before scouring. Desizing using malt extract- merits and demerits of acid and enzyme desizing. Singeing –Impurities present in grey cotton and cotton fabric –objects of singeing –process of singeing on gas singeing machine –precautions to be taken during gas singeing.

UNIT - IV

Principles of Bleaching

Principles of wetting and mechanism of detergency –synthetic detergents –surface active agents-bleaching processes –bleaching agents-H_2O_2, NaOCl, bleaching powder and bio-bleaching and their properties-bleaching of cotton, rayon, wool and synthetic fibres.

UNIT - V

Principles of Dyeing

Colour and chemical constitution –Chromophore and auxochromes-natural and synthetic dyes-dyes –classification, synthesis of dye shift-congored, bismark brown and erifstal violet, theories of dyeing –effect of temperature and salt on dyeing –dyeing of wool, silk and poly-esters-dyeing of cotton with reactive dyes- fastness properties –washing, light, rubbing and perspiration.

TEXT BOOKS & REFERENCE BOOKS

1. *Shenai. V.A.* **Textile Fibres (Vol. I),** *Mahajan Publishers, Ahmedabad, 1991.*

2. *Shenai. V.A.,* **Technology of Beaching,** *Mahajan Publishers, Ahmedabad, 1998.*

3. *Shenai. V.A.,* **Chemistry of Dyes and Principles of Dyeing Vol. II,** *Mahajan Publishers, Ahmedabad, 1991.*

4. *Gopalakrishnan. R.* **Textile Fibres SSM,** *Institute of Textile Technology, Mahajan Publishers, Ahmedabad, 1988.*

17UCY5EA	Elective –I Spectroscopy and Chromatography– II	SEMESTER – V

PREAMBLE

- To enable the students to gain knowledge about the fundamentals of various spectroscopy, the basic principles and applications in Raman, UV –Visible, FT-IR, NMR and Mass spectroscopy.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To understand the basic principles, instrumentation of UV-Visible spectroscopy and to utilize their basic aspects to identify various organic compounds.	K2, K3
CO2	Gain the knowledge in principles, instrumentation and functions of IR and Raman spectroscopy To compare and analyze the simple applications of IR and Raman spectroscopy.	K3
CO3	To study the basic principles and instrumentation of NMR spectroscopy and apply to predict the organic molecules.	K2, K3
CO4	To know about basic principles and instrumentation of mass spectroscopy technique and predict the fragmentation of simple molecules using rearrangement reactions.	K2, K3
CO5	Exploring the various chromatography techniques and their applications in separation of organic mixtures.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY5EA	ELECTIVE: 1 SPECTROSCOPY AND CHROMATOGRAPHY	SEMESTER V

Credits: 4
Hours /Week: 4

UNIT - I

UV -Visible spectroscopy

Instrumentation- selection rules **-**Types of electronic transitions in organic molecules, Woodward Fieser rules for calculation of λ_{max} of conjugated dienes, unsaturated carbonyl compounds. The chromophoric concept- auxochromes, absorption and intensity shifts- bathochromic, Hypsochromic, Hyperchromic, Hypochromic shifts. Types of absorption bands, solvent effects,-Franck - Condon principle.

UNIT - II

Vibrational spectroscopy

IR spectra - Instrumentation-Theory of IR spectra for diatomic molecule as simple harmonic, and anharmonic oscillator, selection rule, vibrational frequencies - Vibrational modes of H_2O and CO_2. Finger print region, Applications of IR spectra – discuss.

Raman spectroscopy - Rayleigh and Raman scattering,Classical theory of Raman effect - Stokes and antistokes lines, instrumentation - block diagram – Rotation and vibration of raman spectrum- structure of CS_2 and N_2O. Mutual exclusion principle and its applications. Comparison of IR and Raman spectroscopy.

UNIT - III

NMR spectroscopy

NMR-principle, instrumentation, solvents used in NMR, conditions of resonance-relaxation process, spin-spin relaxation, spin-lattice relaxation-quadrupole relaxation. Number of signals- equivalent and non equivalent protons-position of signals-chemical shift-shielding and non shielding effects-factors influencing chemical shifts- peak area and proton coupling- splitting of signals in ethanol and chloromethane- spin-spin coupling- coupling constant. NMR spectra of simple molecules such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethylbromide, Toluene and Isopropylphenyl ketone.

UNIT - IV

Mass Spectroscopy

Introduction – instrumentation - theory of mass spectrometry. Meta stable ions (or) peaks, molecular ion peak. Nitrogen rule-general fragmentation modes of hydrocarbons(cyclohexene, ethyl benzene and methyl propyl ketone) Retro-Diels Alder reaction. Hydrogen transfer rearrangements and McLafferty rearrangement.

UNIT - V

Chromatography

Paper chromatography - principle - solvents used - development of chromatogram- ascending, descending and radial paper chromatography - applications.

Thin layer chromatography – principle – choice of adsorbents and solvents, preparation of chromate plates- Rf values, factors affecting Rf values, Significance of Rf values.

Column Chromatography - principle - types of adsorbents, preparation of the column, elution, recovery of substances and applications.

TEXT BOOKS

1. *Y.R Sharma, reprint 2009,* **Elementary Organic Spectroscopy**, *S.Chand&Co*

2. *B.R. Puri, L.R. Sharma, M.S. Pathania, 2010,* **Principles of Physical chemistry**, *Vishal Publications, 44th Edn.*

3. *Gurudeep R.Chatwal,* **Instrumentation methods of chemical analysis,** *Himalaya publishing house, New Delhi, 2002.*

REFERENCE BOOKS

1. *C.N.Banwell, E.M.McCash, 1995,* **Fundamentals of Molecular Spectroscopy**, *Tata Mcgraw Hill, 4th Edn*

2. *Jag Mohan,* **Organic spectroscopy-principles and applications,** *Narosa publishing house, 2013.*

3. *William Kemp,* **Organic spectroscopy,** *3rd edition, palgrave publications, New York, 2008.*

17UCY5EB	Elective –I: Agriculture Chemistry	SEMESTER – V

PREAMBLE

- To understand the basic soil chemistry and the physical properties of soils, chemistry aspects of soil – nitrogen fixation and also to know the chemistry of pesticides, fungicides and herbicides.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To understand the basics of soil chemistry, formation of soil and their importance in agriculture.	K2, K3
CO2	To study the physical properties of soil and their importance in the plant growth.	K1,K2, K3
CO3	To know the basic chemical aspects of soil and soil testing. To have depth of knowledge in nitrogen fixation of soils and bio conversion of agricultural wastes.	K1, K2, K3
CO4	To recognize the role of the plant nutrients in the growth of plant. To have an insight in the principles and classification of fertilizers.	K2,K3
CO5	To distinguish the properties, classification and mechanism of pesticides, fungicides and herbicides.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY5EB	MAJOR ELECTIVE: 1 AGRICULTURAL CHEMISTRY	SEMESTER V

Credits:4
Hours /Week: 4

UNIT - I

Origin of soil

Definition of soil-origin-igneous-metamorphic and sedimentary rocks-rock systems-weathering of rocks and minerals - main components of soil-organic, inorganic, liquid and gaseous phase-Minerals of importance with respect to soil, industries and agriculture –Soil formation physical, chemical and biological factors responsible for soil formation-soil forming processes- Core soil groups of Tamilnadu-Soil survey standard soil survey-methods of soil surveys –remote sensing and soil mapping-soil resource management-use of satellite data for source inventory.

UNIT - II

Physical Properties of Soil

Physical properties of soil-soil texture and textural classification-pore space-bulk density, particle density –soil structure and soil colour-surface area-soil colloids-plasticity, shrinkage-flocculation and deflocculation-soil air, soil temperature, their importance in plant growth-soil reaction –ion exchange reaction-cation exchange-anion exchange –buffering capacity – hydrogen ion concentration-determination of pH - factors affecting soil pH-soil pH and nutrient availability-Soil degradation –causes.

UNIT - III

Chemical Aspects of Soil

Origin of problem soils, their properties acid, alkali and saline soils-diagnosis-remediation of acid and salt effected soils –Methods of reaction

and after care-Quality of irrigation water – causes for poor quality waters for irrigation, their effects in soil and crops. Soil testing-Concept,objective and basis-soil sampling, tools, collection processing, dispatch of soil and water samples. Soil organic matter-its decomposition and effect on soil fertility-source of organic matter in soil –maintenance and distribution – soil organism –their role-nitrification-denitrification, nitrogen fixation in soils-biological nitrogen fixation in soils –microbial interrelationship in soil-microbes in pert and disease management-Bio-conversion of agricultural wastes.

UNIT - IV

Plant Nutrients

Plant nutrients-macro and micro nutrients-their role in plant growth – sources-forms of nutrient absorbed by plants –factors affecting nutrient absorption-deficiency symptoms in plants-corrective measures-chemicals used for correcting nutritional deficiencies-nutrient requirements of crops, their availability, fixation and release of nutrients. Fertilizers – classification of NPK fertilizers –sources-natural and synthetic –straight – complex –liquid fertilizers, their properties, use and relative efficiency-secondary and micro nutrient fertilizers-mixed fertilizers –principles of fertilizers use –the efficient use of various fertilizers-integrated nutrient management biofertilizers –rhizobium, azospirillum, azotobactor-Blue green algae and azolla production and quality control of bio-fertilizers.

UNIT - V

Pesticides, Fungicides and Herbicides

Pesticides: Definition –classification –organic and inorganic pesticides-mechanism of action – Characteristics-Safe handling of pesticides –impact of pesticides on soil, plants and environment –Acts and Laws concerning the pesticides-. Fungicides Definition –classification – mechanism of action-Sulphur, copper-mercury compounds, dithanes, dithiocarbamates. **Herbicides:** Definition –Classification-mechanism of action-Arsenic and boron compounds-nitro compounds, chloro compounds, Triazines, propionic acid derivatives, urea compounds. Acaricides-Rodenticides-Attractants-Reppellants-Fumiganus defoliants.

TEXT BOOKS

1. *Biswas ,T.D and Mukeherjee, S.K.* **Textbook of Soil Science,** *1987.*
2. *Daji, A.J.* **Textbook of Soil Sciences,** *Asia Publishing House, Madras, 1970.*
3. *Tisdale. S. L., Nelson. W. L. and Beaton. J. D*. **Soil Fertility and Fertilizers,** *Macmillan Publishing Company, New York, 1990.*

REFERENCE BOOKS

1. *HESSE ,* **A Textbook of Soil Chemical Analysis** *P.R. John Murray, 1971.*
2. *Buchel, K.H. John Wiley & Sons*, **Chemistry of Pesticides,** *New York, 1983.*
3. *Sree Ramula,* **Chemistry of Insecticides and Fungicides Chemistry of Insecticides and Fungicides,** *U.S. Oxford and IBH Publishing Co.,* New Delhi, 1979.

17UCY5EC	Elective –I: Pharmaceutical Chemistry	SEMESTER – V

PREAMBLE

➢ To know about the common diseases and cure-terms of pharmacology, to understand the mechanism of drug action, get introduced to chemotherapy – antibiotics, knowledge about various health promoting drugs.

Course Outcomes

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To know about the common diseases and terms involved in pharmacology.	K2, K3
CO2	To explore the availability of drugs, classification and their mode of action.	K3
CO3	To understand basic principles of physiological actions of drugs.	K3
CO4	Broadening the concepts of common body drugs.	K3
CO5	To have an insight on the health promoting drugs and their functions.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY5EC	ELECTIVE: 1 PHARMACEUTICAL CHEMISTRY	SEMESTER V

Credits: 4
Hours /Week: 4

UNIT - I

Introduction

Common diseases -infective disease – insect – borne, air borne and water borne - hereditary diseases - Terminology- drug, pharmacology, pharmacognesy, pharmacodynamics, pharmacokinetics, anti metabolites -absorption of drugs-routes of administration of drugs, factors affecting absorption drugs-routes of administration of drugs, factors affecting absorption –Assay of drugs-chemical, biological, immunological assays, LD50 and ED50 therepeutic index, drug dosage.

UNIT - II

Drugs

Various sources of drugs, pharmacologically active constitutents in plants, Indian medicinal plants-tulsi, neem, keezhanelli,- their importance-Classification of drugs- biological chemical-mechanism of drug action- Action at cellular and extra cellular sites. Drug receptors and biological responses- Metabolism of drugs through oxidation, reduction, hydrolysis and conjugate processes, factors affecting metabolism.

UNIT - III

Chemotherapy

Designation of drugs based on physiological action; Definition and two examples each of Anaesthetics-General, IV and local- Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents – Antibiotics –Penicillin, streptomycin, chloramphenicol, tetrecyclins-

Antivirals, AIDS- symptoms, prevention, treatment- Cancer and neoplastic agents.

UNIT - IV

Common Body Ailments

Diabetes-Causes, hyper and hypoglycemic drugs- Blood pressure- Sistolic & Diastolic Hypertensive drugs- Cardiovascular drugs- anti arrhythmic, anti anginals, vasodilators- CNS depresents and stimulants- Psychedelic drugs, hypnotics, sedatives (barbiturates, LSD)- Lipid profile –HDL, LDL cholesterol, lipid lowering drugs.

UNIT - V

Health Promoting Drugs

Nutracenticals- Vitamins A, B, C, D, E and K micronutrients Na, K, Ca, Cu, Zn, I- Medicinally important inorganic compounds of Al, P, As, Hg, Fe – L examples for each, their role and applications- Organic Pharmaceutical acids, Agents for Kidney function (Aminohippuric acid), Agents for liver function (Sulfo bromophthalein), Agents for pitutary function (metyrapone)- Organic Pharmaceutical bases-anti oxidants, treatment of ulcer and skin diseases.

TEXT BOOKS

1. *Jayashree Ghosh*, **Pharmaceutical Chemistry**, *S.Chand and Company Ltd., 2006, New Delhi.*

REFERENCE BOOKS

1. *Lakshmi S.*,**Pharmaceutical Chemistry,** *S. Chand & Sons,New Delhi, 1995.*

2. *Ashutosh Kar,* **Medicinal Chemistry,** *Wiley Eastern Ltd., New Delhi, 1993.*

3. *David William & Thomas Lemke*, **Principles of Medicinal Chemistry,** *Foyers, 5th Edition BI publishers, 2005.*

4. *Romas Nogrady,***Medicinal Chemistry,** *II Edition, Oxford Univ.Press.,2004.*

17UCY6EA	ELECTIVE: 2 DYE CHEMSITRY	SEMESTER – VI

PREAMBLE

- To understand the basic concepts of dye chemistry, basic terms of dye chemistry, knowledge about classification of dyes, know the chemistry of pigments and preparation of dyes

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To understand the basic concepts of dye chemistry and their properties.	K1, K2
CO2	Broadening the concept of dyes and theory behind the color chemistry.	K2,K3
CO3	To distinguish the different types of dyes based on their classifications and applications.	K2,K3
CO4	To have an insight on the preparation and application of the dyes.	K2, K3
CO5	To understand the requirement of pigment and their applications in different fields.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY6EA	ELECTIVE: 2 DYE CHEMISTRY	SEMESTER VI

Credits: 4
Hours /Week: 4

UNIT - I

Introduction to the dyes

Requisites of true dyes. Textiles fibres, Dyeing - ionic interaction, hydrogen bond vanderwalls interaction and covalent bonds. Basics operation in the dyeing process, various methods of dyeing - Direct, vat, mordant and disperse dyeing, formation of the dye on the fibre, dyeing of the wool with acid dyes and dyeing with reactive dyes. Fastness properties- colour, light, sublimation and burnt gas fumes fastness.

UNIT - II

Colour and constitution

Colour and constitution – Relationship of colour observed to wave length of light observed – terms used in colour chemistry – Chromophores, Auxochromes, Bathochromic shift and Hypsochromic shift. Colour of a substance –quinonoid theory, molecular orbital theory.

UNIT - III

Classification of dyes

Classification according to their applications - acid dyes, basic dyes, azoic dyes, mordant dyes, vat dyes, sulphur dyes and disperse dye.s. Azo dyes – principles governing azo coupling – mechanism of diazotisation – coupling with amines, coupling with phenols. Types of azo dyes –acidic azo dyes (methyl orange,metanil yellow), basic azo dyes (bismark brown,chrysodine G), direct dyes (congo red).

UNIT - IV

Preparation of dyes

Synthesis and applications of Diphenyl methane dyes (Auramine O Auramine G) and Triphenyl methane dyes (Malachite green, pararosaniline, crystal violet), phthalein dyes (Phenolphthalein, Phthalein), Xanthene dyes (Fluorescein, Eosin), acridine dyes (Acridine Orange NO) ,sulphur dyes, Phthalocyanines, Cyanine dyes. (anyone dye in equation)

UNIT - V

Non-textile applications of dyes and pigments

Application of dyes in other areas- medicine, chemical analysis, cosmetics, colouring agents,food and beverages. Pigments – requirements of a pigment. Typical organic and inorganic pigments – applications and their uses in paints. Reaction of dyes with fibres and water – fluorescent brightening agents.

TEXT BOOKS

1. *Gurdeep Chatwal* , **Synthetic Dyes**, *Himalaya Publishing House, New Delhi, 1990.*
2. *M.G.Arora,* **Text Book of Dyes,** *Anmol Publications Private Ltd. New Delhi, 1996.*
3. *B.K.Sharma* , **Industral chemistry**, *6th edition.*

REFERENCE BOOKS

1. *E.N. Abraham,* **Dyes and Their Intermediates**, *Bergamon Press, 1969.*
2. *H. A. Lubs,* **The Chemistry of synthetic dyes and pigments**, *ACS publication, Halner, 1970.*
3. *K.Venkataraman,* **The Chemistry of Synthetic Dyes,** *Vol.I, II, III & IV, Academic Press N.Y., 1949.*

4. *F. P. Schafer,* **Physical and Chemical Applications of Dyestuffs**, *Springer – Veriag N.Y., 1976.*

5. *I.L Finar,* **Organic Chemistry**, *Vol II, ELBS, 2009*.

17UCY6EB	Elective –II NANO and Green Chemistry	SEMESTER – VI

PREAMBLE

- To understand the basics of nano chemistry, methods to prepare nano materials, an idea about Green Chemistry and its limitations, about Green solvents in laboratory and also in Industry, the Reactions and applications of Green Chemistry

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Gain knowledge in the basics of nano science and their classification. To apply the principles of nano science in carbon nanotubes.	K2,K3
CO2	To understand the few methods of preparation of nanomaterials based on chemical and photochemical methods.	K2, K3
CO3	To develop the basic knowledge of the various principles involved in green chemistry and their advantages.	K2, K3
CO4	To compare the green solvent-mediated reactions with traditional reactions.	K3
CO5	Analyze the applications of green solvent in various organic naming reactions.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	S	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY6EB	ELECTIVE-II NANO AND GREEN CHEMISTRY	SEMESTER VI

Credits: 4
Hours /Week: 4

UNIT - I

Introduction to Nanoscience

Definition of Nanomaterials – classification (1D, 2D and 3D) with examples - Synthesis top down and Bottom up Approach - Carbon Nanotubes – Types, properties and uses.

UNIT - II

Preparation of Nanomaterials.

Co-precipitation- sol- gel - chemical reduction- photochemical reduction – hydrothermal and solvothermal synthesis.

Unit - III

Green Chemistry: Introduction-definition- Need for green chemistry- Goals - Limitations – Progress of Green Chemistry - principles of green chemistry- Concept of Atom economy- Concept of Selectivity.

Unit - IV

Green Solvents: Green solvents – super critical carbondioxide, ionic liquids - Water as greener solvent- reactions in ionic-liquid, solvent free reaction. Solvent less reaction – Microwave reactions – sonications.

Unit -V

Green Reactions: Green reactions- Aldol condensation (Acid catalyst, Crossed aldol), Claisen rearrangement, Clemmensen reduction, Diels-Alder reaction.

TEXT BOOKS

1. *S. Shanmugam*, **Nanotechnology**, *M.J.P. Publishers, Chennai, 2010.*

2. *V. Kumar,* **An Introduction to Green Chemistry**, *Vishal Publishing Co., 2008.*

3. *V.K. Ahluwalia*, **Green Chemistry**, *Ane Books India, New Delhi, 2006.*

REFERENCE BOOK

1. *G. Cao,* **Nanostructures & Nano Materials**, *Imperial College Press, U.K, 2004.*

17UCY6EC	ELECTIVE: 2 FORENSIC SCIENCE AND CRIME INVESTIGATION	SEMESTER –VI

PREAMBLE

- To give the students the importance of forensic chemistry and an exposure to find and analyse a suitable method to detect the crime.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Demonstrate competency in the principles of crime scene investigation, including the recognition, collection, identification, preservation, and documentation of physical evidence.	K1, K2
CO2	Identify and examine the issues occurring during accidents, transportation of corrosive chemicals from tanks.	K2,K3
CO3	To acquire fundamental principles of physical and biological sciences. To apply scientific principles in gathering and interpreting scientific data.	K2,K3
CO4	To use their primary scientific literature effectively in their own research. To describe the scientific progress that has led to their research. To draw appropriate conclusions from evidence and experimental data.	K2, K3
CO5	To demonstrate the ability to document and orally describe crime scenes, physical evidence and scientific processes.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UCY6EC	ELECTIVE: 2 FORENSIC SCIENCE AND CRIME INVESTIGATION	SEMESTER- VI

Credits: 4
Hours /Week: 4

UNIT - I Food Adulteration

Contamination of wheat, rice, dhal, milk, butter, etc. With clay, sand, stone, water and toxic chemicals (e.g. Kasseri dhal with mentanil yellow).

Food poisons: natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, Follidol), Chemical poisons (KCN). First aid and Antidotes for poisoned persons.

Heavy metal (Hg, Pb, Cd) Contamination of Sea food. Use of neutron activation analysis in detecting poisoning (e.g., As in human hair)

UNIT - II Transportation

Drunken driving: brath analyzer for ethanol. Incendiary and timed bombs in road and railway tracks. Defusing live bombs.

Hit -and-go traffic accidents : paint analysis by AAS. Soill of toxic and coorosive

chemicals (e.g., conc.acids) from tankers.

UNIT - III Crime Detection

Accidental explosions during manufacture of matches and fire-works (as in Sivakasi). Human bombs, possible explosives (gelatin sticks,RDX). Metal detector devices and other security measures for VVIP. Composition of bullets and detection of powder burns.

Scene of crime: finger prints and their matching using computer records. Smell tracks and police dogs. Analysis of blood and other body fluids in rape cases. Typing of blood. DNA finger printing for tissue identification

in dismembered bodies. Blood stains on clothing. Cranial analysis (head and teeth).

UNIT - IV Forgery and Counterfeiting

Detecting forgery in bank cheques / drafts and educational records (mark lists, certificates), using UV-light. Alloy analysis using AAS to detect counterfeit coins. Checking silverline water mark in currency notes. Jewellery : detection of gold purity in 22 carat ornaments, detecting gold plated jewels, authenticity of diamonds (natural, synthetic, glassy).

UNIT - V Medical Aspects

AIDS : Cause and prevention . Misuse of scheduled drugs. Burns and their treatment by plastic surgery. Metabolite analysis, using mass spectrum - gas chromotography. Detecting steroid consumption among athletes and race horses.

REFERENCE BOOK

1. **Criminalistics and introduction to forensic science**-*Richard Saferstein, Prentice Hall of India-1978.*

2. **Forensic Science –***T.H.James-Stanley Thornes ltd.1987*

17UCY6ED	Elective : 3 Polymer Chemistry	SEMESTER – VI

PREAMBLE

➢ To impart knowledge about the preparation and properties of polymers of industrial importance and to know about the need as well as importance of

polymer chemistry.

Course Outcomes

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To impart knowledge about the basics of polymers and their classification To differentiate the properties of plastics, elastomers and adhesives.	K2, K3
CO2	To have detail information on different types of polymerization.	K3
CO3	To acquire the detail conception in stereospecific polymers and their physical properties.	K3
CO4	To know about the utility and preparation of commercial polymers. To explore the application of biomedical polymers.	K3
CO5	To develop a deep knowledge on the polymerization and polymer processing techniques.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY6ED	ELECTIVE: 3 POLYMER CHEMISTRY	SEMESTER VI

Credits: 4
Hours /Week: 4

UNIT - I

Polymers

Basic concepts such as monomers, polymers, polymerization, degree of polymerization, classification of polymers.

Plastics - Definition, thermoplastic, thermosetting plastics, reinforced plastic.

Elastomers**,** Spandex - Definition, natural and synthetic rubber, smoked rubber, reclaimed rubber, foam rubbers, spongy rubber, laminate rubber.

Adhesives - Definition, thermosetting and thermoplastic resins.

UNIT -II

Mechanism of polymerization

Types - Chain polymerization, Free radical polymerization, Ionic polymerization, Step polymerization, Addition polymerization. Co-polymerization - Conditions of formation of block, alternate and random copolymers. Methods of formation of block and graft copolymers.

UNIT - III

Polymer stereochemistry

Stereospecific polymers -Factors influencing stereo regulations, tacticity of polymers- Tactic, atactic and syndiotatic – Tactic forms of polymers of mono substituted and 1,2- disubstituted ethylenes, Zeigler-Natta catalysts, metallocene catalysts .Mono metallic and bimetallic

mechanisms of Zeigler - Natta polymerization, crystalline and amorphous state, methods of determination of degree of crystallinity, glass transition temperature - Factors influencing T_g - Determination of T_g - Glass tansitition temperature of copolymer, importance of Tg,- Visco elastic state - Properties of elastomers.

UNIT - IV

Chemistry of commercial polymers

General methods of preparations- properties and uses of the following polymers. Polyethylene, PVC, Polystyrene, Polyester, Phenol formaldehyde resin, Urea formaldehyde resin, Teflon, Nylon, polyamide (kevelar), Poly methyl methacrylate.

Polymers for biomedical applications.

UNIT - V

Polymer technology

Polymerisation techniques: Bulk, solution, suspension and emulsion polymerization. Polymer processing techniques- calendaring, film casting, die casting, extrusion, compression moulding, injection moulding, blow moulding and foaming.

TEXT BOOKS

1. *Arora M.G. Singh, Yadav M.S.*, **Polymer chemistry**, *Anmol publications Pvt ltd., NewDelhi, 1989.*

2. *B.K.Sharma*, **Polymer chemistry,** *1989*

3. *V.R. Gowariker, N.V.Viswanathan, Jayadev Sreedhar, 2005*, **Polymer science,** *New Age International Ltd.*

REFERENCE BOOKS

1. *Fred. W. Billmeyer, 2002,* **Text book of polymer science**, *Wiley Eastern ltd., 3rd Edn.*

2. *Bahadur and N.V. Sastry, 2002,* **Principles of polymer science –***Narosa Publishers, 1st Edn,*

3. *M.P. Stevens, 2009,* **Polymer chemistry- An Introduction**, *oxford publications, 3rd* Edn

4. *J.R. Fred, 2003,* **Polymer Science & Technology**, *Prentice Hall of India, 2nd Edn.*

17UCY6EF	ELECTIVE: 3 DAIRY CHEMISTRY	SEMESTER – VI

PREAMBLE

- To gain knowledge about the chemistry of milk and milk products, to learn the principles and methods involved in the manufacture of milk products.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To know the chemistry of milk and milk products	K3
CO2	To know the basics of milk proteins, milk lipids, milk carbohydrates, and milk vitamins.	K2,K3
CO3	Understanding the production and composition of milk products.	K2
CO4	By applying the acquired knowledge of dairy products, analyze the constituents of milk products.	K3
CO5	To deepen the knowledge in the various applications of milk products.	K3,K4

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY6EF	ELECTIVE: 3 DAIRY CHEMISTRY	SEMESTER VI

Credits: 4
Hours /Week: 4

UNIT - I

Milk: Definition-General composition of milk-physical properties of milk-colour, odour, acidity-natural and developed, specific gravity-Recknagel effect viscosity and conductivity, factors affecting the gross competition of milk, physico-Chemical change taking place in milk due to processing parameters-boiling pasteurization- sterlilzation and homogenization.

Adulterants, preservatives and neutralizers-example and their detection. Estimation of fat, specific gravity, acidy and total solids in milk.

UNIT - II

Milk lipids-terminology and definitions classification – saponifiable (triglycerodes) and unsaponifiable matters (sterols and cholesterol) phosphor lipids structure and properties (Lecithin and Cephalin) Milk fat constants-refractive index-saponification number, Iodine number, R.M.number, R.M number and polenske number.

Milk proteins-Chemistry of proteins in general structure-N-terminal and Cterminal, hydrogen bond, disulphide bond and salt linkages, outlines of primary, secondary and tertiary structure of proteins. Physical properties of milk proteins- Electrical properties and hydration, solubility. Reaction of milk properties with formaldehyde and ninhydrin. Non-protein nitrogen constituents of milk, effect of heat on milk protein, milk enzyme and functions.

Milk carbohydrate-Lactose-Its structure, solubility, hydrolysis, Oxidation and reduction, Estimation of lactose in milk.

Milk vitamins-water and soluble vitamins, effect of heat and light on vitamins. Ash and mineral matters in milk.

UNIT - III

Creams - Definition-composition-chemistry of creaming process-gravitational and centrifugal methods of separation of cream-Factors influencing cream separation (Mention the factors only)-Cream neutralization. Estimation of fat in cream.

Butter - Definition-% composition-manufacture-Estimation of fat, acidity, salt and moisture content-Desi butter.

Ghee - Major constituents-common adulterants added to ghee and their detection rancidity- definition-types (hydrolytic, oxidative and ketonic) prevention- antioxidants and synergists (natural and synthetic)-Measurements.

UNIT - IV

Fermented milk products - Fermentation of milk-definition, conditions, cultured milk-definition of culture-examples, conditions, types-cultured cream-cultured butter milk-Bulgaricus milk-acidophillus milk-yogurt. Racteriophage-definition and its function.

Indigenous products - Definition percentage composition-preparation-physicochemical changes take place during khoa-making-khoa sweet-Gulab jamum, chana sweet-Rossogolla-ingredients and preparation.

Ice cream - Definition-percentage composition-types-ingredients needed manufacture of ice-cream stabilizers-emulsifiers and their role.

UNIT - V

Milk powder - Definition-need for making powder-drying process-spray drying, drum drying, jet drying and foam drying-principles involved in each.

Manufacture of whole milk powder by spray drying process-keeping quality of milk powder.

Dairy Detergents - Definition-characteristics-classification-washing procedure (modern method) sterilization-chloramin-T and hypochlorite solution.

REFERENCE BOOKS

1**. Outlines of Diary Technology**-*Sukumar De*

2. **Principles of Dairy Chemistry**-*Robert Jenness & S.Patorn.*

3. **Indian Diary products**-*K.S. Rangappa and K.T. Achaya.*

4. **Modern Diary Products**-*L.M. Lampert.*

5. **Principles of Dairy processing**-*Warner.*

17UCY6EG	Elective : 3 Leather chemistry	SEMESTER – VI

PREAMBLE

- To gain knowledge about the structure and composition of hides, to learn the different methods of tanning leather, to understand the pollution problems caused by tannery effluents.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To obtain the knowledge on the structure and composition of the hides, skin and Leather To know the basic principles involved in the pre-training methods of leather manufacture.	K2, K3
CO2	To know the different types of tanning and the physico-chemical principles.	K3
CO3	To widen a skill on the preparation and chemistry of chrome tanning liquids and their factors involving in it.	K3
CO4	To explore the broad idea on the chemical methods of curing and preserving the hides in different medium.	K3
CO5	To understand the problems caused by tannery effluents and to develop the method to dispose the tannery waste in safe manner.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	S	S

S – Strong; M - Medium; L – Low

17UCY6EG	ELECTIVE: 3 LEATHER CHEMISTRY	SEMESTER VI

Credits:4
Hours /Week: 4

UNIT - I

Introduction-chief process used in leather manufacture. Hides, Skins, Leather – An elementary knowledge of the structure and composition of hides and skins. Proteins and their characteristics, Anatomy and histology of protein constituents of leather (an elementary concept).Basic principles involved in pre-training such as soaking, lining, deliming, bating, pickling and depickling.

UNIT - II

Types of tanning – vegetable and mineral tanning, different types of vegetable tanning–materials classification and chemistry of vegetable tanning. Factors and Physico-chemical principles involved in vegetable tanning, Fixation of vegetable tanning.Synthetic tanning – their classifications, general methods of manufacture and use.

UNIT - III

The preparation and chemistry of chrome tanning liquids, Olation, Oxolation and hydrolysis of chrome liquids. Effect of adding tanning agents – Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning- chemistry of neutralization process. A brief survey of chemistry of other tanning materials like Al, Zr and Te salts and their relative merit in contrast with chrome tanning. Chemistry of combination of tannages involving vegetable tanning aldehyde chrome and other tanning agents.

UNIT - IV

Chemical methods of curing and preservation of hides and skins in acid and alkaline solutions. Principles of Analytical methods employed in curing, liming, deliming, bating, pickling. Analysis of vegetable tanning materials and extract. Process of dyeing leather – use of mordant, dyeing auxiliaries such as leveling, Wetting and dispersing agents – dye fixations.

UNIT - V

Animal by-products – their collection, handling and preservation methods (such as hair, blood, bones, glands, keratinous materials and their utilization).Tannery effluents and treatment: Types of water pollution – physical, chemical, physiological and biological. Different types of tannery effluents and waste- beam-house waste – liquors – tanning and finishing yard waste liquors, solid waste – origin and disposal.

TEXTBOOKS

1. *B.K.Sharma,2008,***Industrial chemistry,***Goel publishing House,Meerut*.

2. *Jayashree Ghosh,* **Reprint 2008, Fundamental Concepts of Applied Chemistry,** *S.Chand & Company Ltd*

3. *P.C.Jain, M.Jain, 2007*, **Engineering Chemistry**, *Dhanpat Raj Publishing Company Pvt Ltd, 15th Edn*

17UED34C	NON MAJOR ELECTIVE COURSE: I CHEMISTRY IN DAILY LIFE - I	SEMESTER – III

PREAMBLE

- To learn about the chemistry involved in our daily life.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Basic understanding of water technology and acquire knowledge in the treatment of water for multi-purpose.	K1, K3
CO2	Study on the manufacture of alcohol and alcoholic beverages.	K1,K2
CO3	To understand the chemistry involved in manufacture of fatty acids.	K2
CO4	To design a demonstration, that provides an opportunity to identify adulteration in food standards.	K2, K3
CO5	Broadening the knowledge about paints and pigments.	K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	M	S
CO4	M	S	M	S	S
CO5	M	M	S	S	S

S – Strong; M - Medium; L – Low

17UED34C	NON MAJOR ELECTIVE COURSE: I CHEMISTRY IN DAILY LIFE – I	SEMESTER III

Credits: 2
Hours /Week: 2

Unit - I

Water Treatment

Introduction – Sources and Uses of Water – Water for Industrial Purposes – Quality of Normal water – water in human body – Hardness of water – Types -Softening of Water – Soda – Lime Process, Zeolite, and Ion-exchange Processes (principles only). Demineralization of water – Treatment of Water for Municipal purposes – Desalination of Brackish Water – Electro dialysis – Reverse Osmosis Method (principles only).

Unit - II
Fermentation

Introduction – Conditions for Fermentation – Characteristics of Enzymes –Fermentation Processes – Alcohol Beverages – Wine, Beer-Manufacture of Spirits – Whisky – Wine Vinegar – Manufacture – Manufacture of Power Alcohol – Alcohol from Molasses, Starch, Hydrocarbon gases – Uses.

Unit - III
Oils, Fats, Waxes and Soap

Waxes – Classification – Solubility – Saponification value –Manufacture of Candles – Hydrocarbon in Candles – Hydrogenation – of Oils – Soaps –Manufacture – detergents – Cleansing Action of Soaps.

Unit - IV
Food Adulteration and Hygien

Definition of Adulteration of Food – Common Adulterants in Different Foods – Toxic Effects of Some Metals and Chemicals – Contamination of Foods with Harmful Microorganisms – Detection of Adulteration in Some

Common Food items – Food Additives and Preservatives – Food standards.

Unit – V

Paints

Classification – Requirements of a good paint -Importance of PVC – Paint Failure. Emulsion Paints , Enamels , Lacquers and Varnishes – constituents and Manufacture.

TEXT BOOKS / REFERENCES

1. *B.K. Sharma,* **Environmental Chemistry**, *Krishna Prakasam Medai (P) Ltd., Meerut, 6th Revised Edn., (2001).*

2. *P.C. Jain and Monika Jain,* **Engineering Chemistry**, *Dhanpat Rai & Sons, Delhi*

3. *M. Swaminathan,* **Food & Nutrition**, *Bappco, 2nd ed. (2011).*

4. *B. Sri Lakshmi*, **Food Science,** *New Age, 5th ed. (2011).*

5. *Jayashree*, **Applied Chemistry**, *S. Chand, 3rd ed. (2013).*

17UED44C	NON MAJOR ELECTIVE COURSE: 2 CHEMISTRY IN DAILY LIFE - II	SEMESTER – IV

PREAMBLE

- To gain knowledge about chemistry involved in food processing and medicinal aspects.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Understanding the role of chemistry in the day to day life. Acquire knowledge about pollutants.	K2, K3
CO2	Understanding the facts and applications of milk and milk products.	K2,K3
CO3	Gain knowledge in drug chemistry. Demonstrate the composition of blood and extend the concept to identify the chemical reactions occurring in our body.	K2,K3
CO4	Acquire knowledge about the role of diet in specific diseases.	K3
CO5	Understand the role of medicinal plants and to examine its properties in various fields.	K3,K4

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	M	S	S	M	S
CO3	S	S	S	S	M
CO4	S	M	S	S	S
CO5	S	S	M	S	S

S – Strong; M - Medium; L – Low

17UED44C	NON MAJOR ELECTIVE COURSE: 2 CHEMISTRY IN DAILY LIFE – II	SEMESTER IV

Credits:2

Hours /Week: 2

Unit - I

Chemistry in day today life

Dry Cleaning of Clothes, Versatile Bleaching Agents. Environmental Pollution by Volatile Organic Solvents / Compounds (VOCs).

Lubricants

Definition, function of lubricants and properties. Examples, classification of lubrication, additives for lubricating oils, synthetic lubricants, greases and solid lubricants.

Unit - II

Milk and Milk Products

Milk, Changes at Room Temperature, Methods of Routine Examination of Milk. Classification of bacteria, acid products, peptonizing organisms, fat splitters, pathogens. Milk Products – Butter, Cheese, Fermented Milk, Curd, Yogurt, Abnormal Changes in Milk and Milk Spoilage, Preservation of Milk and Milk Products.

Unit - III

Drugs

Cardiovascular drugs, action, dosage and examples of cardiac glycosides, antiarrhythemic drugs, antihypertension drugs and vascodialator.

Blood and Hametalogical agents

Composition of blood, blood grouping and matching, role of blood as oxygen carrier, blood pressure, coagulation of blood. Determination of blood urea (using urease method only).

Unit - IV

Special diets for specific diseases

Peptic ulcer, diabetes, mellines, infective hepatitis, heart disease and hypertension.

Unit - V

Indian medicinal plants

Medicinal properties and uses of Hibiscus Rosasinesis, adathoda vasica, Ocimum sanchum, Mangifera Indica, Azadirachtra Indica, Phyllantum Niruri, Solatum Trolbafum.

TEXT BOOKS / REFERENCES

1. *P.C. Jain and Monika Jain,* **Engineering Chemistry**, *Dhanpat Rai & Sons, Delhi.*

2. *V. Thiagarajan*, **Pharmaceutical Chemistry**, *Educational Publishers.*

3. A.K. De. Environmental Chemistry.

4. *B. Sri Lakshmi,* **Food Science**, *New Age, 5th ed. (2011).*

17UCYSS1	SELF STUDY PAPER CHEMISTRY IN THE SERVICE OF MANKIND	SEMESTER – III

PREAMBLE

- To gain knowledge about the techniques involved in the processing of commercial products.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	Know about renewable and non-renewable resources.	K1, K2
CO2	To study about natural and synthetic polymers. To know the needs and requirements of the fertilizers.	K1, K2 & K3
CO3	Broaden the knowledge in the sources and the functions of vitamins. To distinguish the properties of some important drugs.	K2, K3
CO4	To have an insight idea on the surface coatings and paints.	K2, K3
CO5	To acquire knowledge in the industrial preparation of paper, sugar, cement, glass.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	M	S	M	S	S
CO3	S	S	S	M	M
CO4	S	M	S	S	S
CO5	S	S	M	S	S

S – Strong; M - Medium; L – Low

16UCYSS1	SELF STUDY PAPER CHEMISTRY IN THE SERVICE OF MANKIND	SEMESTER – III

Credits:1

Unit - I

Fuels and Energy Resources

Types of fuels - liquid fuels - petroleum products – gaseous fuel - coal gas, producer gas and bio gas - Rocket fuels - solid and liquid propellants - nuclear fuels - difference between nuclear and chemical fuels. Renewable sources of energy - solar energy, wind energy and tidal energy.

Unit - II

Polymers and Fertilizers

Chemistry of some important polymers - synthetic fibres - nylons, polyester – synthetic rubber - polyurethane rubber – reclaimed rubber - sponge, foam rubber, thermocol - polymerization techniques - bulk, solution, suspension, emulsion polymerization.

Plant nutrients - need and requirements - natural and artificial fertilizer - urea, triple super phosphate, muriate of potash – complex fertilizers.

Unit - III

Vitamins and Drugs

Vitamins - Water soluble vitamins - Vitamin B and C - fat soluble vitamins - A, D, E & K -sources - physiological functions and deficiency symptoms.

Drugs - some important drugs - antibacterials – sulphonamide - antipyretics - aspirin - antimalarials - paludrine - antibiotics - penicillin.

Unit - IV

Surface Coatings

Pretreatment of the surface metallic coating, galvanizing, tinning, inorganic coatings, organic coatings, oil paints, water paints, special paints, enamels and lacquers.

Unit - V

Industrial Processes

Small scale units - manufacture of candles, safety matches, soap and naphthalene balls, shoe polish, gum paste, fountain pen ink, Chalk crayons, plaster of paris and silicon carbide crucibles.

Large scale units - manufacture of pulp and paper, sugar, glass, ceramics and cement.

REFERENCES

1. *B.K. Sharma,* **Industrial Chemistry**, *Goel Publishing House, 12th Edition, 2001.*

2. *P.C. Jain and Monica Jain,* **Engineering Chemistry**, *Dhanpat Rai and Sons, 15th edition 2006.*

3. *George and T Austin*, **Shreve's Chemical Process Industries**, *McGraw Hill Book Co, 1984.*

17UCYSS2	SELF STUDY PAPER COSMETIC CHEMISTRY	SEMESTER –III

PREAMBLE

- To know about the major constituents and the chemistry involved in beauty care products.

COURSE OUTCOMES

In the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Knowledge Level
CO1	To know about the chemical constituents and composition of hair care products.	K1, K2
CO2	To identify and differentiate the skincare products according to their constituents.	K2, K3
CO3	To understand the manufacturing methods involved in colour cosmetics.	K1, K2
CO4	To know about the dental products and their importance.	K1, K2, K3
CO5	Understand the constituents and manufacturing methods of bath powders.	K1, K2, K3

MAPPING WITH PROGRAMME OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	S	S	S
CO5	M	S	S	M	S

S – Strong; M - Medium; L – Low

17UCYSS2	SELF STUDY PAPER COSMETIC CHEMISTRY	SEMESTER –III

Credits:1

Unit - I

Hair Care Products

Shampoos – principal constituents – thickeners and foam stabilizers– perfumes –preservatives – conditioning agents – antidandruff shampoos.

Hair cream – composition – hair dyes – types – constituents – dye removals

Unit - II

Skin Care Product

Skin cleansers – classifications – cold cream – cleansy milk – moisturizers – hand and body lotions – sun screen lotions – constituents

Unit - III

Colour Cosmetics

Lipstick – constituents – manufacturing method – lip glosses – nail polish – formulation – manufacture – face powder – constituents.

Unit - IV - Dental Product

Oral care product – product categories – toothpaste – toothpowder – oral rinses – mouth washes.

Unit - V - Bath Powder Preparation

Bath powders – soap and detergents – constituents – manufacture.

REFERENCES

1. **Modern Technology of Cosmetics,** *Asia Pacific Business Press Inc., New Delhi, 2004*

10/01/2018
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