ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

CUDDALORE-1

PG & RESEARCH DEPARTMENT OF CHEMISTRY

UG - SYLLABUS 2018-2019

B.Sc. CHEMISTRY

CURRICULUM DESIGN TEMPLATE FROM 2018- 2019

Semester	Code	Part	Course Title	Hours	Credit
I	LT101T/LH101S/LF101	I	Tamil-I / Hindi-I / French-I	4	3
	LE101T	II	Communicative English - I	4	3
	CH101T	III	Organic Chemistry-I	4	3
	CH102Q	III	Kinetic Theory of Gas and Chemical Kinetics	4	3
	CHP201S	III	*Practical Chemistry-I Volumetric Analysis	3	2
	AMT101	III	Allied Mathematics-I	8	5
	VE101T	IV	SEC- Value education	3	2
			Total	**30**	**21**
II	LT202T/LH202S/LF202	I	Tamil-II / Hindi-II / French-II	4	3
	LE202T	II	Communicative English - II	4	3
	CH203T	III	Inorganic Chemistry-I	4	3
	CH204Q	III	Analytical Chemistry-I	4	3
	CHP202	III	Practical-Inorganic Qualitative Analysis and Preparations	3	2
	AMT202S	III	Allied Mathematics-II	8	5
	EPB201T	IV	SEC- Dynamics Of Personality	3	2
			Total	**30**	**21**
III	LT303T/LH303S/LF303	I	Tamil-III / Hindi-III / French-III	4	3
	LE303S	II	Communicative English - III	4	3
	CH305T	III	Inorganic Chemistry-II	4	4
	CH306S	III	Analytical Chemistry-II	4	4
	CHP403	III	*Practical-Qualitative Organic Analysis	3	2
	APH301S	III	Allied Physics	5	3
	APHP301	III	Practical-Allied Physics Practical	3	2
	AOCT301	IV	Food processing technology	3	4
			Total	**30**	**25**
IV	LT404T/LH404S/LF404	I	Tamil-IV / Hindi-IV / French-IV	4	3
	LE404S	II	Communicative English - IV	4	3
	CH407S	III	Organic Chemistry -II	4	4
	CH408T	III	Introduction To Molecular Structure	4	4
	CHP404	III	Practical-Physical Methods	3	2
	ACCH401S	III	Allied Computer in Chemistry	5	3
	ACCHP401	III	Allied practical - Computers in Chemistry	3	2
	EVS401	IV	Environmental Science	3	2
			Total	**30**	**23**
V	CH509S	III	Organic Chemistry-III	4	4
	CH510T	III	Inorganic Chemistry-III	4	4
	CH511S	III	Equilibrium Thermodynamics of Gaseous Systems	4	4
	ECH512	III	**Elective Paper-I** 1.Analytical Techniques	4	3

	ECH512A		2. Forensic Chemistry		
	ECH513 ECH513A	III	**Elective Paper – II** 1. Chemistry of Industrial Products 2. Food Chemistry	4	3
	CHP506	III	Practical-Gravimetric Estimation Practical	4	2
	CHP507S	III	Practical – Analytical Chemistry Practical	3	2
	CHP505S	III	Practical - Physical Chemistry Practical	3	2
			Total	**30**	**24**
VI	CH614T	III	Organic Chemistry-IV	4	4
	CH615S	III	Inorganic Chemistry-IV	4	4
	CH616T	III	Thermodynamics of Ideal and non-ideal solutions	4	4
	ECH617T ECH617A	III	**Elective Paper – III** 1. Medicinal Chemistry 2. Agricultural Chemistry	4	3
	ECH618 ECH618A	III	**Elective Paper – IV** 1. Polymer Chemistry 2. Green Chemistry	4	3
	JCH601	III	Project Work	10	6
			Total	**30**	**24**
	EU601	V	Extension Activities		**2**
			TOTAL CREDITS	**180**	**140**

*End of the Academic Year

Courses Offered to other Departments

Semester	Code	Class	Part	Course Title	Hours	Credit
I	ACH101T	B.Sc. (Biochem)	III	Allied Chemistry – I	5	3
	ACHP101	B.Sc. (Biochem)	III	Practical - Allied Chemistry Practical - I	3	2
	ACH101T	B.Sc. (Zoology)	III	Allied Chemistry – I	5	3
	ACHP101	B.Sc. (Zoology)	III	Practical - Allied Chemistry Practical - I	3	2
II	ACH202T	B.Sc. (Biochem)	III	Analytical Chemistry	5	3
	ACHP202S	B.Sc. (Biochem)	III	Practical - Allied Chemistry Practical - II	3	2
	ACH202T	B.Sc. (Zoology)	III	Analytical Chemistry	5	3
	ACHP202S	B.Sc. (Zoology)	III	Practical - Allied Chemistry Practical – II	3	2
III	ACH301S	B.Sc. (Physics)	III	Allied Chemistry for Physics	5	3
	ACHP301	B.Sc. (Physics)	III	Allied Chemistry Practical	3	2

I B.Sc. (CH)	ORGANIC CHEMISTRY – I For the students admitted in the year 2014	CH101T
SEMESTER – I		HRS/WK – 4
CORE - 1		CREDIT – 3

Objective:

To understand the basic concepts of Organic Chemistry and naming organic molecules.

COURSE OUTCOMES (COs)

CO1: Understanding of the basic principles of Organic Chemistry and the IUPAC rules for naming organic molecules.

CO2: Knowledge of Preparation and Reactions of the Hydrocarbons like Alkanes, Alkenes and Alkynes.

CO3: Knowledge of Preparation and Reactions of Dienes and Allenes.

CO4: Knowledge and understanding of Conformational isomerism and Geometrical isomerism.

CO5: Knowledge of methods of distinguishing geometrical isomers

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: CH101T					TITLE OF THE COURSE: ORGANIC CHEMISTRY – I								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	3	4	4	2	4	4	3	4	4	4	4	3.61	
CO2	4	3	3	4	4	2	3	4	3	4	4	4	4	3.53	
CO3	3	3	3	4	3	2	3	4	3	4	3	4	4	3.30	
CO4	3	3	3	4	3	2	3	4	3	4	3	4	4	3.30	
CO5	3	3	3	4	3	3	3	4	3	4	4	4	4	3.46	
Mean Overall Score														3.44	

Result: The Score of this Course is 3.44 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: BASIC CONCEPTS. [12 Hrs]

1.1 IUPAC nomenclature of organic compounds- naming of simple organic Molecules , practicing line formula for organic molecules

1.2 Geometry of molecules – Hybridisation sp^3, sp^2, sp with examples.

1.3 Cleavage of Bonds – Homolytic and heterolytic cleavage.

1.4 Bond energy, Bond length and Bond angle.

1.5 Electron displacement effects – inductive, inductomeric, electromeric, resonance, hyperconjugation and steric effects.

1.6 Reactive Intermediates: Carbocations, Carbanions, Carbenes and free radicals.

UNIT – II: ALKANES&CYCLOALKANES [12 Hrs]

2.1 Alkanes – methods of preparation: Wurtz reaction, hydrogenation of alkenes, hydrolysis of Grignard reagents, Kolbe's method. Physical and Chemical properties of alkanes.

2.2 Cycloalkanes – Preparation using Wurtz's reaction – Dieckmann's ring closure and reduction of aromatic hydrocarbons.

2.3 Substitution and ring opening reactions of cycloalkanes.

2.4 Bayer's strain theory and theory of strain less rings.

UNIT – III: ALKENES [12 Hrs]

3.1 Alkene Nomenclature - structure and bonding - Isomerism in Alkenes – properties – stability.

3.2 Preparation of Alkenes – Elimination reactions: Dehydration of Alcohols, Dehydrohalogenation of Alkyl halides. E1 and E2 mechanism. Hofmann and Saytzeff's rules – Problems related to these mechanism.

3.3 Addition reactions of Alkenes: Hydrogenation, Halogenation, Hydrohalogenation - mechanisms – Markovnikov's rule and Anti Markovnikov's rule. Mechanism of Hydration , Hydroboration, Ozonolysis, Hydroxylation with $KMnO_4$. Self-addition. Polymerization of Ethylene and Propylene problems.

UNIT – IV: ALKYNES AND DIENES [12 Hrs]

4.1 Alkynes – Sources of Alkynes - Nomenclature – acidity of alkynes – addition reactions – hydrogenation, Hydrohalogenation, Hydration with $HgSO_4$

4.2 Preparation of Alkynes by elimination reactions , Ozonolysis of alkynes Alkylation of alkynes using acetylides.

4.3 Dienes - preparation of dienes, classes of dienes - conjugated, isolated and cumulative - stability of dienes - addition of hydrogen halides & halogens to conjugated dienes - Polymerization of dienes– Diels-Alder reaction - Problems

4.4 Allenes – preparation and structure.

UNIT – V: STEREOCHEMISTRY – I [12 Hrs]

1.1 Conformational isomerism: Conformers, Dihedral angle, torsional strain.

1.2 Conformational analysis of ethane and n-butane,

1.3 Geometrical isomerism: Cis – trans, syn-anti and E-Z notations, Methods of distinguishing geometrical isomers using melting point, dipole moment, dehydration, cyclization and heat of hydrogenation.

Text Books:

1. Francis A.Carey, - Organic Chemistry- Tata McGraw Hill-1999.
2. Seyhan Ege- Organic Chemistry-A.I.T.B.S Publishers-1999.

Reference Books:

1. Ahluwalia and Parassar- Organic Reaction mechanisms, Narosa Publishers.2004.
2. Bahl & Arun Bahl- Advanced Organic Chemistry, Sultan Chand-1996.
3. Paula Yurkanis Bruice - Organic Chemistry, Prentice Hall- 1999.
4. E.L. Eliel and S.H.Wilers , Stereochemistry of Organic Compounds , John Wiley and sons , 2004.
5. P.S.Kalsi , Stereochemistry : Conformation and Mechanism , Wiley Eastern Ltd -2007.

I B.Sc (CH)	ORGANIC CHEMISTRY – I For the students admitted in the year 2014	CH101T
SEMESTER – I		HRS/WK – 4
CORE - 1		CREDIT - 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a maximum of two sub divisions)

I B.Sc (CH)	KINETIC THEORY OF GAS AND CHEMICAL KINETICS	CH102Q
SEMESTER – I		HRS/WK – 4
CORE-2	For the students admitted in the year 2014	CREDIT – 3

Objective:

To study about SI units and unit conversion, gaseous state and chemical kinetics.

COURSE OUTCOMES (COs)

CO1: Students acquire knowledge about units and their dimensions and knowledge about gaseous laws and their applications.

CO2: Students learn the kinetic gas equation and understand the concepts like diffusion, effusion and Collisions.

CO3: Students learn the concept of equilibrium and adsorption.

CO4: Knowledge of Chemical kinetics is given with problem-solving skills.

CO5: Students understand the knowledge of solutions, concentration terms and mesophases.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: CH102Q					TITLE OF THE COURSE: KINETIC THEORY OF GAS AND CHEMICAL KINETICS								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	4	3	4	2	3	4	3	3	3	4	4	3.30	
CO2	2	3	4	3	3	2	2	3	4	3	3	4	4	3.07	
CO3	2	3	4	3	3	2	3	4	4	4	4	4	4	3.38	
CO4	3	3	3	3	2	2	3	4	4	3	4	4	4	3.23	
CO5	3	3	3	4	3	2	2	3	3	4	4	4	4	3.23	
Mean Overall Score														3.24	

Result: The Score of this Course is 3.24 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I **[12 Hrs]**

1.1 Dimensions of units and its conversion.

1.2 The perfect gas equation of state – Boyle's law, Charle's law and Avogadro's principle.

1.3 Real gas equation –critical temperature – compression factor - Virial equations of state – Vanderwaals equation of state- Boyle temperature - joule –Thomson effect- Linde refrigerator (Pages 12 – 34)

UNIT – II **[12 Hrs]**

2.1 Kinetic model of gases laws from the kinetic gas equation – Kinds of speed – mean, rms, most probable velocities. Maxwell's distribution of molecular speeds –Variation with temperature and molar mass.

2.2 Combined gas equation- Standard temperature and pressure.

2.3 Mixture of gases: partial pressures- Dalton's law.

2.4 Diffusion and effusion-Molecular collisions. [Pages 17-34]

UNIT – III **[12 Hrs]**

3.1 Concept of equilibrium- law of mass action – relationship between Kp&Kc – effect of concentration, pressure, partial pressure, temperature & volume – Le Chatlier's principle

3.2 adsorption – terminologies – Gibbs adsorption isotherm – Friendlich – Langmiur – BET theory – adsorption isotherms – applications of adsorption

UNIT – IV **[12 Hrs]**

4.1 Concepts of reaction rates- rate and units of rate of a reaction- dependence of rate on concentration- rate expression and rate constant- order and molecularity.

4.2 Integrated rate equations-zero order, first order, pseudo first order reaction-half-life of a reaction - temperature dependence of the rate of a reaction- effect of catalyst.

UNIT – V **[12 Hrs]**

5.1 Solutions- types of solutions- concentration units of solutions- ideal and non ideal solutions.

5.2 Colloids- various types of classification – emulsions-applications of colloids.

5.3 Meso phases and disperse systems – liquid crystals- classification- surface,structure and stability- electrical double layer.(403-407)

Text Books:

1. P.W. Atkins.Elements of Physical chemistry. Oxford university Press.3rd edition.1990.
2. Puri and Sharma. Principles of physical chemistry. 40th edition.2003

Reference Book:

1. Arun Bahl, B.S.Bahl and G.D. Tuli . Essentials of Physical Chemistry. 26th edition (revised multicolour). 2009

I B.Sc (CH)	KINETIC THEORY OF GAS AND CHEMICAL KINETICS	CH102Q
SEMESTER – I		HRS/WK – 4
CORE-2	For the students admitted in the year 2014	CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a maximum of two subdivisions)

Conceptual descriptive and Problem solving type. 20% of the questions should be Problems (15marks out of 75 marks)

I B.Sc (BC & ZO)	ALLIED CHEMISTRY - I For the students admitted in the year 2014	ACH101T
SEMESTER – I		HRS/WK – 5
ALLIED-I		CREDIT – 3

Objectives:

To introduce basic concepts of co-ordination chemistry & chemical bonding. To study the important concepts of bio-organic chemistry, physical chemistry & polymer reactions. To understand the synthesis of currently used drugs and their potential use.

COURSE OUTCOMES (COs)

CO1: To introduce the basic concepts of organic chemistry and chemical bonding.
CO2: Students will learn the fundamental aspects of co-ordination chemistry and bio-inorganic chemistry.
CO3: To study few basic and important concepts of physical chemistry.
CO4: Students acquire knowledge about the basics of pharmaceutical chemistry and learn about few drugs.
CO5: Students learn some applied chemistry methods such as polymer chemistry and Biofuels.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: ACH101T					TITLE OF THE COURSE: ALLIED CHEMISTRY – I								HOURS: 5	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	3	4	3	3	4	3	4	3	3	4	3.46	
CO2	3	3	4	4	3	2	2	4	3	4	3	4	4	3.31	
CO3	4	3	4	3	4	2	3	4	3	4	4	4	4	3.54	
CO4	3	4	3	3	4	2	3	4	4	3	4	4	4	3.46	
CO5	3	4	3	3	3	3	2	3	4	4	3	4	4	3.31	
Mean Overall Score														3.42	

Result: The Score of this Course is 3.42 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: ORGANIC CHEMISTRY [12 Hrs]

1.1 Chemical bonding –Types of Bonding-Bonding in Carbohydrates and Proteins-Structure of Amino acids-Zwitter ion-Isoelectric Point – Structure of Proteins.

1.2 Stereoisomerism - Types, causes of optical activity of Lactic Acid & Tartaric acid – Racemisation - Resolution, Geometrical isomerism – Maleic acid &Fumaric acid.

1.3 Oxidation-Reduction reactions- selectivity in Oxidation and Reduction reactions.

UNIT – II: INORGANIC CHEMISTRY [12 Hrs]

2.1 Co-Ordination Chemistry: Definition of terms used-classification of ligands-Werner's theory

2.2 Biochemistryof iron--Heme proteins-Nature of Heme-Dioxygen Binding-Iron storage and Transport- Structure and function of haemoglobin, myoglobin.

2.3 BioChemistry of other metals- Zn-CarboxypeptidaseA, Carbonic anhydrase - Mg-chlorophyll.Co-VitaminB_{12}

UNIT – III: PHYSICAL CHEMISTRY [12 Hrs]

3.1 Thermochemistry-Units of Energy changes-Exothermic and Endothermic reactions-Heat of reaction- Different types of heat of reaction

3.2 IonicEquilibria-pH scale-Buffer solution-Types of Buffer Solution-Calculation of pH values of Buffer mixtures-Henderson equation

3.3 Acid-Basecatalysis-Bronsted relation-Enzyme catalysis-Michales-Menton equation-Influence of pH and temperature

UNIT – IV: PHARMACEUTICALCHEMISTRY [12 Hrs]

4.1 Developement of NewDrugs-Drug and Disease-Structure and activity-Additives and their role-Human Gene therapy- Animal and Synthetic Biotechnology

4.2 Mode of action and uses of sulpha drugs - Prontosil, sulphadiazine and sulphafurazole. Definition and one example of analgesics, antipyretics, transquilizers, sedatives, local and general anaesthetics.

UNIT – V: APPLIED CHEMISTRY [12 Hrs]

5.1 Macromolecules-Classification of Polymers-Chemistry of polymerization-Addition

5.2 Polymerisation-Condensation Polymerisation-Coordination Polymerisation-Dendrimers-Biopolymers

5.3 Bio fuels-First generation of Bio fuels-Second generation of Bio fuels-Sustainable Bio Fuels-Calorific value of food and fat.

Text Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5th edition, Blackwell science, London 1996.
2. P. S. Kalsi. Organic Reaction stereochemistry & Mechanism. 4th edition . New Age International publishers. 2006.
3. Puri and Sharma. Principles of physical chemistry. 40th edition.2003
4. I. L. Finar, Organic chemistry, 6th edition, ELBS, 1990
5. G.R.Chatwal,Pharmaceutical Chemistry Organic (vol II), Himalaya Publishing House, Second Revised Edition 1997
6. Polymer Science, V. R. Gowariker, N. V. Viswanathan and J. Sreedhar, Wiley Eastern
7. J.Rajaram and J.C.Kuriacose,Thermodynamics For Students of Chemistry,Lal Nagin Chand,New Delhi, 3rd edition, 1986.

Reference Books:

1. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6th edition., John wiley, New York 1999.
2. Text book of Polymer Science, F.W. Billmeyer Jr, Wiley
3. J.E. Huheey, Inorganic Chemistry, 5th Edn., Harper International.1993.
4. Raj.K. Bansal,Organic Reaction Mechanism, 3rd edition, Tata McGraw Hill, 1998

I B.Sc (BC & ZO)	ALLIED CHEMISTRY - I For the students admitted in the year 2014	ACH101T
SEMESTER – I		HRS/WK – 5
ALLIED-I		CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain a minimum of two sub divisions)

I B.Sc (BC & ZO)	ALLIED CHEMISTRY PRACTICAL - I For the students admitted in the year 2011	ACHP101
SEMESTER – I		HRS/WK – 3
ALLIED PRACTICAL-I		CREDIT – 2

QUALITATIVE ANALYSIS OF AN ORGANIC COMPOUND

1. Systematic Analysis of an Organic Compound Containing one functional Group and Characterisation by Confirmatory Tests
2. Reactions of Aldehyde (Aliphatic & Aromatic), Carbohydrate, (Reducing & Non-Reducing sugar), Carboxylic Acid (Mono & Di), Phenol (Mono & Dihydric), Primary amine, Amide (Mono & Di).

Reference Books:

1. A.O. Thomas, Practical chemistry- Scientific Book Center.
2. Vogel, Text book of chemical analysis, Longman.
3. S. Sundaram, & S. Viswanathan, Practical chemistry, 3 Volumes.
4. Vogel, Text book of Practical Organic chemistry, Longman

Scheme of evaluation

Analysis	**:**	**35 marks**
1. Saturated/ Unsaturated	:	5 marks
2. Special elements	:	8 marks
3. Aromatic / Aliphatic	:	5 marks
4. Identification of functional group	:	8 marks
5. Confirmatory tests	:	7 marks
6. Preparation of derivative	:	6 marks
7. Systematic procedure	:	6 marks
Record	:	10 marks
Viva	:	5 marks
Total	**:**	**60 marks**

I B.Sc (CH)	INORGANIC CHEMISTRY – I For the students admitted in the year 2014	CH203T
SEMESTER – II		HRS/WK – 4
CORE- 3		CREDIT - 3

Objectives:

To know the arrangement of elements in the periodic table and identify the nature of chemical bond and also the shapes of various inorganic molecules.

COURSE OUTCOMES (COs)

CO 1: students acquire the knowledge about unit atoms and accommodation of electrons and their periodic trends.
CO 2: Students learn the comparative account of alkali and alkaline earth metals.
CO 3: Students learn the elements of boron and their applications.
CO 4: A knowledge on ionic, covalent bonds and nature solvents.
CO 5: Understanding on molecular orbital theory.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: CH203T					TITLE OF THE COURSE: INORGANIC CHEMISTRY – I								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	2	3	3	3	3	3	3	3	3	4	3	3	3	3.0	
CO2	2	3	3	3	3	3	3	3	4	3	3	4	2	3.0	
CO3	2	3	3	3	3	2	3	3	3	3	4	4	4	3.07	
CO4	3	3	3	3	2	2	3	4	3	3	3	4	3	3.0	
CO5	3	3	3	2	3	3	2	3	3	4	2	4	4	3.0	
Mean Overall Score														3.01	

Result: The Score of this Course is 3.01 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: ATOMIC ORBITALS AND GENERAL PERIODIC PROPERTIES OF ELEMENTS [12 Hrs]

1.1 Atomic orbitals - Shapes of s, p, d, f orbital. Hund's rule of maximum multiplicity- applications of Hund's rule- Aufbau principle - Pauli's exclusion principle - electronic configuration of elements - Stability of half filled and completely filled orbitals - classification of s, p, d and f block elements.

1.2 General periodic properties of elements - Periodic table- IUPAC - nomenclature of Inorganic compounds - Atomic radii and ionic radii – size - ionization energies – electron affinity - oxidation states and variable valencies - Inert pair effect – electro negativity - Pauling's and Mulliken scale- Alfred Rochow's scale.

1.3 Applications of electronegativities – Calculation of partial ionic character of a covalent bond, Calculation of enthalpies of formation of compounds - Calculation of bond length - Explanation of diagonal relationship.

UNIT – II: CHEMISTRY OF ALKALI AND ALKALINE EARTH METALS [12 Hrs]

2.1 Chemistry of Alkali metals: Occurrence, comparative study of elements - oxides, halides, hydroxides and carbonates. Exceptional properties of Li. diagonal-relationship of Li with Mg.

2.2 Chemistry of Alkaline earth metals: Comparative study of elements – oxides - hydroxides, halides, sulphates and carbonates. Exceptional properties of Be. Diagonal relationship of Be and Al. Comparison of alkali metals with alkaline earth metals. Mg acting as bridging element between II A & II B groups resemblance of Mg with Zn.

2.3 Hydrogen bonding – Intra and Inter molecular hydrogen bonding – properties of hydrogen bonded Nitrogen, Oxygen, Fluorine and sulphur compounds.

UNIT – III: CHEMISTRY OF P – BLOCK ELEMENTS - BORON FAMILY [12 Hrs]

3.1 Chemistry of p – block elements – Boron family- semi metals - group discussion – anomalous behavior of B - diagonal relationship between B & Si - electron deficiency & electron acceptor behavior of BX_3.

3.2 Boron hydrides - Bonding in diborane, (VBT & MOT approach) Bonding in tetraborane. Borax, sodiumborate, sodiumtetraborate, or disodiumtetraborate - Boric acid.

3.3 Compounds of Boron with Nitrogen - Borazole and Boron nitrides**.**

UNIT – IV: IONIC, COVALENT BONDING AND ACID- BASE CONCEPTS [12 Hrs]

4.1 Ionic Bond : Conditions for the formation of ionic bond – Radius ratio rules and its limitations – formation of NaCl – Hydration energy – Lattice energy and their applications – Born Haber cycle– General properties of ionic compounds.

4.2 Covalent bonding: Polarization and Fajan's rule, Effects of polarization, VBT- conditions for the formation of covalent bond – orbital overlap– hybridization- sigma and pi bonds - Characteristics of Covalent Compounds. Hannay smith equation.

4.3 Acid- Base concepts – Lewis, Lowry-Bronsted, Luxflood, Usanovich concepts & HSAB approach.

UNIT – V: VSEPR THEORY AND MOLECULAR ORBITAL THEORY [12 Hrs]

5.1 VSEPR Theory**:** Molecular shapes predicted by Sidgwick's Powell theory – Effect of lone pairs and Electronegativity – Effects of bonding and lone pairs on bond angles. Geometries of ClF_3, IF_7, XeF_6 , BF_4^-, BO_3^{3-}, NH_4^+, I_3^-.

5.2 Molecular Orbital Theory**:** LCAO method, criteria of orbital overlap – types of molecular orbitals - sigma and pi molecular orbitals, combination of atomic orbital to give sigma and pi molecular orbitals and their schematic illustration.

5.3 Qualitative molecular energy level diagram of homo and hetero diatomic molecules – H_2, N_2, O_2, CO, NO & HCl – bond order and stability of molecules.

Text Books:

1. J.D. Lee, A New Concise Inorganic Chemistry, 3rd Edn, ELBS, 1987.
2. R.D. Madan, Modern Inorganic Chemistry, 3rd Edn, Sulthan Chand Publications, 1988.

Reference Books:

1. F.A. Cotton, G. Wilkinson, Advanced Inorganic Chemistry, 5th Edn., John Wiley. 1985.
2. B. Douglas, D. McDaniel, J. Alexander, Concepts and Models of Inorganic Chemistry, 3rd Edn, John Wiley, 2001.
3. J.E. Huheey, Inorganic Chemistry, 5th Edn, Harper International. 1993.
4. D.F. Shriver, P.W. Atkins, C.H. Langford, 3rd Edn. Inorganic Chemistry, ELBS. 1999.
5. W.V.Mallik, G.D. Tuli, R.D. Madan, Selected topics in Inorganic Chemistry, 4rd Edn., Sulthan Chan Publications,1992.

I B.Sc (CH)	INORGANIC CHEMISTRY - I For the students admitted in the year 2014	CH203T
SEMESTER – II		HRS/WK – 4
CORE-3		CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **all** the Questions

I. multiple choice with only one correct option	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Fourteen**
(Conceptual and descriptive type questions)
(Not more than two questions from any unit)

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Eight**
(May contain two sub divisions)
(Conceptual and descriptive type. 20% of the questions should be Problems (15 marks out of 75 marks)

I B.Sc (CH)	ANALYTICAL CHEMISTRY- I For the students admitted in the year 2018	CH204Q
SEMESTER – II		HRS/WK – 4
CORE-IV		CREDIT – 3

Objectives:

To understand the basic concepts of electronics, error analysis and to know how to prepare varying concentrations of solution.

COURSE OUTCOMES (COs)

CO 1: Students will acquire knowledge of error analysis**.**
CO 2: To understand the various concentration units and to know how to prepare solutions of varying concentrations.
CO 3: To understand the basics of electronics.
CO 4: Data handling/ statistical treatment of data..
CO 5: Potentiometric, Coulometric, and Voltametric methods of analysis. Chromatographic Techniques and applications.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: CH204Q					TITLE OF THE COURSE: ANALYTICAL CHEMISTRY-I								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	4	3	3	4	3	3	4	3	4	3	3.54	
CO2	4	3	3	3	3	4	3	2	3	4	3	4	4	3.31	
CO3	3	4	3	3	4	3	2	3	4	3	4	3	3	3.23	
CO4	3	4	3	3	3	3	3	3	3	3	3	4	3	3.23	
CO5	4	3	3	4	3	2	4	2	3	4	3	3	4	3.15	
Mean Overall Score														3.29	

Result: The Score of this Course is 3.29 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I **[12 Hrs]**

Theory of Errors – idea of significant figures and its importance with examples – Precision, Accuracy- methods of expressing accuracy – Error analysis – minimizing errors – method of expressing precision – average deviation – Standard deviation – Confidence limit.

UNIT – II **[12 Hrs]**

Definitions of Molality – Normality – Mole fraction and their calculations – Definition and examples for primary and secondary standards – Calculation of equivalent. Theories of acid base – Redox, complexometric and Iodometric titrations – Problems on Volumetric analysis-strengths of solutions – Theories of indicators – acid, base, redox, metal ion and adsorption indicators and choice of indicators.

UNIT – III **[12 Hrs]**

Chemical formulae and percentage composition – Determination of empirical Formulae – and molecular formulae. Laws of chemical combination: Law of conservation of mass – Law of constant composition – Law of multiple proportions – Law of reciprocal proportions – Gay Lussac's law of Gaseous volumes.Equivalent weights of Compounds –methods of determination of equivalent weights using hydrogen displacement method, oxide method, chloride method, metal displacement method – problems based on law of normalities for acid, Alkali titrations – concept of double and back titrations.

UNIT – IV **[12 Hrs]**

Chemical Instrumentation: Elementary Electronics, Simple integrated circuit, Semiconductor, Power supply, transformer, Operational amplifier, Detectors (Oscilloscope and recorders), transducers, Rectifiers, Signal to noise ratio, Electronic components (Resistors, capacitors, inductors, transistors), Measuring instruments for pressure, temperature, current and voltage.

UNIT – V **[12 Hrs]**

Chromatographic technique – principle of chromatography – definition of the terms – Rf value – paper chromatography – principle and applications – thin layer chromatography – theory and applications – ion exchange chromatography – principle, types and applications

Text Books:

1. R.Gopalan, P.S.Subramanian, K.Rengarajan, S.Chand and sons (1997) - Elements of Analytical Chemistry.
2. G. R. Chatwal, S. K. Anand - Instrumental Methods of Chemical Analysis – Himalaya Publishing House (2000)
3. B.K.Mehta, Rohit Mehta, Principle of electronics, 2004

Reference Books:

1. D.A. Skoog and D.M. West, Fundamental of Analytical Chemistry, International Edition, 7th Edition (1996), Saunders College Publishing, Philadelphia, Holt, London.
2. R.L. Pecsok, L.D. Shields, T. Cairns and L.C. Mc William, Modern Methods of Chemical Analysis, 2nd (1976), John Wiley & Sons, New York.

I B.Sc (CH)	ANALYTICAL CHEMISTRY- I For the students admitted in the year 2018	CH204Q
SEMESTER – II		HRS/WK – 4
CORE-IV		CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a minimum of two subdivisions)
Conceptual and problem solving type.

I B.Sc (CH)	INORGANIC QUANTITATIVE ANALYSIS	CHP201S
SEMESTER –I		HRS/WK – 3
CORE PRACTICAL – I		CREDIT – 2

COURSE OUTCOMES (COs)

CO1: Student**s** learn inorganic quanitative analytical techniques.

VOLUMETRIC ANALYSIS

UNIT-I TITRIMETRIC QUANTITATIVE ANALYSIS

Estimation of HCl by NaOH using a standard oxalic acid solution
Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution
Estimation of Oxalic acid by $KMnO_4$ using a standard oxalic acid solution
Estimation of Iron(II) Sulphate by $KMnO_4$ using a standard Mohr's salt solution
Estimation of Iron(II) Sulphate by $K_2Cr_2O_7$ using a standard Mohr's salt solution
Estimation of Copper(II) Sulphate by $K_2Cr_2O_7$ solution.
Estimation of Magnesium(II) by EDTA solution.

UNIT – II

SOME APPLIED EXPERIMENTS

*Estimation of total Hardness of water
*Estimation of antacid
*Estimation of Bleaching powder
***Experiments will not be given for the examination**

Reference Books:

1. Venkateswaran V, Veerasamy R., Kulandaivelu A.R.1997. Basic principles of Practical Chemistry. (2nd ed) New Delhi:Sultan chand & Sons
2. Basset.J.,et al.1985. Vogel's Textbook of Quantitative Inorganic Analysis, (4th ed) ELBS Longmann.

SCHEME OF EVALUATION:

Error upto 1%	:	45 marks
1% - 2%	:	40 marks
2 % - 3%	:	30 marks
3% - 4%	:	20 marks
Above 4%	:	05 marks
Viva – voce	:	05 marks
Record	:	10 marks
Total	**:**	**60 marks**

I B.Sc (CH)	INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS	CHP202
SEMESTER – I		HRS/WK – 3
CORE PRACTICAL – II		CREDIT – 2

COURSE OUTCOMES (COs)

CO1: Students acquire the experimental skill of analyzing acid and basic radicals.
CO2: Students get to know the preparation of inorganic compounds.

UNIT – I: SEMI – MICRO QUALITATIVE ANALYSIS

1. Analysis of simple acid radicals: Carbonate, Nitrate, Sulphate, Chloride
2. Analysis of interfering acid radicals: Fluoride, Oxalate, Borate, Phosphate
3. Elimination of interfering acid radicals and identifying the groups of the basic Radicals
4. Analysis of basic radicals (group-wise): Lead, Copper, Bismuth, Cadmium, Aluminium, Iron, Cobalt, Nickel, Manganese, Zinc, Barium, Calcium, Strontium.
5. Analysis of mixtures containing two cations and two anions (of which one is interfering)

UNIT – II: PREPARATION OF INORGANIC COMPOUNDS

1. TetrammineCopper(II) Sulphate
2. Tris(thiourea)Copper(I) Chloride
3. Ferrous Ammonium Sulphate
4. Microcosmic salt
5. Potassiumtrisoxalato ferrate (II)
6. Chloropentammine Cobalt(III) Chloride

Reference Books:

1. Inorganic Qualitative Analysis- V.V. Ramanujam
2. Practical Chemistry – B.Sharma
3. Vogel, Text book of quantitative chemical analysis, 6th Ed, Prentice Hall, 2000.

SCHEME OF EVALUATION:

Salt Analysis	:	35 marks
Preparation	:	10 marks
Viva – voce	:	05 marks
Record	:	10 marks
Total	**:**	**60 marks**

I B.Sc (BC & ZO)	ANALYTICAL CHEMISTRY For the students admitted in the year 2014	ACH202T
SEMESTER – II		HRS/WK – 5
ALLIED-II		CREDIT – 3

Objectives:

To introduce basic concepts of purification and separation techniques. To study the important concepts of water technology. To learn various Spectroscopic techniques and their uses.

COURSE OUTCOMES (COs)

CO1: Students learn various crystallization and distillation methods involved in the purification of solid and liquid chemicals.
CO2: Students acquire the knowledge of various chromatographic separation techniques.
CO3: Students learn various analyzing abilities of Polarography, Polarimetry and Cyclic Voltammetry.
CO4: Students learn various Spectroscopic techniques.
CO5: Students learn the concepts of analysis, estimations and purification of water.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: ACH202T					TITLE OF THE COURSE: ANALYTICAL CHEMISTRY								HOURS: 5	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	4	3	3	4	4	4	4	5	4	5	3.92	
CO2	4	5	4	5	4	2	4	4	3	4	5	4	5	4.07	
CO3	3	3	4	3	3	3	3	4	3	3	4	4	5	3.46	
CO4	4	5	4	4	4	3	3	4	3	4	4	5	5	4.0	
CO5	4	3	3	4	4	3	4	4	3	4	4	4	5	3.77	
Mean Overall Score														3.84	

Result: The Score of this Course is 3.84 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: PURIFICATION TECHNIQUES [12 Hrs]

Purification of solid compounds- Crystallisation- Fractional crystallization- Sublimation- Purification of liquids- Experimental techniques of distillation- Fractional distillation- Vacuum distillation- Steam distillation

UNIT – II: SEPARATION TECHNIQUES [12 Hrs]

Chromatography-Types-Column chromatography-TLC-Ion Exchange Chromatography

UNIT – III: INSTRUMENTAL ANALYSIS [12 Hrs]

Polarography-Principle-Instrumentationb-Appilication of Polarography
Cyclic voltammetry-Principle-Instrumentation-Application of CV
Polarimetry-Principle-Instrumentationb-Application –Estimation of Glucose

UNIT – IV: SPECTROSCOPY [12 Hrs]

General features of spectroscopy-units
Rotational spectroscopy-the rotational energy levels of molecules-rotational transitions
Vibrational spectroscopy – the vibrations of molecules –transitions-
UV-Visible Spectroscopy-Absorption Laws-Selection Rules-Types of Electronic transitions – chromophore-Auxochrome-Absortion bands and Intensity.Woodwardfieser rules for calculating λ_{max} in Dienes and α,β-unsaturated carbonyl compounds.

UNIT – V: TECHNOLOGY OF WATER [12 Hrs]

Water quality parameters-Temporary and Permanent hardness-Estimation of hardness (EDTA method) - Water softening (Zeolite) - Demineralization (Ion Exchange) and desalination (RO)

Text Books:

1. R. Gopalan, P.S. Subramanian & K. Rangarajan, Elements of analytical chemistry, Sultan Chand & Sons, 2003.
2. G.R. Chatwal & S.K. Anand, Instrumental Methods of Chemical Analysis, Sultan Chand & Sons, 1998
3. C. N. Banwell. 1966, Fundamentals of Molecular Spectroscopy, McGraw Hill.
4. S. S. Dara, “A Text Book of Engineering Chemistry” fifth revised edition (1996) S Chand company limited, New Delhi.

Reference Books:

1. A. Skoog and D. M. West, “Fundamentals of Analytical Chemistry”, International edition, seventh edition (1996), Saunders college publishing Philadelphia, Halt, London.
2. Y.R.Sharma Elementary Organic Spectroscopy Principles and Chemical Appilications S.Chand&Company Ltd; New Delhi4th Revised Edition(2007)

I B.Sc (BC & ZO)	ANALYTICAL CHEMISTRY For the students admitted in the year 2014	ACH202T
SEMESTER – II		HRS/WK – 5
ALLIED-II		CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain maximum of 2 sub divisions)

I B.Sc (BC & ZO)	ALLIED CHEMISTRY PRACTICAL - II For the students admitted in the year 2018	ACHP202S
SEMESTER – II		HRS/WK-3
ALLIED PRACTICAL – II		CREDIT – 2

1. Colorimetry- Estimation of Iron.
2. Titrimetry:
   (a)Estimation of Iron with $KMnO_4$ and $K_2Cr_2O_7$.
   (b) Estimation of oxalic acid
   (c) Estimation of sodium carbonate
3. Analysis of water- Determination of hardness of water by complexometric titration.

Reference Books:

1. B.K. Sharma, Industrial chemistry, GOEL Publishers, 2004.
2. R. Morris, Shreve, J.A. Brink, Chemical Process Industry, Prentice Hill, 2000.
3. S. Sundaram, S. Viswanathan, Practical chemistry, 3 Volumes
4. Vogel, Quantitative Analysis, Longman.

Evaluation pattern

External = 60 marks

Volumetric	– 40
Record	– 10
Viva voce	– 10
Toal	– **60 marks**

II B.Sc (CH)	INORGANIC CHEMISTRY-II For the students admitted in the year 2015	CH305T
SEMESTER – III		HRS/WK – 4
CORE-V		CREDIT – 4

Objectives:

To know the arrangement of elements in the periodic table. To identify the nature of chemical bond in a given inorganic compound. To learn the shapes of various inorganic molecules.

COURSE OUTCOMES (COs)

CO1: Students acquire the knowledge about the theory behind the practicals and solvents.
CO2: Students learn the comparative study of carbon group elements and their applications.
CO3: Students learn the elements of nitrogen and oxygen group elements.
CO4: A knowledge on halogen family and its applications.
CO5: Students acquire the knowledge about halogens and their reactivity.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: CH305T					TITLE OF THE COURSE: INORGANIC CHEMISTRY-II								HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	2	3	3	4	4	2	3	3	3	4	4	3	3	3.15	
CO2	2	3	2	3	3	2	3	3	4	4	3	3	2	2.85	
CO3	3	3	3	4	3	4	3	4	3	3	4	3	4	3.38	
CO4	3	3	3	2	3	3	3	3	3	3	3	4	3	3.00	
CO5	3	3	3	2	3	2	3	3	3	4	3	3	3	2.92	
Mean Overall Score														3.06	

Result: The Score of this Course is 3.06 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: PRINCIPLES OF INORGANIC QUALITATIVE ANALYSIS AND TYPES OF SOLVENT [12 Hrs]

1.1 Principles of acid-base equillibria - Common ion effect, solubility product and their applications in qualitative analysis. Reactions involved in the separation and identification of cations and anions in qualitative analysis – Spot reagents – aluminon, Cupferon, DMG, Thiourea, magneson, alizarin and Nessler's reagent.

1.2 Types of solvents: Physical properties of solvents, protic and aprotic solvents, amphiprotic and amphoteric solvents – aqueous and non aqueous solvents – Liquid NH_3 as a solvent - HF as a solvent - solvation number – medium effect - Vander waal's forces - ion-dipole, dipole-dipole interactions

UNIT – II: CARBON FAMILY AND TYPES OF CHEMICAL REACTIONS [12 Hrs]

2.1 Carbon family: Group discussion - valencies, oxides, halides, hydrides of C and Si - catenation and hetero catenation – allotropy of carbon, comparison of properties of C & Si. Carbides: salt like carbides – Interstitial carbides – covalent carbides – applications of carbides in Industry.

2.2 Types of chemical reactions: Acid – Base, oxidation – reduction, electron transfer, double decomposition reaction – balancing chemical reactions by oxidation number and ion, electron method.

UNIT – III: NITROGEN AND OXYGEN FAMILY [12 Hrs]

3.1 Nitrogen family - Comparative study of N, P, As, Sb, Bi oxides – N_2O_3, P_4O_6, N_2O_5 and P_4O_{10}. Oxy-acids: HNO_2, HNO_3, H_3PO_2, H_3PO_3 and H_3PO_4 –properties and structure. Halides – PCl_3, PCl_5 – properties and structure. Hydrides – NH_3, PH_3, AsH_3 and BiH_3 – structure, trends in boiling point, basic character and hydrogen bonding. Properties, structure and uses of hydrazine and hydroxylamine

3.2 Oxygen family: Comparative study of O, S, Se, Te elements – anomalous behavior of Oxygen, oxides of sulphur – SO_2 and SO_3, properties and structure.Oxoacids of sulphur – H_2SO_3, H_2SO_4 and $H_2S_2O_7$, properties and structure. Peroxosulphuric acids- Caro's acid, Marshall's acid - structure and comparison – Dithionic and Polythionic acids. Chemistry of ozone

UNIT – IV: HALOGENS [12 Hrs]

4.1 Halogens – Comparative study of F, Cl, Br, I, At elements – reactivities – comparison of fluorine with oxygen – hydrogen halides – preparation and properties of HF, HCl, HBr and HI – Bleaching powder, estimation of available of chlorine.

4.2 Oxyacids of halogens – Sodiumhypochloride and Soduim chlorite – Poly halides - interhalogen compounds (ClF_3, ICl, BrF_3, ClF_5, BrF_5, IF_5 structure and properties) – Psuedo halogens (CN^-, SCN^-, N_3^- structure and properties). Basic properties of halogens - positive iodine – exceptional properties of fluorine, similarities between H_2O & HF.

UNIT – V: NOBLE GASES [12 Hrs]

Noble gases: electronic configuration – reasons for placing in zero group – position in the periodic table - chemical inertness of noble gases – reasons – applications – clathrates – hybridization and geometries of XeF_2, XeF_4, XeF_6, $XeOF_4$. Uses of noble gases.

Text Books:

1. Vogels, Text book of quantitative chemical analysis, 6th Ed, Prentice Hall, 2000.
2. J.D.Lee, A New Concise Inorganic Chemistry, 3rd Edn., ELBS, 1987.
3. R.D.Madan, Modern Inorganic Chemistry, 3rd Edn., Sulthan Chand Publications,1988.

4. R. Gopalan,. Inorganic Chemistry For Undergraduates, university press pvt ltd, 1st ed, 2009.
5. B.R. Puri,; L.R.Sharma,; K.C.Kalia, Priciples of Inorganic Chemistry, Lal Nagin chand and co. Delhi 1996.

Reference Books:

1. F.A.Cotton, G.Wilkinson, Advanced Inorganic Chemistry, 5th Edn., John Wiley.1985.
2. B.Douglas, D.McDaniel, J.Alexander, Concepts and Models of Inorganic Chemistry, 3rd Edn., John Wiley,2001.
3. J.E. Huheey, Inorganic Chemistry, 5th Edn., Harper International.1993.
4. W.V.Mallik, G.D.Tuli , R.D.Madan , Selected topics in Inorganic Chemistry, 4rd Edn., Sulthan Chand Publications,1992.

II B.Sc (CH)	INORGANIC CHEMISTRY-II For the students admitted in the year 2015	CH305T
SEMESTER – III		HRS/WK – 4
CORE-V		CREDIT – 4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a minimum of two subdivisions)
Conceptual and problem solving type. 20% of the questions should be Problems (15 marks out of 75 marks)

II B.Sc (CH)	ANALYTICAL CHEMISTRY- II For the students admitted in the year 2014	CH306S
SEMESTER – III		HRS/WK – 4
CORE-VI		CREDIT – 4

Objective:

To learn about the principles of gravimetric analysis, polarography, separation and purification techniques, UV- Visible spectroscopy, X – Ray methods- water treatment and parameter calculations

COURSE OUTCOMES (COs)

CO1: Students learn about the principles of gravimetric analysis and thermo analytical methods.
CO2: Students learn separation and purification techniques.
CO3: Students learn about the principles and uses of Polarography, Polarimetry and Amperometry.
CO4: To learn UV- Visible spectroscopy and X-Ray methods.
CO5: To impart the knowledge of water treatment and parameter calculations.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: CH306S					TITLE OF THE COURSE: ANALYTICAL CHEMISTRY- II								HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	3	4	3	4	4	4	4	4	4	4	3	3.69	
CO2	3	3	3	3	3	3	3	3	4	3	3	4	4	3.23	
CO3	3	3	4	3	3	3	3	4	4	4	4	4	4	3.53	
CO4	3	3	3	3	3	3	3	4	4	3	4	4	4	3.38	
CO5	3	3	3	4	3	3	3	3	3	4	4	4	4	3.38	
Mean Overall Score														3.44	

Result: The Score of this Course is 3.44 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: GRAVIMETRIC ANALYSIS AND THERMAL ANALYTICAL METHODS [12 Hrs]

Characteristics of precipitating agents- Choice of precipitants and conditions of precipitation – Specific and selective precipitants- Use of sequestering agents- Co-precipitation- Post precipitation- Peptisation- Differences- Reduction of error –Precipitation from homogeneous solution- Calculations in gravimetric methods- use of gravimetric factors.

Principle involved in thermogravimetric analysis and differential thermal analysis- Discussion of various components with block diagram- Characteristics of TGA&DTA- Factors affecting TGA & DTA curves- Thermometric titrations

UNIT - II: SEPARATION AND PURIFICATION TECHNIQUES [12 Hrs]

Principles involved in the separation of solids- Purification of solid organic compounds- Crystallisation- Fractional crystallization- Sublimation- Purification of liquids- Experimental techniques of distillation- Fractional distillation- Vaccuum distillation- Steam distillation- Eletrophoresis.

UNIT – III: POLAROGRAPHY, AMPEROMETRY AND POLARIMETRY [12 Hrs]

Principle – concentration polarization- dropping mercury electrode- advantages and disadvantages – convention- migration and diffusion currents- Ilkovic equation (derivation not required) and significance- experimental assembly- electrodes- capillary solutions- current voltage curve- oxygen wave- influence of temperature and agitation on diffusion layer- Polarography as an analytical tool in quantitative & qualitative analysis. **Amperometry** – basic principle & uses. **Polarimetry** principle- instrumentation- comparison of strengths of acids- Estmation of glucose.

UNIT – IV: UV- VISIBLE SPECTROSCOPY AND X-RAY METHODS [12 Hrs]

Absorption laws- calculations involving Beer – Lambert's law – instrumentation – photocalorimeter and spectrophotometer – block diagram with description of components with theory – types of electronic transitions – chromophore – auxochromes – absorption bands and intensity – factors governing absorption maximum and intensity.

Bragg's equation – explanation of terms – experimental methods – Rotating crystal technique – powder technique – determination of structure of NaCl.

UNIT – V: TECHNOLOGY OF WATER [12 Hrs]

Hardness of water – Hard water – soft water – Temporary and permanent hardness- problems on calculating temporary and permanent hardness – Estimation of hardness using EDTA method and their problems – Water treatment – lime soda process – calculation of amount of soda lime required for water softening – zeolite process – problems – Demineralisation process – Reverse osmosis – Electrodialysis – biological oxygen demand – chemical oxygen demand - treatment of domestic water supply – sedimentation – coagulation – filtration – sterilization of water

Text Books:

1. R. Gopalan, P.S. Subramanian and K. Rengarajan "Elements of Analytical Chemistry", 2nd edition (1991). Sultan Chand & sons educational publishers.
2. B. K. Sharma, "Industrial chemistry" Seventeenth edition (2004) Goel publishing house, Meerut.
3. G. R. Chatwal, S. K. Anand " Instrumental Methods of Chemical Analysis" Enlarged edition (2007) Himalaya publishing house Mumbai.
4. S. S. Dara, " A Text Book of Engineering Chemistry" fifth revised edition (1996) S Chand company limited, New Delhi.

Reference Books:

1. Skoog and D. M. West, “Fundamentals of Analytical Chemistry”, International edition, seventh edition (1996), Saunders college publishing Philadelphia, Halt, London.
2. Jagmohan, Spectroscopy of Organic chemistry, Narosa Publications

II B.Sc (CH)	ANALYTICAL CHEMISTRY- II For the students admitted in the year 2014	CH306S
SEMESTER – III		HRS/WK – 4
CORE-VI		CREDIT – 4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain sub divisions with maximum of 3 marks)

II B.Sc. (PH)	ALLIED CHEMISTRY FOR PHYSICS For the students admitted in the year 2011	ACH301S
SEMESTER – III		HRS/WK – 5
ALLIED CHEMISTRY		CREDIT – 3

Objectives:

To introduce basic concepts of nuclear chemistry. To study the important concepts of spectroscopy. To understand the superconductors & electrode reactions.

COURSE OUTCOMES (COs)

CO1: Students learn the basic concepts and applications in nuclear chemistry.
CO2: Students understand some important concepts in spectroscopy and the properties of dilute solutions.
CO3: Students learn the concepts in solid state chemistry.
CO4: Students learn the concepts of acid base titrations and basic principles and uses in conductometry, Amperometry and Voltametry.
CO5: Students understand the superconductors & electrode reactions.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: ACH301S					TITLE OF THE COURSE: ALLIED CHEMISTRY FOR PHYSICS								HOURS: 5	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	4	3	3	4	4	5	4	4	4	4	3.84	
CO2	2	5	3	4	3	3	4	4	4	3	4	4	5	3.69	
CO3	3	3	3	3	2	3	4	4	3	3	3	4	4	3.23	
CO4	2	4	3	4	3	3	4	4	4	4	4	4	4	3.62	
CO5	2	4	3	3	3	3	4	3	3	3	4	4	3	3.38	
Mean Overall Score														3.55	

Result: The Score of this Course is 3.55 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: NUCLEAR CHEMISTRY [12 Hrs]

Atom - classification of nuclides, nuclear stability, magic number, Radioactive elements, Decay kinetics, Photonuclear reaction, nuclear fission and fusion, Nuclear Reactor – Detectors - Application of Radioactivity.

UNIT – II: SPECTROSCOPY & PROPERTIES OF DILUTE SOLUTIONS [12 Hrs]

Spectroscopy – Types, electromagnetic radiation, characteristics of electromagnetic radiation, electromagnetic spectrum, absorption & emission spectra.IR : Types of vibration, selection rule - UV: Electronic energy levels - electronic transition & selection rule – Beer-Lambert law, chromophores, auxochrome - Bathochromic shift, Hypsochromic shift. Colligative properties Lowering of Vapour pressure, Raoult's law, Osmosis, derivation of osmotic pressure, reverse osmosis, elevation of boiling point, determination of molar mass, freezing point depression, and cryoscopic constant, Vant - Hoff factor.

UNIT – III: INORGANIC & SOLID STATE CHEMISTRY [12 Hrs]

Bragg's equation – Principles of X-ray diffraction – Comparison of X-ray, electron and neutron diffraction. Crystal lattices – laws of crystallography – elements of symmetry – crystal systems – unit cell, space lattices – Bravis lattice – Miller Indices - ionic crystal structures of simple inorganic compounds.

UNIT – IV: ANALYTICAL CHEMISTRY [12 Hrs]

Acid, base titrations, complexation, precipitation and redox titrations, voltammetry, amperometry and conductometry, basic principle and uses.

UNIT – V: MATERIAL SCIENCE AND ELECTRODICS [12 Hrs]

Material Science: Super conductivity -characters of Superconductors- types of Superconductors- application of Super conductors.

Electrodics: Types of electrodes and cells – Nernst equation - EMF measurements and its application - principles of chemical and electrochemical corrosion - corrosion control.

Text Books:

1. H.J. Arnikar, Essentials of Nuclear chemistry, New Age International (P) Ltd. 4th edition, 2003.
2. S. Glasstone, Principles of electrochemistry, Oxford University Press, 3rd edition, 2004.
3. P.S. Kalsi, Spectroscopy of Organic Compounds, New Age International (P) Ltd. 5th edition, 2004.
4. A.G. West, Solid Chemistry, New Age International (P) Ltd, 2003.

Reference Books:

1. P.W. Atkins, The elements of Physical chemistry, Oxford University Press, 3rd edition, 2004.
2. D.A. Skoog, D.M. West, F.J. Holler & S.R. Crouch, Fundamentals of Analytical chemistry, Thomson. Brooks / Cole, 2004.
3. D.F.Shriver and P.W.Atkins, Inorganic chemistry, Oxford University Press, 3rd edition, 2002.

II B.Sc. (PH)	ALLIED CHEMISTRY FOR PHYSICS For the students admitted in the year 2011	ACH301S
SEMESTER – III		HRS/WK – 5
ALLIED CHEMISTRY		CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain sub divisions with maximum of 3 marks)

II B.Sc. (PH)	ALLIED CHEMISTRY PRACTICAL	ACHP301
SEMESTER – III	For the students admitted in the year	HRS/WK – 3
ALLIED PRACTICAL – I	2011	CREDIT – 2

Conductometric titrations:

1. Determination of cell constant
2. Estimation of the amount of HCl by titrating with Standard NaOH conductometrically.
3. Estimation of the amount of CH_3COOH by titrating with Standard NaOH, conductometrically.

Potentiometric titrations:

1. Estimation of the amount of FAS, potentiometrically, by titrating with Standard $KMnO_4$.
2. Determination of pka of CH_3COOH, by performing potentiometric titration using standard NaOH solution.
3. Estimation of the amount of KCl by titrating with Standard $AgNO_3$ potentiometrically.

Scheme of Evaluation

Record	-	10 Marks
VIVA Voce	-	10 Marks
Principle, model graph	-	10 Marks
Manipulation	-	5 Marks
Error up to 2%	-	25 Mark
2.1 – 3 %	-	20 Marks
3.1 – 4 %	-	15 Marks
4.1 – 5 %	-	10 Marks
>5 %	-	5 Marks
Total	**-**	**60 Marks**

II B.Sc (CH)	ORGANIC CHEMISTRY - II For the students admitted in the year 2014	CH407S
SEMESTER – IV		HRS/WK – 4
CORE-VI		CREDIT – 4

Objectives:

To learn aliphatic, aromatic electrophilic and nucleophlic substitution, expertise in preparation of carbonyl, ethers and phenols and practice the mechanism of above such reactions.

COURSE OUTCOMES (COs)

CO1: Knowledge pertaining to reaction and mechanism of aliphatic nucleophlic substitution.
CO2: Logic to explain aromatic electrophilic and nucleophlic substitutions.
CO3: Expertise in preparation and reactions of alcohols, ethers and phenols.
CO4: Expertise in reactions of aldehydes and ketones.
CO5: Reaction of carboxylic acids.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: CH407S					TITLE OF THE COURSE: ORGANIC CHEMISTRY - II								HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	4	3	4	2	3	4	3	3	3	4	4	3.30	
CO2	2	3	4	3	3	2	2	3	4	3	3	4	4	3.07	
CO3	2	3	4	3	3	2	3	4	4	4	4	4	4	3.38	
CO4	3	3	3	3	2	2	3	4	4	3	4	4	4	3.23	
CO5	3	3	3	4	3	2	2	3	3	4	4	4	4	3.23	
Mean Overall Score														3.24	

Result: The Score of this Course is 3.24 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: ALIPHATIC NUCLEOPHILIC SUBSTITUTION [12 Hrs]

1.1 Nucleophiles – Nucleophilicity

1.2 Aliphatic nucleophilic substitution – Mechanisms of SN1, SN2 and SNi. Energy Profile diagrams – Effects of nature of substrates, solvent, nucleophile and Leaving groups. Leaving group ability and pKa value. Basicity and Nucleophilicity – a comparison.

1.3 Substitution Vs elimination – with examples.

1.4 Stereochemistry of Substitution reactions – a brief introduction.

UNIT – II: AROMATIC ELECTROPHILIC & NUCLEOPHILIC SUBSTITUTION [12 Hrs]

2.1 Aromaticity – Huckel's theory of aromaticity and its applications to Benzene and polynuclear hydrocarbons like naphthalene. Resonance and delocalization in benzene. Examples of aromatic, anti-aromatic and non-aromatic compounds. Problems.

2.2 Aromatic electrophilic substitution. Mechanisms of Nitration, halogenation, Sulfonation. Friedel – Crafts alkylation and acylation. Substituent effects in Aromatic electrophilic substitution. Reactivity and orientation. Activation and Deactivation of the benzene ring. Ortho – para ratio. Problems.

2.3 Synthesis of simple substituted benzenes using the above reactions.

2.4 Aromatic nucleophilic substitutions. The addition – elimination mechanism AdE2. The elimination – addition mechanism - Benzyne mechanism.

UNIT – III: ALCOHOLS, ETHERS & PHENOLS [12 Hrs]

3.1 Alcohols – Sources – Nomenclature – Preparation by reduction of aldehydes, Ketones, acids and esters. Preparation using Grignard reagents. Types of Alcohols and their reactivity. Diols and polyhydric alcohols.

3.2 Reactions of alcohols – oxidation, esterification and dehydration. Cleavage of Diols using periodic acid (HIO_4) and lead tetraacetate.

3.3 Allyl alcohol – its preparation. Allylic substitution using N-bromosuccinimide (NBS).

3.4 Phenols – Nomenclature – structure and bonding. Sources of phenols –acidity of phenol and substituent effects on its acidity. Reactions of phenols: Reimer-Tiemann, Kolbe-Schmidt, Lederrer-Manasse reactions and coupling with diazonium salts. Problems

3.5 Ethers – Nomenclature – structure and bonding – Preparation – Williamson synthesis. Cleavage of ethers by acids.

UNIT –IV: ALDEHYDES AND KETONES [12 Hrs]

4.1 Nomenclature and classification

4.2 Preparation of aldehydes and ketones

4.3 Reactivity of carbonyl groups, acidity of alpha hydrogen.

4.4 Reactions: Mechanism of enolisation reactions, nucleophilic addition, oxidation and reduction reactions, addition reactions with Grignard reagents, cyanide and bisulphate. Preparation of derivatives of ammonia and alcohols.

4.5 Mechanism of aldol, Cannizaro perkin, knoevenagel reactions. Benzoin condensation, Claisen, Wittig and Reformasky reactions.

4.6 Mechanisms of reductions with $NaBH_4$, $LiAlH_4$, Wolff- Kishner, Clemmensen and MPV reductions.

4.7 Photochemical reactions of carbonyl compounds: Norrish type – I and II reactions

UNIT – V: CARBOXYLIC ACIDS [12 Hrs]

5.1 Carboxylic acids – nomenclature.

5.2 Ionization of carboxylic acids – acidity constants

5.3 Comparison of acid strengths of substituted haloacids and substituted benzoic acids.

5.4 Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction.
5.5 Conversion of acids to their derivatives.
5.6 Dicarboxylic acids – nomenclature.
5.7 Preparation and properties of oxalic, malonic,succinic, glutaric and adipic acids

Text Books:

1. Francis A.Carey, - Organic Chemistry- Tata McGraw Hill-1999.
2. Seyhan Ege- Organic Chemistry-A.I.T.B.S Publishers-1999.

Reference Books:

1. Ahluwalia and Parassar- Organic Reaction mechanisms, Narosa Publishers.2004.
2. Bahl & Arun Bahl- Advanced Organic Chemistry, Sultan Chand-1996.
3. Paula Yurkanis Bruice - Organic Chemistry, Prentice Hall- 1999.
4. E.L. Eliel and S.H.Wilers , Stereochemistry of Organic Compounds , John Wiley and sons , 2004.
5. P.S.Kalsi , Stereochemistry : Conformation and Mechanism , Wiley Eastern Ltd -2007.

II B.Sc (CH)	ORGANIC CHEMISTRY - II For the students admitted in the year 2014	CH407S
SEMESTER – IV		HRS/WK – 4
CORE-VI		CREDIT – 4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a maximum of two sub divisions)

II B.Sc (CH)	INTRODUCTION TO MOLECULAR STRUCTURE	CH408T
SEMESTER – IV		HRS/WK – 4
CORE-VII	For the students admitted in the year 2014	CREDIT – 4

Objectives:
To study about the quantum concept and atomic and molecular structures. To study about bonding and orbitals. To study the principle, selection rules and applications of spectroscopy.

COURSE OUTCOMES (COs)

CO1: To study the quantum concept and atomic and molecular structures.
CO2: To study about bonding and orbitals.
CO3: To study the principle, selection rules and applications of spectroscopy.
CO4: To study about symmetry elements and properties of solid state.
CO5: To understand about electronic, vibrational, raman and microwave spectroscopy to molecular level.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: CH408T					TITLE OF THE COURSE: INTRODUCTION TO MOLECULAR STRUCTURE								HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	3	3	4	3	4	4	3	5	4	4	4	3.46	
CO2	4	4	4	3	4	4	4	5	5	4	4	3	3	4.30	
CO3	5	3	4	4	3	3	4	4	3	3	4	3	3	3.53	
CO4	4	4	3	4	3	5	4	4	4	3	3	4	4	3.76	
CO5	3	3	4	3	3	3	4	4	4	3	3	3	3	3.90	
Mean Overall Score														3.79	

Result: The Score of this Course is 3.79 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I **[12 Hrs]**

1.1 Quantum Chemistry – the failures of classical physics-block body radiation – Photo electric effect –diffraction of electrons.(Pages 270-278)

1.2 Schrodinger equation –the Born interpretation-uncertainty principle. (Pages 280-283)

1.3 Quantum numbers- wave functions –s orbitals-p and d orbitals-electron spin. (Pages 301-307)

UNIT – II **[12 Hrs]**

2.1 Chemical bond-classification of bonds-potential energy curves-VBT-diatomic molecules-polyatomic molecules-promotion and hybridization-resonance.(Pages 326-332)

2.2 Molecular orbitals-linear combinations of atomic orbitals- bonding orbitals -anti bonding orbitals-structure of diatomic molecules- hydrogen and helium molecules-period 2 diatomic molecules.(Pages 334-339)

UNIT – III **[12 Hrs]**

3.1 Electric and magnetic properties – Clausius-Mosotti equations – Debye equation – measurement of dipole moments – dependence of polarizability on frequency.

3.2 Molar refractivity – dipole moments and molecular structure – magnetic permeability – magnetic susceptibility – diamagnetism – Para magnetism – measurement of magnetic susceptibility

UNIT – IV **[12 Hrs]**

4.1 Group theory – symmetry elements and operations – classes and sub groups –group multiplication table- postulates of a group.

4.2 Solid state- Amorphous and crystalline- classification of crystalline solids- bonding and electrical conductivity in solids – crystal lattices and unit cells-Bravais lattices.

UNIT – V **[12 Hrs]**

5.1 General features of spectroscopy – experimental techniques – intensities & line widths

5.2 rotational spectroscopy-the rotational energy levels of molecules-rotational transitions-microwave spectroscopy-rotational Raman spectra.

5.3 Vibrational spectroscopy – the vibrations of molecules –transitions- vibrational Raman spectra of diatomic molecules-vibrations of polyatomic molecules and vibrational Raman spectra of polyatomic molecules.

5.4 Electronic transitions – UV and visible spectra –Franck Condon principle-measures of intensity-spin selection rules, spectral transitions and types of transitions. (Pages 415-446)

Text Book:

1. P.W. Atkins.Elements of Physical chemistry. Oxford university Press.3rd edition.1990.

Reference Books:

1. K.V.Raman. Group theory. 1996. (5th edition)
2. Puri and Sharma. Principles of physical chemistry. 40th edition.2003
3. R. K. Prasad, Quantum Chemistry, Wiley Eeastern, New Delhi, 2nd edition,1992
4. C.N Banwell, fundamentals of molecular spectroscopy, Chapman and hall 4th edition,1991.

II B.Sc (CH)	INTRODUCTION TO MOLECULAR STRUCTURE	CH408T
SEMESTER – IV		HRS/WK – 4
CORE-VII	For the students admitted in the year 2014	CREDIT – 4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer (10 x 1 = 10)
II. Match the following (05 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 8 = 40)
Answer **Five out of Seven**
(May contain sub divisions)
(Each question should contain a maximum of two sub divisions)
Conceptual descriptive and Problem solving type. 20% of the questions should be Problems (15marks out of 75 marks).

II B.Sc (CH)	PRACTICAL CHEMISTRY – III	CHP403
SEMESTER – IV	QUALITATIVE ORGANIC ANALYSIS	HRS/WK – 3
CORE PRACTICAL –III	PRACTICAL	CREDIT – 2

COURSE OUTCOMES (COs)

CO1: Students acquire the experimental skill of analyzing various organic functional groups.
CO2: Students get to know the preparation of organic compounds.

ORGANIC ANALYSIS
Identification of an organic compound through the functional group analysis.
Detection of special elements (N,S and halogens).(Micro scale)

ORGANIC PREPARATIONS
1. NITRATION: Prepartion of m-dinitrobenzene and p-nitroacetanilide.
2. ACETYLATION: Preparation of acetyl derivatives of aniline, salicylic acid and glucose.
3. DIAZOTIZATION: Preparation of methyl orange and methyl red.
4. REDUCTION: Preparation of aniline from nitrobenzene.
5. OXIDATION: Preparation of benzoic acid from benzaldehyde.
6. HALOGENATION: Preparation of p-bromoacetanilide.

Reference books:
1. Mann and Saunders, Laboratory manual of Organic Chemistry.
2. Vogel's Quantitative Organic Analysis.

Scheme of evaluation

Analysis	**:**	**35 marks**
i) Saturated/ Unsaturated	:	3 marks
ii) Special elements	:	6 marks
iii) Aromatic / Aliphatic	:	3 marks
iv) Identification of functional group	:	6 marks
v) Confirmatory tests	:	5 marks
vi) Preparation of derivative	:	6 marks
vii) Systematic procedure	:	6 marks
Preparation	:	**15 marks**
i) Crude sample	:	10 marks
ii) Recrystallised Sample	:	5 marks
Record	:	10 marks
Total	**:**	**60 marks**

II B.Sc (CH)	PRACTICAL CHEMISTRY – IV PHYSICAL METHODS	CHP404
SEMESTER – IV		HRS/WK – 3
CORE PRACTICAL –III		CREDIT – 2

COURSE OUTCOMES (COs)

CO1: Students learn the ability to find melting point and boiling point of chemicals.
CO2: Students learn the purification of impure Naphthalene and decolourisation of brown sugar.
CO3: Students learn the determination of Viscosity and Surface tension.

Part -I
Determination of melting point
Naphthalene, Benzoic acid, Urea, Succinic acid, m-Dinitrobenzene, Acetanilide, p-Dichlorobenzene.
Determination of boiling point
Ethanol, Cyclohexane, Toluene

Part - II
Decolorisation and crystallization using Charcoal
1. Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration.
2. Crystallization and decolorisation of impure naphthalene from ethanol.

Part - III
Viscosity, Surface Tension
1. To determine the percentage composition of a given mixture by viscosity method.
2. To determine the percentage composition of a given binary mixture by surface tension method.
3. To determine the viscosity of amyl alcohol in water at different concentrations.

Scheme of evaluation

Part I	:	10 marks
Part II	:	10 marks
Part III		
i) Procedure	:	5 marks
ii) Formula	:	2 marks
iii) Calculation	:	8 marks
iv) Result	:	15 marks
Record	:	10 marks
Total	**:**	**60 marks**

III B.Sc (CH)	ORGANIC CHEMISTRY - III For the students admitted in the year 2014	CH509S
SEMESTER - V		HRS/WK – 4
CORE - V		CREDIT – 3

Objective:

To learn various reactions of nitro compounds and their applications. To understand the basic stereochemistry, chemistry of carbohydrate and amino acids. To learn and practice the molecular rearrangements and their mechanisms.

COURSE OUTCOMES (COs)

CO1: Students learn the chemistry of nitro compounds and their applications.
CO2: Students will learn the fundamental aspects of stereochemistry and its influence on chemical properties.
CO 3: Students acquire the knowledge in carbonyl compounds.
CO 4: Students learn the application of some named reactions and their mechanisms.
CO5: Students learn about chemistry of carbohydrate, amino acids and its applications.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: CH509S					TITLE OF THE COURSE: ORGANIC CHEMISTRY - III								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	3	3	4	3	3	4	3	3	3	4	4	3.46	
CO2	3	3	4	3	3	2	2	3	4	4	3	4	4	3.23	
CO3	3	3	4	3	4	2	3	4	4	4	4	4	4	3.54	
CO4	3	4	3	3	4	2	3	4	4	3	4	4	4	3.46	
CO5	3	3	3	4	3	3	2	3	4	4	4	4	4	3.38	
Mean Overall Score														3.41	

Result: The Score of this Course is 3.41 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: NITROGEN CONTAINING COMPOUNDS [12 Hrs]

1.1 Nomenclature and classification, Preparation

1.2 Nitrocompounds: aliphatic and aromatic nitro compounds, classification, general properties.

1.3 Reactions: reduction by chemical and electrolytic method

1.4 Di- and tri-substitution of aromatic nitro compounds: synthesis of o-, m-, p-dinitrobenzenes and trinitrobenzene.

1.5 Aromatic amines. Preparation of primary, secondary and tertiary amines.

1.5.1 Reactions: basicity of amines, effect of substituents on basicity of aromatic amines.

1.6 Diazonium salts: Preparation, diazotization reaction, Sandmeyer, Gatterman, Gomberg, and coupling reactions.

UNIT – II: STEREOCHEMISTRY – II [12 Hrs]

2.1 Conformers of cyclohexane -chair , boat and skew boat forms, axial-equatorial positions and their interconversions, conformers of mono and disubstituted cyclohexanes-1,2 and 1,3 interactions.

2.2 Optical isomerism, optical activity, optical and specific rotations, conditions for optical activity. Asymmetric center, chirality, achiral molecules, (+) and (-) and D and L notations, elements of symmetry, racemization, methods of racemization, methods of resolution, asymmetric synthsis (partial and absolute synthesis), Walden inversion.

2.3 Projection formula: Fischer, flying wedge, sawhorse and Newmann projection formulae-notation of optical isomers- Cahn- Ingold-Prelog rules, R and S notations for optical isomers with one or two asymmetric carbon atoms, erythro and threo representations.

2.4 Optical activity in compounds not containing asymmetric carbon atoms namely biphenyls, allenes and spiranes.

UNIT – III: SYNTHESIS INVOLVING ACTIVE METHYLENE GROUP AND TAUTOMERISM [12 Hrs]

3.1 Carbonyl polarization – reactivity – acidity of alpha hydrogen- malonic – acetoacetic and cyanoacetic esters – characteristic reactions of active methylene group – synthetic uses of malonic, aceto acetic and cyano acetic esters.

3.2 Diazomethane and diazoacetic ester: Preparation, structure and synthetic applications.

3.3 Tautomerism: Definition- keto-enol tautomerism- identification, acid and base catalyzed mechanisms, evidences – amido – imidol and nitro- acinitro tautomerisms.

UNIT – IV: MOLECULAR REARRANGEMENTS [12 Hrs]

4.1 Classification as anionotropic, cationotropic, free radical, inter and intramolecular rearrangement

4.2 Pinacol-pinacolone rearrangement –mechanism, evidence for carbonium ion intermediate formation – migratory aptitude

4.3 Beckmann, Hoffmann, Curtius and Benzillic acid, Baeyer Villiger rearrangements.

4.4 Fries rearrangement (two mechanisms)

UNIT – V: CARBOHYDRATES AND AMINO ACIDS [12 Hrs]

5.1 Carbohydrates : Structural elucidation of glucose and fructose – pyranose and furanose forms – determination of ring size – Haworth projection formula – epimerization reactions of glucose and fructose – Osazone formation, mutarotation and its mechanism – chain lengthening and chain shortening of aldoses – inter conversion of aldoses and ketoses.

5.2 Structural elucidation of sucrose and maltose. Structure and properties of starch and cellulose.

5.3 Amino acids : Classification and structure of amino acids – Gabriel pthalimide synthesis – Strecker synthesis – Erlenmeyer synthesis – Zwitter ion , isoelectric point – peptide – Merrifield synthesis – End group analysis – Proteins – primary, secondary and tertiary structure of proteins.

Text Books:

1. R. T. Morrison and R. N. Boyd, Organic chemistry, 6th edition, Prentice Hall of India Limited., New Delhi, 1992.
2. B. Y. Paula Yurkanis Bruise, Organic Chemistry, 3rd edition, Pearson education, New Delhi 2002.
3. I. L. Finar, Organic chemistry, 6th edition, ELBS, 1990.
4. O. P. Agarwal, Chemistry of organic natural products vol 1, Goel publishing house, 2002.
5. Gurdeep chatwal, Chemistry of organic natural products, vol 1, Goel publishing house, 2002.
6. B. S. Bahl and Arun Bahl, Organic chemistry, S. Chand and Sons, New Delhi, 2005.

Reference Books:

1. Jerry March, Advanced organic chemistry, 4th edition, John wiley and sons, New Yorkk, 1992.
2. S. H. Pine, Organic chemistry, 5th edition, Mcgraw Hill international edition chemistry series, New York, 1987.
3. Seyhan. N. Ege, Organic chemistry, structure and reactivity, 3rd edition, A.I.T.B.S., New Delhi,1998.
4. P. S. Kalsi, Stereochemistry: Conformation and Mechanism, 2nd edition, Wiley easern ltd, 1993.

III B.Sc (CH)	ORGANIC CHEMISTRY - III For the students admitted in the year 2014	CH509S
SEMESTER - V		HRS/WK – 4
CORE - V		CREDIT – 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a maximum of two subdivisions)

III B.Sc (CH)	INORGANIC CHEMISTRY - III For the students admitted in the year 2016	CH510T
SEMESTER - V		HRS/WK – 4
CORE - VI		CREDIT - 3

Objectives:

To impart knowledge about Coordination chemistry and early theory. To learn various aspects of crystal structure and solid state chemistry

COURSE OUTCOMES (COs)

CO1: To understand the general characteristics and the metallurgical process of the d block elements.

CO2: To explain the isomerism in coordination compounds.

CO3: To describe Werner's theory, valence bond theory, crystal field theory of coordination compounds

CO4: To improve the level of understanding of the CFSE, Jahn – Teller effect and its consequences.

CO5: To describe the principles concerning solid state structures.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: CH510T					TITLE OF THE COURSE: INORGANIC CHEMISTRY – III								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	4	4	2	4	4	4	2	4	4	3	3.54	
CO2	2	3	4	4	4	2	4	4	4	2	2	3	3	3.15	
CO3	3	3	3	3	3	3	3	3	4	2	3	3	3	3.00	
CO4	3	4	4	4	4	3	4	4	4	3	4	4	3	3.69	
CO5	2	3	3	4	3	3	4	3	4	3	4	3	3	3.23	
Mean Overall Score														3.32	

Result: The Score of this Course is 3.32 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: CHEMISTRY OF D-BLOCK ELEMENTS AND METALLURGICAL PROCESSES [12 Hrs]

1.1 Chemistry of d-block elements - Characteristics of d-block elements - occurrence - oxidation states, magnetic properties and color - comparative study of Ti, V, Cr, Mn & Fe group.

1.2 Metallurgical processes: Methods involved in ore concentration, isolation and purification. Metallurgy of Ti, V, W, Cr

UNIT – II: COORDINATION CHEMISTRY I [12 Hrs]

2.1 Coordination Chemistry: Definition of terms used - Nomenclature of Co-ordination complexes - Classification of ligands.

2.2 Isomerism in complexes – ionization isomerism, hydrate isomerism, linkage isomerism, ligand isomerism, Coordination isomerism and polymerization isomerism - Geometrical and optical isomerism in tetra and hexa coordinated complexes.

UNIT – III: COORDINATION CHEMISTRY II [12 Hrs]

3.1 Werner's theory - Sidgwick's theory - EAN rule, - Valence bond theory – hybridization - geometry and magnetic properties - failure of VBT.

3.2 Crystal field theory - Splitting of d-orbitals in octahedral, tetrahedral and square planar complexes - crystal field stabilization energy - calculation of CFSE in octahedral complexes - Spectrochemical series - low spin and high spin complexes - explanation of magnetic properties and color of complexes using CFT

UNIT – IV: COORDINATION CHEMISTRY III [12 Hrs]

4.1 Comparison of VBT and CFT. Trans effect and Jahn-Teller effect.

4.2 Pi - Acceptor ligands, bonding, hybridizations, structures and properties of carbonyls of Ni, Cr, Fe, Co, Mn, W & V.

UNIT – V: SOLID STATE CHEMISTRY [12 Hrs]

5.1 X-Ray diffraction – Bragg's equation - principle of X-ray diffraction - comparison of X-ray, electron and neutron diffraction

5.2 Radius ratio and coordination number of Crystal structure – NaCl, Rutile, Wurtzite, Zincblende and CaF_2, - Crystal defects – Schottky , Frenkel, Metal excess and Metal deficiency defects, and their consequences. Metallic bond, Metallic properties, Band theory of metals, semiconductors - n and p type semiconductors - Superconductors.

Text Books:

1. R. Gopalan,; V.Ramaligam, Concise Co-ordianation Chemistry , 2 nd Ed, Vikas publisihing house, 2008.
2. R. Gopalan,. Inorganic Chemistry For Undergraduates, university press pvt ltd, 1st ed, 2009.
3. B.R. Puri,; L.R.Sharma,; K.C.Kalia, Priciples of Inorganic Chemistry, Lal Nagin chand and co. Delhi 1996.
4. J. D. Lee, Concise Inorganic Chemistry, 5th ed, Blackwell science, London 1996.

Reference Books:

1. W. R. West, Solid State Chemistry And Its Applications, John Wiley and Sons, New York, l984.
2. W. L. Jolly, Modern Inorganic Chemistry, 2nd ed, Mc-Graw Hill 1991.
3. J.E.Huheey,; E.A.Keiter,; R.L.Keiter, Inorganic Chemistry Principles of Structure and Reactivity, 4th ed, Harper and Collins 1993.

4. L. E. Smart, E. A. Moore, Solid State Chemistry – An introduction 3rd ed, Taylor and Francis group 2005.

III B.Sc (CH)	INORGANIC CHEMISTRY - III For the students admitted in the year 2016	CH510T
SEMESTER - V		HRS/WK – 4
CORE - VI		CREDIT - 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a minimum of two subdivisions)
Conceptual and problem solving type. 20% of the questions should be Problems (15 marks out of 75 marks)

III B.Sc (CH)	EQUILIBRIUM THERMODYNAMICS OF GASEOUS SYSTEMS	CH511S
SEMESTER - V		HRS/WK – 4
CORE - VII	For the students admitted in the year 2014	CREDIT - 3

Objective:

Ability to learn and understand the laws of thermodynamics and different kinds of phase equilibria.

COURSE OUTCOMES (COs)

CO1: To learn the concept of thermodynamics and apply it to physical and chemical systems.
CO2: To study the fundamental aspects of thermochemistry and able to calculate enthalpy of reaction.
CO3: To understand the efficient way of converting energy into work from the thermodynamic perspective and to learn the physical significance of entropy.
CO4: To study the third law of thermodynamics and to acquire knowledge about the conditions for spontaneity of chemical reactions.
CO5: Students get to know the informations through Phase diagram and to learn the basic concepts of Phase equlibria.

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Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: CH511S					TITLE OF THE COURSE: EQUILIBRIUM THERMODYNAMICS OF GASEOUS SYSTEMS								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	2	4	3	3	3	3	3	4	3	3	4	4	3	3.23	
CO2	3	4	3	3	3	2	3	3	3	3	4	3	4	3.15	
CO3	3	4	3	4	3	4	4	4	3	3	4	4	4	3.61	
CO4	3	4	3	4	3	2	4	4	3	3	4	4	4	3.46	
CO5	2	4	2	3	2	4	3	4	3	2	3	4	4	3.07	
Mean Overall Score														3.30	

Result: The Score of this Course is 3.30 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I **[12 Hrs]**

1.1 Thermodynamics-the conservation of energy-systems and surroundings-work and heat-the measurement of work- the measurement of heat.

1.2 Internal energy –enthalpy- the temperature variation of the enthalpy. (Pages 37-56)

UNIT – II **[12 Hrs]**

2.1 Thermo chemistry-physical change-the enthalpy of phase transition-atomic and molecular change.

2.2 chemical change – standard enthalpy changes- the combination of reaction enthalpies-standard Enthalpies of formation –variation of reaction enthalpy with temperature. (Pages 57-76)

UNIT – III **[12 Hrs]**

3.1 II law of thermodynamics-entropy –The carnot Cycle – carnot theorems – Entropy and carnot cycle – Entropy a measure of randomness and probability.

3.2 Direction of spontaneous change-entropy and II law-entropy changes for typical processes- entropy changes in the surroundings. (Pages 77-85)

UNIT – IV **[12 Hrs]**

4.1 III law of thermodynamics- Nernst heat theorem- Gibbs-Duhem equation-effect of temperature and pressure on chemical potential – chemical potential in systems of ideal gases- Duhem-Margules equation. Absolute entropies – standard reaction entropy.

4.2 The spontaneity of Chemical reactions –Gibbs free energy – focusing on the system properties of the Gibbs energy. (Pages 77-90)

UNIT – V **[12 Hrs]**

5.1 Phase equilibria-thermodynamics of transition –condition of stability- variation of Gibbs energy with pressure- variation of Gibbs energy with temperature.

5.2 Phase diagrams –phase boundaries-location of phase boundaries-characteristic points - Phase rule –phase diagram for typical materials. (Pages 95-110)

Text Book:

1. P.W. Atkins.Elements of Physical chemistry. Oxford university Press.3rd edition.1990.

Reference Books:

1. J.Rajaram and J.C.Kuriacose,Thermodynamics For Students of Chemistry,Lal Nagin Chand,New Delhi, 3rd edition, 1986.
2. Puri and Sharma. Principles of physical chemistry. 40th edition.2003
3. Arun Bahl, B.S.Bahl and G.D. Tuli . Essentials of Physical Chemistry. 26th edition (revised multicolour). 2009.

III B.Sc (CH)	EQUILIBRIUM THERMODYNAMICS OF GASEOUS SYSTEMS	CH511S
SEMESTER - V		HRS/WK – 4
CORE - VII	For the students admitted in the year 2014	CREDIT - 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer (10 x 1 = 10)
II. Match the following (05 x 1 = 5)

SECTION -B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**
(Conceptual descriptive and Problem solving type)

SECTION –C (5 x 8 = 40)
Answer **Five out of Seven**
(Each question should contain a maximum of two subdivisions)
Conceptual descriptive and Problem solving type. 20% of the questions should be Problems (15marks out of 75 marks).

III B.Sc CH)	ANALYTICAL TECHNIQUES For the students admitted in the year 2014	ECH512
SEMESTER - V		HRS/WK – 4
ELECTIVE - I		CREDIT- 5

Objectives:

To learn the basic analytical methods and appreciate what is involved in an analysis.
To enable the students to develop instrumentation skills.

COURSE OUTCOMES (COs)

CO1: To learn the basic analytical methods and appreciate what is involved in an analysis
CO2: To enable the students to develop instrumentation skills.
CO3: Be able to describe Ultraviolet and visible spectrophotometry.
CO4: Be able to know Infrared Spectroscopy.
CO5: Be able to Know Nuclear Magnetic Resonance (NMR).

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Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: ECH512					TITLE OF THE COURSE: ANALYTICAL TECHNIQUES								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	5	2	4	5	2	4	2	4	2	5	4	3	3.54	
CO2	5	5	2	4	5	2	4	2	4	2	5	4	3	3.62	
CO3	5	5	3	4	5	2	4	2	4	2	5	4	3	3.69	
CO4	4	5	3	5	4	3	3	3	5	3	4	5	4	3.92	
CO5	4	5	2	4	5	2	4	2	4	2	5	4	3	3.54	
Mean Overall Score														3.70	

Result: The Score of this Course is 3.70 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I **[12 Hrs]**

1.1. **Introduction:** Introduction to instrumental methods of chemical analysis.

1.2. **Microwave spectroscopy:** Introduction–instrumentation–the source and monochromator–sample and sample space–detector–spectrum analyzer–working.

1.3. **IR-spectroscopy:** Introduction – source - monochromators –sample cells & sampling substances – sampling of solids – detector – bolometers – thermocouples – thermistars – golay cell – photoconductivity cell – single beam & double beam spectrometers.

UNIT – II **[12 Hrs]**

2.1 **Raman spectroscopy:** Introduction – instrumentation – source of light – filters – sample holder – spectrograph

2.2 **UV spectroscopy:** Introduction–instrumentation–radiation source – monochromators–detectors–recording system–sample cells–power supply

2.3 **NMR spectroscopy:** introduction - instrumentation – sample holder – magnet – sweep generator – radio frequency generator – radio frequency receiver.

UNIT – III **[12 Hrs]**

3.1 **NQR spectroscopy**: Introduction – Instrumentation

3.2 **ESR spectroscopy:** Introduction – instrumentation – source – circulator – sample cavity – magnet system – crystal detectors

3.3 **Mass spectroscopy:** Introduction – instrumentation – inlet system – ion source – electrostatic accelerating system – ion collector – vacuum system

UNIT – IV **[12 Hrs]**

4.1 **Massbouer spectroscopy**: Introduction – instrumentation

4.2 **Atomic absorption spectroscopy:** Introduction – instrumentation –radiation source – chopper – production of the atomic vapor – nebulisation of the liquid sample – monochromators – detectors – amplifiers

4.3 **Flame photometry:** Introduction –instrumentation – burner – mirrors – monochromators – filters - detectors

UNIT – V **[12 Hrs]**

5.1 **Nephlometry and Turbidimetry:** Introduction – instrumentation – sources – detectors – cells – turbidimeters - nephlometers

5.2 **pH meter:** Introduction – instrumentation – potentiometric type – direct reading type

5.3 **Fluorimetry and Phosphorimetry**: Introduction – instrumentation – flourimeters & spectroflourimetrs

Text Books:

1. Instrumental methods of chemical analysis; Chatwal & Anand, Himalaya publishing House.
2. R. Gopalan, Analytical chemistry, S. Chand & Co., New Delhi, 2002.
3. D. A. Skoog; D. M. West; F. J. Holler, Analytical chemistry: An introduction, 5th edition, Saunders college publishing, Philadelphia, 1990.

Reference Books:

1. A. K. Srivastava, P. C. Jain, Chemical Analysis – an instrumental approach for B. Sc., honors and M.Sc., classes, S. Chand & company Ltd., Ram Nagar, New Delhi.
2. R. M. Roberts, J. C. Gilbert, L. B. Rodewald, A. S. Wingrove, Modern experimental chemistry, 4th edition, Holt Saunders international edition.

III B.Sc (CH)	ANALYTICAL TECHNIQUES For the students admitted in the year 2014	ECH512
SEMESTER - V		HRS/WK – 4
ELECTIVE - I		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	FORENSIC CHEMISTRY For the students admitted in the year 2017	ECH512A
SEMESTER - V		HRS/WK – 4
ELECTIVE - I		CREDIT- 5

Objectives:

To learn the importance of forensic chemistry and an exposure to find a suitable method to analyse food adulteration, transportation and detect the crime.

COURSE OUTCOMES (COs)

CO1: Students acquire the awareness of adulteration in various food materials.
CO2: Students get to know the analytical idea for detecting various crime and defusing live bombs.
CO3: To give an exposure to find, analyze and suitable methods to detect the crime.
CO4: understanding and detecting forgery and Counterfeiting.
CO5: Able to explain medical application and prevention.

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Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: ECH512A					TITLE OF THE COURSE: FORENSIC CHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	3	4	3	4	4	4	4	4	4	4	3	3.76	
CO2	4	3	3	3	3	3	3	3	4	3	3	4	4	3.30	
CO3	3	3	4	3	3	3	3	4	4	4	4	4	4	3.53	
CO4	4	3	3	3	3	3	3	4	4	3	4	4	4	3.46	
CO5	3	3	3	4	3	3	3	3	3	4	4	4	4	3.38	
Mean Overall Score														3.48	

Result: The Score of this Course is 3.48 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: FOOD ADULTRATION [12 Hrs]

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

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

1.3 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: TRANSPORTAION [12 Hrs]

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

2.2 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 [12 Hrs]

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.

UNIT – IV: FORGERY AND COUNTERFEITING [12 Hrs]

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

UNIT – V: MEDICAL ASPECTS [12 Hrs]

AIDS : Cause and prevention . Burns and their treatment by plastic surgery.

Metabolite analysis, using mass spectrum - gas chromotography. Detecting steroid consumption among athletes and race horses.

Text Book:

1. Jay A. Siegel, Forensic chemistry- Fundamentals and applications, Wiley, 2015

Reference Book:

1. Suzanne Bell, Forensic chemistry- Second edition, Pearson, 2012

III B.Sc (CH)	FORENSIC CHEMISTRY For the students admitted in the year 2017	ECH512A
SEMESTER - V		HRS/WK – 4
ELECTIVE - I		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	CHEMISTRY OF INDUSTRIAL PRODUCTS For the students admitted in the year 2014	ECH513
SEMESTER - V		HRS/WK – 4
ELECTIVE - II		CREDIT- 5

Objectives:

To provide the basic knowledge in Industrial Product Chemistry and modern trends in the industry

COURSE OUTCOMES (COs)

CO1: Students learn about the preparation and applications of soaps and detergents.
CO2: Students acquire the knowledge of shampoos and dyes.
CO3: Students learn about preparation of face powder and nail polish
CO4: Students learn about leather, sugar and agricultural chemistry
CO5: Students get to know the chemical aspects of lubricants and explosives

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Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: ECH513					TITLE OF THE COURSE: CHEMISTRY OF INDUSTRIAL PRODUCTS							HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)							MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	3	3	3	4	2	4	3	3	3	4	5	4	4	3.46
CO2	3	4	4	4	2	4	3	3	3	4	5	4	4	3.62
CO3	3	3	3	4	3	2	3	3	3	4	5	4	4	3.38
CO4	3	4	3	4	3	4	4	3	4	4	5	5	4	3.85
CO5	4	4	3	4	4	4	4	3	4	4	4	4	4	3.85
Mean Overall Score														3.63

Result: The Score of this Course is 3.63 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: SOAPS AND DETERGENTS [12 Hrs]

1.1 Saponification of oils and fats – Manufacture of soaps – Formulation of Toilet soaps– Different ingredients used–Their functions–Medicated soaps. Herbal soaps–Mechanism of action of soap–Soft soaps–Shaving soaps and creams–ISI specifications–Testing procedures and limits.

1.2 Anionic detergents: Manufacture of LAB (Linear Alkyl Benzene) – Sulphonation of LAB – preparation of acid slurry–Different ingredients in the formulation of detergent powders and soaps–Liquid detergents–Foam boosters–AOS (alpha olefin sulphonates).

1.3 Cationic detergents: Examples– Manufacture and applications.

1.4 Non-ionic detergents: Examples–Manufacture of ethylene oxide condensater.

1.5 Mechanism of action of detergents: Comparison of soaps and detergents– Biodegradation – environmental effects – ISI specifications and limits.

UNIT – II: SHAMPOOS AND DYES [12 Hrs].

2.1 Manufacture of Sodium lauryl sulphate and Sodium laureth sulphate: Ingredients– Functions–Different kinds of shampoos – anti-dandruff–anti-lice–herbal and baby shampoos.

2.2 Hair dye: Manufacture of conditioners – Coco betaines or coco diethanolamides – ISI specifications – Testing procedures and limits.

2.3 Introduction: Methods of dying – Classifications of dyes – Methods of application of dyes – Fluorescent brightening agent – non-textile uses of dyes

UNIT – III: SKIN PREPARATIONS [12 Hrs]

3.1 Face and skin powders: Ingredients – functions – Different types – Snows and face creams – A chemical ingredients used – Anti perspirants.

3.2 Sun screen preparation: UV absorbers – Skin bleaching agents – Depilatories – Turmeric and neem preparations – Vitamin oil.

3.3 Nail polishes: Nail polish preparation – Nail polish removers – Article removers – Lipsticks – roughes, eyebrow pencils – Ingredients and functions – hazards – ISI specifications.

UNIT – IV: LEATHER & SUGAR CHEMISTRY, AGRICULTURAL CHEMISTRY [12 Hrs]

4.1 Introduction: Manufacture of leather–Preparation of hides for tanning– Vegetable–chrome and oil tanning–tannery effluents–pollution control.

4.2 Introduction– manufacture of cane sugar– recovery of sugar from molasses–manufacture of sucrose from beet root–testing and estimation of sugar.

4.3 Classification and examples for insecticides, fungicides and herbicides –fluorine compounds, boron compounds, arsenic compounds, mercuric compounds, pyridine compounds – ill effects of use of chemical fertilizers and insecticides.

UNIT – V: LUBRICANTS, EXPLOSIVES AND PROPELLANTS [12 Hrs]

5.1 Mechanism of lubrication: Classification of lubricants–lubricating oils– greases or semi solid lubricants– solid lubricants and synthetic lubricants.

5.2 Explosives: Classification of explosives, primary explosives–high explosive and low explosive. Blasting fuses–manufacture of important explosives–propellants and rocket fuels–classification of propellants and uses.

Text Books:

1. Gobala Rao. S, Outlines of chemical technology, Affiliated East West Press, 1998.

2. Kafaro, Wasteless chemical processing, Mir Publishers, 1995.

Reference Books:

1. Sawyer. W, Experimental cosmetics, Dover publishers, New York, 2000.
2. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2004

III B.Sc (CH)	CHEMISTRY OF INDUSTRIAL PRODUCTS For the students admitted in the year 2014	ECH513
SEMESTER - V		HRS/WK – 4
ELECTIVE - II		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	FOOD CHEMISTRY For the students admitted in the year 2017	ECH513A
SEMESTER - V		HRS/WK – 4
ELECTIVE - II		CREDIT- 5

Objectives:

To provide the basic knowledge in Food Chemistry and modern trends in the food industry

COURSE OUTCOMES (COs)

CO1: To impart the awareness about food adulteration.
CO2: Students aware of food poison and first aid for poison consumed victims.
CO3: Students learn about various concepts of food additives.
CO4: Students get the knowledge of beverages.
CO5: Students get to know edible oils and preventing of heart diseases.

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Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: ECH513A					TITLE OF THE COURSE: FOOD CHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	3	4	4	5	4	4	4	4	5	5	3	4.0	
CO2	4	4	4	4	4	5	4	4	4	4	4	4	3	4.0	
CO3	3	3	3	5	4	4	3	4	4	3	4	4	4	3.7	
CO4	3	3	3	4	3	3	3	3	4	4	4	4	3	3.4	
CO5	4	3	4	4	4	4	3	3	4	4	4	4	4	3.7	
Mean Overall Score														3.76	

Result: The Score of this Course is 3.76 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: FOOD ADULTERATION [12 Hrs]

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

UNIT – II: FOOD POISON [12 Hrs]

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

UNIT – III: FOOD ADDITIVES [12 Hrs]

Food additives - artificial sweetners - Saccharin - Cyclomate and aspartate. Food flavours - esters, aldehydes and heterocyclic compound. Food colours - Emulsifying agents – preservatives - leavening agents. Baking powder - yeast - taste makers - MSG vinegar.

UNIT – IV: BEVERAGES [12 Hrs]

Beverages - soft drinks - soda - fruit juices - alcholic beverages examples. Carbonation - addiction to alcohol – diseases of liver and social problems. 340

UNIT – V: EDIBLE OILS [12 Hrs]

Fats, Oils - Sources of oils - Production of refined vegetable oils - Preservation. Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heart diseases - determination of iodine value , RM value, saponification values and their significance.

Text Books:

1. Swaminathan M., Food Science and Experimental oods, Ganesh and Company.
2. Jayashree Ghosh, Fundamental concepts of Applicated chemistry, S. Chand & Co. Publishers.

Reference Book:

1. Thanlamma Jacob, Text Books of applied chemistry for HOme Science and allied Sciences, Macmillan.

III B.Sc (CH)	FOOD CHEMISTRY For the students admitted in the year 2017	ECH513A
SEMESTER - V		HRS/WK – 4
ELECTIVE - II		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	PHYSICAL CHEMISTRY PRACTICALS For the students admitted in the year 2016	CHP505S
SEMESTER - V		HRS/WK – 3
CORE PRACTICAL- V		CREDIT- 2

COURSE OUTCOMES (COs)

CO1: Students get the exposure on kinetic experiments.
CO2: Students get the exposure on colligative properties.
CO3: Students learn the effect of impurity in solutions.

1. Distribution law:

a) Association of Benzoic acid between water and benzene.
b) Distribution coefficient of Iodine between water and CCl_4.
c) Distribution coefficient of Iodine between water and Benzene.

2. Kinetics:

a) Acid catalyzed hydrolysis of an ester (methyl or ethyl acetate).
b) Saponification of an ester (methyl or ethyl acetate).
c) Iodination of acetone.

3. Colligative properties:

Rast's method:

a) Determination of molecular weight of a solute – using naphthalene or diphenyl as solvents.

Solutions:

a) Determination of activity and activity coefficient from freezing point depression method.
b) Construction of temperature - composition curves for Azeotropic mixtures.
   (i) Intermediate deviation
   (ii) Maximum deviation
   (iii) Minimum deviation

4. Heterogeneous Equilibria:

a) Phenol – water system – CST
b) Effect of impurity – 2% NaCl or succinic acid solutions on phenol water system – determination of the concentration of the given solution.

5. Determination of the transition temperature of the given salt hydrate:

$Na_2S_2O_3.5H_2O$, $CH_3COONa.3H_2O$, $SrCl_2.6H_2O$, $MnCl_2.4H_2O$.

SCHEME OF EVALUATION

Continuous Internal Assessment (CIA): (40 MARKS)

Based on the periodical evaluation of record and experiments assessed by the staff in charge.

External Examination: (60 MARKS)

Aim & short procedure	– 10
Record	– 10
Experiment & Manipulation	– 25
Viva voce	– 10
Accuracy	– 5
Total	– **60**

III B.Sc (CH)	GRAVIMETRIC ESTIMATION	CHP506
SEMESTER - V		HRS/WK – 4
CORE PRACTICAL-VI		CREDIT- 3

COURSE OUTCOMES (COs)

CO1: Students learn various estimations through gravimetric methods.
CO2: Students learn how to handle the drying of precipitates.
CO3: Students learn the techniques of filtration.

1. Estimation of Sulphate as barium sulphate.
2. Estimation of Barium as barium sulphate.
3. Estimation of Barium as barium chromate.
4. Estimation of Lead as lead chromate.
5. Estimation of Calcium as calcium oxalate monohydrate.

GRAVIMETRIC ESTIMATION PRACTICAL EXAMINATION

Continuous Internal Assessment (CIA): (40 MARKS)

Based on the periodical evaluation of record and experiments assessed by the staff incharge.

External Examination: (60 MARKS)

1. Experiment	20 marks
2. Manipulation	20 marks
3. Accuracy of the report	10 marks
4. Record	10 marks

III B.Sc (CH)	ANALYTICAL CHEMISTRY PRACTICALS	CHP507S
SEMESTER - V		HRS/WK – 3
CORE PRACTICAL - VII		CREDIT- 2

COURSE OUTCOMES (COs)

CO1: Students learn Chromatographic techniques of TLC and Column.
CO2: Students learn Conductometry and Potentiometry through various determinations.
CO3: Students learn Colorimetry and pH metry

1. Chromatography:

a) Thin – layer chromatography.
b) Column chromatography.

2. Conductometry:

a) Determination of strength of stong acid (HCl Vs NaOH).
b) Verification of Onsager's equation.
c) Determination of strength of mixture of acids (HCl + CH_3COOH Vs NaOH).

3. Potentiometry:

a) Determination of single electrode potential.
b) Determination of pKa of weak acid using std. NaOH solution.

4. Colorimetry:

Determination of unknown concentration using Photoelectric colorimeter.

5. pH meter:

Determination of pKa of acetic acid.

ANALYTICAL CHEMISTRY PRACTICAL EXAMINATION

Continuous Internal Assessment (CIA): (40 MARKS)

Based on the periodical evaluation of record and experiments assessed by the staffincharge.

External Examination: (60 MARKS)

1. Short procedure and work sheet preparation	5 marks
2. Experiment	20 marks
3. Manipulation	20 marks
4. Accuracy of the report	5 marks
5. Record	10 marks

III B.Sc (CH)	ORGANIC CHEMISTRY -IV For the students admitted in the year 2014	CH614T
SEMESTER - VI		HRS/WK – 4
CORE - VIII		CREDIT- 3

Objective:

To learn various synthetically important reactions with a view to appreciate their scope, limitations and use in synthetic sequences. To impart knowledge about heterocyclic compounds. To understand UV, IR, NMR and Mass spectra of organic molecules

COURSE OUTCOMES (COs)

CO1: Knowledge and understanding of the principles of UV and IR spectroscopic techniques and the ability to interpret the data obtained from UV and IR Spectrometers.

CO2: Knowledge and understanding of the principles of NMR and Mass spectroscopic techniques and the ability to interpret the NMR and Mass spectral data.

CO3: Knowledge of the oxidizing and reducing agents and their applications in organic synthesis.

CO4: Understanding of the principles of pericyclic and photochemical reactions and the ability to apply them in solving problems.

CO5: Knowledge of preparation and properties of heterocycles, Terpenoids and some specific alkaloids.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: CH614T					TITLE OF THE COURSE: ORGANIC CHEMISTRY -IV								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	4	4	3	2	4	4	3	3	4	4	4	3.54	
CO2	4	3	4	4	3	2	3	4	3	4	4	4	4	3.54	
CO3	3	3	3	4	3	2	3	4	4	4	4	4	4	3.46	
CO4	3	3	4	4	3	2	3	4	3	4	4	4	4	3.46	
CO5	3	3	4	4	4	3	3	4	3	4	4	4	4	3.61	
Mean Overall Score														3.52	

Result: The Score of this Course is 3.52 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: UV-VISIBLE AND IR SPECTROSCOPY [12 Hrs]

1.1 Principles – Type of transitions - Woodward – Fieser rules as applied to conjugated dienes and α,β – unsaturated ketones.

1.2 Characteristic IR absorption frequencies of important functional groups – finger print region –The effect of intermolecular and intramolecular hydrogen bonding in IR.

1.3 Problems based on IR and UV spectra. Problems using Woodward – fieser rules.

UNIT – II: NMR SPECTROSCOPY AND MASS SPECTROMETRY [12 Hrs]

2.1 Principles of nuclear magnetic resonance – chemical shift - shielding and deshielding of protons – spin–spin splitting of neighbouring protons. Coupling constants and their application.

2.2 Applications of ^{1}H NMR in the structural determination of simple organic compounds.

2.3 Mass spectroscopy: Basic principles of mass spectrum- molecular ion peak, base peak, isotopic peak, determination of molecular formula. Fragmentation patterns in hydrocarbons, alcohols, aldehydes, ketones, acids, halobenzenes.

2.4 Simple Combined problems using UV, IR, NMR, Mass spectra

UNIT – III: OXIDATION AND REDUCTION [12 Hrs]

3.1 Oxidation with Cr(VI) and Mn(VII) reagents, Oxidation by peracids and DMSO with oxalyl chloride

3.2 Catalytic hydrogenation and dehydrogenation

3.3 Reductions with LAH, $NaBH_4$ and DIBAL. Birch reduction

3.4 Hydroboration of alkenes and alkynes.

UNIT – IV: PERICYCLIC REACTIONS AND ALKALOIDS [12 Hrs]

4.1 Electrocyclic reactions – 4 and 6 Pi electron system

4.2 Cycloaddition reactions – 2 + 2 and 4+2 additions

4.3 Sigmatropic rearrangements - 1,3; 1,5 and 3,3 sigmatropic rearrangements Claisen and Cope rearrangements

4.4 Alkaloids: definition, occurrence, extraction of alkaloids from plants, structural elucidation of coniine, piperine.

UNIT – V: HETEROCYCLIC COMPOUNDS AND TERPENOIDS [12 Hrs]

5.1 Preparation , properties and uses of furan, pyrrole, thiophene, pyridine and piperidine. Comparative study of basicity of pyrrole, pyridine and piperidine with amines.

5.2 Six membered rings: synthesis and reactions of quinoline, isoquinoline and indole. Skraup synthesis, Bischler Napieralskii and Fischer Indole synthesis.

5.3 Terpenoids: Classification, isoprene rule, isolation, general structure of geraniol, citral, menthol, α-pinene and camphor. Structural elucidation of menthol.

Text Books:

1. B. Y. Paula Yurkanis Bruise, Organic Chemistry, 3rd edition, Pearson education, New Delhi 2002.
2. R. T. Morrison and R. N. Boyd, Organic chemistry, 6th edition, Prentice Hall of India Limited., New Delhi, 1992
3. I. L. Finar, Organic chemistry, 6th edition, ELBS, 1990.
4. O. P. Agarwal, Chemistry of organic natural products vol 2, Goel publishing house, 2002.
5. Gurdeep chatwal, Chemistry of organic natural products, vol 2, Goel publishing house, 2002.
6. Bahl and Arun Bahl, Organic chemistry, S. Chand and sons, New Delhi,2005
7. William Kemp, Organic Spectroscopy, 3rd edition, sarmaha publishers, 2002

8. M. B,smith, Organic synthesis, McGraw Hill International edition 1994.

Reference Books:

1. Jerry March, Advanced organic chemistry, 4th edition, John wiley and sons, New Yorkk, 1992.
2. S. H. Pine, Organic chemistry, 5th edition, Mcgraw Hill international edition chemistry series, New York, 1987.
3. Seyhan. N. Ege, organic chemistry, structure and reactivity, 3rd edition, A.I.T.B.S., New Delhi,1998.
4. P. S. Kalsi, Spectroscopy, 2nd edition, Wiley easern ltd, 1993.
5. Silverstein and Bassler, Spetrometric identification of organic compounds, John wiley and sons.

III B.Sc (CH)	ORGANIC CHEMISTRY -IV For the students admitted in the year 2014	CH614T
SEMESTER - VI		HRS/WK – 4
CORE - VIII		CREDIT- 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a maximum of two sub divisions)

III B.Sc (CH)	INORGANIC CHEMISTRY - IV For the students admitted in the year 2008	CH615S
SEMESTER - VI		HRS/WK – 4
CORE - IX		CREDIT- 3

Objective:

To know the importance of nuclear reactions in the modern world and to know the occurrence of lanthanides, actinides in nature and Organometallic chemistry, Bio inorganic chemistry and their uses.

COURSE OUTCOMES (COs)

CO1: To understand the chemistry of f-block elements.
CO2: To gain Knowledge on basic concepts in Nuclear chemistry.
CO3: To describe role of different metal ions in biological system and to recognize role of porphyrin ring in hemoglobin.
CO4: To know about the bond between transition metal and carbon, ligands and to count total of electrons in organometallic compound.
CO5: To understand the catalytic process in organo metallic chemistry.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: CH615S					TITLE OF THE COURSE: INORGANIC CHEMISTRY - IV								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	4	4	3	4	3	3	2	4	4	3	3.46	
CO2	3	3	4	4	4	3	3	3	3	4	3	3	3	3.31	
CO3	3	4	4	4	4	4	4	4	4	3	4	3	4	3.78	
CO4	3	4	4	4	4	3	4	4	3	2	4	4	3	3.54	
CO5	3	4	4	4	4	3	3	4	4	3	4	4	3	3.61	
Mean Overall Score														3.54	

Result: The Score of this Course is 3.54 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: CHEMISTRY OF F-BLOCK ELEMENTS & NUCLEAR CHEMISTRY I [12 Hrs]

1.1 Chemistry of f-block elements; Occurrence, elements, oxidation states, magnetic properties, color and spectra - lanthanide contraction - causes, consequences and uses - comparison between 3d and 4f block elements - comparative account of lanthanides and actinides.

1.2 Nuclear Chemistry - Introduction of nucleus - nuclear force acting between nucleons - N/P ratio, curves, stability belts – packing fraction – isotopes - isobars, isotones and isomers. Natural radioactivity - Detection and measurement of radioactivity - radioactive series including neptunium series-group displacement law – rate of disintegration and half-life period-average life period - Nuclear binding energy – Mass defect - simple calculations involving mass defect and binding energy per nucleon - magic number - liquid drop model - shell model.

UNIT – II: NUCLEAR CHEMISTRY II [12 Hrs]

2.1 Artifical radioactivity-induced radioactivity-uses of radioisotopes-hazards of radiation-nuclear fission- nuclear fusion-thermo nuclear reaction-energy source of the sun and stars.

2.2 Nuclear reaction: Types & reactions - cross section, Q-value, threshold energy, compound nucleus theory, direct reaction; photonuclear reaction - Nuclear reactors: Breeder reactor and Fast breeder reactor - Particle accelerators - linear accelerators, cyclotrons, Synchrotrons.

UNIT – III: BIOINORGANIC CHEMISTRY [12 Hrs]

3.1.Bioinorganic chemistry: Role of metal ions in biological systems Heme proteins – Fe - transport and storage of Dioxyge, structure and function of hemoglobin, myoglobin.

3.2. Zn - Carboxy peptidase, Carbonic anhydrase – Mg - chlorophyll. Co-VitaminB_{12} - Mo-Nitrogen fixation - $Na^+/K^+$and Ca^{2+}-pump.

UNIT – IV: ORGANO METALLIC CHEMISTRY I [12 Hrs]

4.1 Organo Metallic Chemistry – Compounds with transition metals to carbon bonds – classification of ligands – nomenclature- 18 electron rule – Organometallic – metal alkyls – metal alkylidenes, metal alkylidynes.

4.2 Organometallic Reactions: Substitution, addition and elimination, ligand protonation, electrophilic and nucleophilic attack on ligands. Carbonylation and Decorbonylation, oxidative addition, reductive elimination.

UNIT – V: ORGANO METALLIC CHEMISTRY II [12 Hrs]

5.1. Organometallic Chemistry - Catalytic processes- Hydrogenation of olefin (Wilkinson's catalyst), Hydroformylation of olefins using cobalt catalysts (oxo process), oxidation of olefins to aldehydes (wacker's process).

5.2. Polymerization of olefins (Zeigler-Natta catalyst); cyclo oligomerisation of acetylene using nickel catalyst (Repee's catalyst); Polymer bound catalyst.

Text Books:

1. H. J. Arnikar, Essentials Of Nuclear Chemistry, 4th edition, New Age international, New Delhi, 1995.
2. B.R.Puri.; L.R.Sharma,; K.C. Kalia, Principles of Inorganic Chemistry, Lal Nagin chand and co. Delhi 1996.
3. J. D. Lee, Concise Inorganic Chemistry, 5th edition, Blackwell science, London 1996.
4. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, 6th edition., John wiley, New York 1999.

5. R.Gopalan,; V.Ramalingam, Concise coordination chemistry, Vicas publications.

Reference Books:

1. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rd edition., W. H. Freeman and Co, London, 1999.
2. S. Glasstone, Source Book of Atomic Energy, 3rd ed, ELBS,1986.
3. Keith F. Purcell. ; John C. Kotz, Inorganic Chemisty, W.B Saunder Company, 1977
4. Ivano. ; Harry B. Gray. ; Stephen J. Lippard.; Valentine, Bioinorganic Chemistry, 1st ed, University science book, 1998.

III B.Sc (CH)	INORGANIC CHEMISTRY - III For the students admitted in the year 2011	CH615S
SEMESTER - V		HRS/WK – 4
CORE - VI		CREDIT - 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a minimum of two subdivisions)
Conceptual and problem solving type. 20% of the questions should be Problems (15 marks out of 75 marks)

III B.Sc (CH)	THERMODYNAMICS OF IDEAL AND NON IDEAL SOLUTIONS	CH616T
SEMESTER - VI		HRS/WK – 4
CORE - X	For the students admitted in the year 2018	CREDIT - 3

Objective:

To learn the chemistry of Ideal and Non Ideal. To Learn Raoult's law and Nernst distribution law in sloutions. To impart the knowledge on Electrochemistry.

COURSE OUTCOMES (COs)

CO1: To learn partial molar properties of system, colligative properties and to acquire knowledge about the phase diagram of mixtures.

CO2: To study the principle of chemical equilibrium and the response of equilibrium to the conditions.

CO3: To acquire knowledge about hydrolysis of salt, common ion effect, acid base indicators and able to determine solubility product, pH of buffer solution and salt solution.

CO4: To understand the interconversion of chemical energy and electrical energy, electrode reactions and working principle of battery

CO5: To relate the laws of thermodynamics with electrochemistry and to gain the knowledge about electrochemical cells.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: CH616T					TITLE OF THE COURSE: THERMODYNAMICS OF IDEAL AND NON-IDEAL SOLUTIONS								HOURS: 4	CREDITS: 3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	4	3	3	2	3	4	3	3	3	3	3	3.07	
CO2	3	4	3	4	2	2	3	4	3	3	3	4	4	3.23	
CO3	3	4	3	4	3	3	3	4	3	3	3	4	4	3.38	
CO4	3	4	3	3	2	2	3	4	3	3	4	3	4	3.15	
CO5	3	4	3	3	3	2	3	4	3	3	4	4	4	3.30	
Mean Overall Score														3.22	

Result: The Score of this Course is 3.22 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT - I **[12 Hrs]**

1.1 The properties of mixture- thermodynamic description of mixture-measures of concentration –partial molar properties –spontaneous mixing-ideal solutions- Ideal –dilute Solutions.

1.2 Real solutions –Colligative properties-modification of boiling and freezing points-Osmosis.

1.3 Phase diagrams of mixture- mixture of volatile liquids-liquid – liquid phase diagrams-liquid -solidphase diagrams-ultra purity and controlled impurity. (Pages 111-142)

UNIT – II **[12 Hrs]**

2.1 Principle of chemical equilibrium-reaction Gibbs energy –variation of ΔG with composition –reactions at equilibrium-standard reaction Gibbs energy.

2.2 The response of equilibria to the conditions- presence of a catalyst – effect of temperature- effect of compression. (Pages 143-166)

UNIT – III **[12 Hrs]**

3.1 Consequences of equilibrium-proton transfer equilibrium –Bronzed-Lowry theory – protonation and deprotonation- amphiprotic systems.

3.2 Salts in water- Acid – base titrations –buffer action-indictors –solubility constants – common -ion effect. (Pages 167-186)

UNIT – IV **[12 Hrs]**

4.1 Electro chemistry –migration of ions- conductivity-specific, equivalent and molar conductance-ion mobility-Transport number and its determination (Hittorf's and moving boundary method).

4.2 Electro chemical cells-half reactions and electrodes –reactions at electrodes. (Pages 187-196)

4.3 Fuel cells (H_2-O_2 and hydrocarbon-O_2)-Batteries-Primary and Secondary batteries.

UNIT – V **[12 Hrs]**

5.1 Electrochemical cells-varieties of cell- the cell reaction –the cell potential –cells at equilibrium –standard potentials-the variation of potential with pH-the determination of pH.

5.2 Applications of standard potential-the electro chemical series-the determination of thermodynamic functions. (Pages 197-214)

Text Book:

1. P.W. Atkins.Elements of Physical chemistry. Oxford university Press.3rd edition.1990.

Reference Books:

1. J.Rajaram and J.C.Kuriacose,Thermodynamics For Students of Chemistry,Lal Nagin Chand,New Delhi, 3rd edition, 1986.
2. Puri and Sharma. Principles of physical chemistry. 40th edition.2003
3. Arun Bahl, B.S.Bahl and G.D.Tuli . Essentials of Physical Chemistry. 26th edition (revised multicolour). 2009

III B.Sc (CH)	THERMODYNAMICS OF IDEAL AND NON IDEAL SOLUTIONS For the students admitted in the year 2018	CH616T
SEMESTER - VI		HRS/WK – 4
CORE - X		CREDIT - 3

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blanks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain a maximum of two subdivisions)

(Conceptual descriptive and Problem solving type. 20% of the questions (15 marks out of 75 marks) should be Problems.

III B.Sc (CH)	MEDICINAL CHEMISTRY For the students admitted in the year 2016	ECH617T
SEMESTER - VI		HRS/WK – 4
ELECTIVE - III		CREDIT-5

Objective:

To impart knowledge in drug designing. To acquire knowledge of synthesis of currently used drugs and their potential use.

COURSE OUTCOMES (COs)

CO1: Students impart the knowledge in drug designing.
CO2: Students acquire the knowledge of antibiotics.
CO3: Students to get the knowledge about antineoplastic agents and cardiovascular drugs.
CO4: Students shall understand the chemistry of anti- infective drugs.
CO5: Students acquire the knowledge of psychoactive drugs.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: ECH617T					TITLE OF THE COURSE: MEDICINAL CHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	4	5	3	4	4	4	4	4	4	4	4	4.0	
CO2	3	4	4	4	4	4	3	4	4	4	4	3	3	3.69	
CO3	4	4	4	4	3	4	3	3	3	4	4	3	3	3.54	
CO4	3	3	4	4	4	4	3	3	4	4	4	3	3	3.54	
CO5	3	3	4	4	4	4	4	3	4	4	4	3	3	3.61	
Mean Overall Score														3.68	

Result: The Score of this Course is 3.68 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: DRUG DESIGN [12 Hrs]

1.1 Development of new drugs– procedures followed in drug design–concepts of prodrugs and soft drugs–structure-activity relationship (SAR).

1.2 Theories of drug activity: Occupancy theory–rate theory–induced fit theory–Quantitative structure activity relationship.

1.3 Concepts of drug receptors: Elementary treatment of drug receptor interactions.

1.4 Introductions to pharmacokinetics and pharmacodynamics

UNIT – II: ANTIBIOTICS [12 Hrs]

2.1 Antibiotics Cell wall biosynthesis– inhibitors– β-lactum rings–antibiotics inhibiting protein synthesis.

2.2 SAR of penicillin G – penicillin V– chloramphenicol– ciprofloxin– tetracycline – streptomycin.

UNIT – III: ANTINEOPLASTIC AGENTS & CARDIOVASCULAR DRUGS [12 Hrs]

Antineoplastic Agents

3.1 Introduction– cancer chemotheraphy– special problems–role of alkylating agents and antimetabolites in treatment of cancer.

3.2 SAR of uracil– mustards– 6-mercaptopurine – Hormone and natural products.

Cardiovascular Drugs

3.4 Introduction – cardiovascular diseases–central intervention of cardiovascular output – Direct acting arteriolar dilators.

UNIT – IV: ANTIINFECTIVE DRUGS [12 Hrs]

4.1 Introduction and general mode of action.

4.2 SAR of sulphonamides – nalidixic acid –amino salicylic acid – isoniazid-chloroquin.

UNIT – V: PSYCHOIACTIVE DRUGS-THE CHEMOTHERAPY OF MIND [12 Hrs]

5.1. Introduction – neuotransmitters– CNS depressants– general anaesthetica– mode of action of hypnotics– sedatives– anti-anxiety drugs– benzodiazepines– buspirone– neurochemistry of mental diseases.

5.2. Antipsychotic drugs– the neuroleptics– antidepressants– butyrophenones– serendipity and drug development– stereochemical aspects of psychotropic drugs.

Text Books:

1. Introduction to medicinal chemistry, A.Gringuage, Wiley-VCH
2. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F.Dorge.
3. Medicinal Chemistry, Ashutosh Kar, New Age International (P) Ltd., 1996
4. Textbook of pharmaceutical chemistry, Jayashree Ghosh, S.Chand&Company Ltd., 1997

Reference Books:

1. An introduction to drug design, S.S.Pandeya and J.R.Dimmock, New Age international.
2. Burger's Medicinal Chemistry and Drug discovery, Vol-1(chapter-9 & 14), Ed. M.E.Wolff, John Wiley.
3. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.
4. The organic chemistry of drug design and drug action, R.B. Silverman, Academic press.
5. Strategies for Organic Drug synthesis and design, D. Lednicer, John Wiley.

III B.Sc (CH)	MEDICINAL CHEMISTRY For the students admitted in the year 2016	ECH617T
SEMESTER - VI		HRS/WK – 4
ELECTIVE - III		CREDIT-5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION –C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	AGRICULTURAL CHEMISTRY For the students admitted in the year 2017	ECH617A
SEMESTER - VI		HRS/WK – 4
ELECTIVE - III		CREDIT-5

Objectives:

To give the students the importance of Agricultural chemistry and an exposure to find, and analyse a suitable method to cultivate and promote agricultural methods.

COURSE OUTCOMES (COs)

CO1: To give the students the importance of Agricultural chemistry and exposure.
CO2: To find, analyze and find a suitable method to cultivate and promote agricultural methods.
CO3: To learn about fertilizers and pesticides.
CO4: To study the origin, characterization and testing of soils.
CO5: To understand ethical issues and responsibility of serving the society and the environment at large.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: ECH617A					TITLE OF THE COURSE: AGRICULTURAL CHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	3	3	2	4	3	3	4	2	3	3	3	3.07	
CO2	3	3	3	2	3	2	2	3	3	4	2	3	4	2.84	
CO3	3	3	3	3	4	4	3	3	3	2	4	3	4	3.23	
CO4	3	3	3	3	2	4	3	3	3	3	3	2	3	2.92	
CO5	4	4	3	2	3	3	4	4	3	3	2	3	3	3.15	
Mean Overall Score														3.08	

Result: The Score of this Course is 3.08 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT - I: SOIL CHEMISTRY [12 Hrs]

Soil analysis. Composition of soil: Organic and Inorganic constituents.
Soil acidity: buffering capacity of soils. Limiting of soil.
Absorption of cations and anions: availability of soil nutrients to plants

UNIT – II: FERTILIZERS [12 Hrs]

Peat and organic manures (composts). Role of humus. Effluent form gobar gas plants.
Use of fertilizers: urea, DAP, Super phosphate, Gypsum, NPK-mixed fertiizers, optimal addition of Fertilizers to obtain estimated yields.

UNIT – III: PESTICIDES – I [12 Hrs]

Insecticides: stomach and contact poisons. Plant derivatives: pyrethrine, Nicotine and rotenone
Synthetic organic: carbophos, carbaryl, p-DCB, dimethoate, butachlor, Endrin, Aldrin (Chemical name and uses). Rodenticdes.

UNIT – IV: PESTICIDES – II [12 Hrs]

Fungicides: Inorganic (Bordeaux mixture) and organic (dithiocarbamate).
Industrial fungicides: creosote fractions.
Herbicides and weedicides: Selective and non-selective
Intenerated pest management. Sex attractants for insect control. Sustainable agriculture.

UNIT – V: PLANT FROWTH REGULATORS [12 Hrs]

3-Indole acetic acid: Naphthalene Acetic Acid: Ethepon (2-chloroethyl phosphoric acid): Alar (succinin acid-2, 2-dimethyhydrzine :) their function.
Plant hormones: Gibberlin, Cyclocel, Phosphon, dwarfing compound (CCC: 2-Chlorethyltrimethyl ammonium chloride). Defoliants

Text Book:

1. G.T. Austin: shreve's Chemical Process Industries, 5th edition, Mc-Graw-Hill, 1984

Reference Book:

1. B.A. Yagodin (Ed). Agricultural Chemistry, 2 Volumes, Mir Publishers (Moscow), 1976.

III B.Sc (CH)	AGRICULTURAL CHEMISTRY For the students admitted in the year 2017	ECH617A
SEMESTER - VI		HRS/WK – 4
ELECTIVE - III		CREDIT-5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (15 x 1 = 15)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	POLYMER CHEMISTRY For the students admitted in the year 2014	ECH618
SEMESTER - VI		HRS/WK – 4
ELECTIVE - IV		CREDIT- 5

Objective:

To study the importance of polymers. To emphasize the applications of polymers.

COURSE OUTCOMES (COs)

CO1: To know the concept of polymerization and types of polymers.
CO2: To understand the characteristics of polymers.
CO3: To acquire knowledge about the polymerization techniques and polymer processing.
CO4: To know the chemistry of individual polymers.
CO5: To have an idea about the recent advances in polymer sciences.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: ECH618					TITLE OF THE COURSE: POLYMER CHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	4	3	4	2	3	4	3	3	3	4	4	3.30	
CO2	2	3	4	3	3	2	2	3	4	3	3	4	4	3.07	
CO3	2	3	4	3	3	2	3	4	4	4	4	4	4	3.38	
CO4	3	3	3	3	2	2	3	4	4	3	4	4	4	3.23	
CO5	3	3	3	4	3	2	2	3	3	4	4	4	4	3.23	
Mean Overall Score														3.24	

Result: The Score of this Course is 3.24 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: BASICS [12 Hrs]

1.1. Importance of polymers. Basic concepts: Monomers–repeating units– degree of polymeriztation–Linear, branched and network polymers.

1.2. Classification of polymers: Polymerisation – condensation, addition, radical chain-ionic and coordination and co-polymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogenous systems

UNIT – II: STRUCTURE AND PROPERTIES [12 Hrs]

2.1 Morphology and order in crystalline polymers – configurations of polymer chains Crystal structures of polymers.

2.2 Morphology of crystalline polymers: strain-induced morphology, crystallization and melting–Crystalline melting point T_m. The glass transition temperature, T_g relationship between T_m and T_g.

UNIT – III: POLYMER PROCESSING [12 Hrs]

Plastics, elastomers and fibers: Compounding–Processing techniques: Calendering–die casting–rotational casting–film casting–injection moulding–blow moulding–extrusion moulding–thermoforming–foaming–reinforcing and fibre spinning.

UNIT – IV: POLYMER CHARACTERIZATION [12 Hrs]

4.1 Polydispersion: Average molecular weight concept–Number, weight and viscosity average molecular weights–Polydispersity and molecular weight distribution – The practical significance of molecular weight.

4.2 Analysis and testing of polymers: Chemical analysis of polymers– spectroscopic methods–X-ray diffraction study–Thermal analysis and physical testing – tensile strength–Fatigue, impact–Tear resistance–Hardness and abrasion resistance.

UNIT – V: PROPERTIES OF COMMERCIAL POLYMERS [12 Hrs]

5.1 Polyethylene, Polyvinyl chloride, polyamides, phenolic resins, epoxy resins and silicone polymers.

5.2 Functional polymers – fire retarding polymers and electrically conducting polymers. Biomedical polymers – contact lens, dental polymers, artificial heart, kidney, skin and blood cells.

Text Books:

1. Text book of Polymer Science, F.W. Billmeyer Jr, Wiley
2. Polymer Science, V. R. Gowariker, N. V. Viswanathan and J. Sreedhar, New Age International(P) Ltd., 2005

Reference Books:

1. Functional monomers and polymers, K. Takemoto, Y, Inaki and R. M. Ottanbrite.
2. Physics and chemistry of polymers, J. M. G. Cowie, Blackie Academic and Professional.

III B.Sc (CH)	POLYMER CHEMISTRY For the students admitted in the year 2014	ECH618
SEMESTER - VI		HRS/WK – 4
ELECTIVE - IV		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain maximum of 2 sub divisions)

III B.Sc (CH)	GREEN CHEMISTRY For the students admitted in the year 2017	ECH618A
SEMESTER - VI		HRS/WK – 4
ELECTIVE - IV		CREDIT- 5

Objective:

To know the basics of Green Chemistry and its developments. To know the basic ideas of Nano chemistry.

COURSE OUTCOMES (COs)

CO1: Students learn the principles behind organic synthesis by Microwave-assisted synthesis and sonication method.
CO2: Students acquire the knowledge on green reactions.
CO3: Students understand the uses of green solvents.
CO4: Students learn the basics and Techniques to synthesize nanoparticles.
CO5: Students learn about Nano Materials and their Characterization.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: ECH618A					TITLE OF THE COURSE: GREEN CHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	4	4	3	5	4	4	3	5	4	5	5	4.15	
CO2	4	4	3	4	3	4	4	4	4	5	4	4	4	3.92	
CO3	3	3	3	3	4	4	4	4	3	5	4	4	4	3.69	
CO4	4	4	4	4	3	4	3	3	3	4	4	4	5	3.77	
CO5	4	3	4	4	3	3	3	3	3	4	4	4	4	3.54	
Mean Overall Score														3.81	

Result: The Score of this Course is 3.81 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: GREEN CHEMISTRY – INTRODUCTION [12 Hrs]

1.1 Need for green chemistry – principles of green chemistry – atom economy - definition with example (ibuprofen synthesis)

1.2 Green oxidant – hydrogen peroxide.

1.3 Microwave assisted organic synthesis – apparatus required – examples of MAOS (synthesis of fused anthroquinones, acetalization of a by-product of sugar industry, 1, 3-dipolar cycloaddition of nitrones to fluorinated dipolarophiles, Leukart reductive amination of ketones) – advantages and disadvantages of MAOS.

1.4 Organic reactions by sonication method – apparatus required – examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).

UNIT – II: GREEN REACTIONS [12 Hrs]

2.1 Acetylation of primary amine, base catalyzed aldol condensation (synthesis of dibenzalpropanone), halogen addition to C=C bond (bromination of trans-stilbene), [4+2] cycloaddition reaction (Diels-Alder reaction between furan and maleic acid).

2.2 Rearrangement reaction (benzyl-benzilic acid rearrangement), coenzyme catalyzed benzoin condensation (thiamine hydrochloride catalyzed synthesis of enzoin, Pechmann condensation for coumarin synthesis (clay catalyzed solid state synthesis of 7-hydroxy-4-methylcoumarin).

2.3 Electrophilic aromatic substitution reactions (nitration of phenol, bromination of acetanilide) – green oxidation reactions (synthesis of adipic acid, preparation of manganese (III) acetylacetonate) – zeolite catalyzed Friedel-Crafts acylation.

UNIT – III: GREEN SOLVENTS [12 Hrs]

3.1 Ionic liquids: simple preparation – types – properties and application – ionic liquids in organic reactions (Heck reaction, Suzuki reactions, epoxidation), industrial (battery) and analytical chemistry (matrices for MALDI-TOF MS, gas chromatography stationary phases – advantages and disadvantages.

3.2 Super critical CO2 – preparation, properties and applications (decaffeination, dry cleaning) – environmental impact.

3.3 Diels-Alder reaction in water – catalysis in water (aerobic oxidation of alcohols catalyzed by Pd(II) / bathophenanthroline).

UNIT – IV: BASICS OF NANOCHEMISTRY [12 Hrs]

4.1 Definition, length scales and importance of nanoscale and its technology – self-assembly of materials – self-assembly of molecules – porous solids, nanowires, nanomachines and quantum dots.

4.2 Nano particles: Introduction – types of nanoparticles – preparation, properties and uses of gold, silicon, silver, zinc oxide, iron oxide, alumina and titania nanoparticles.

4.3 Techniques to synthesize nanoparticles – top down and bottom up approaches – common growth methods.

UNIT – V: NANO MATERIALS AND THEIR CHARACTERIZATION [12 Hrs]

5.1 Preparation, properties and applications of carbon nanotubes, nanorods, nano fibre and nanoclay – toxic effects of nanomaterials.

5.2 Electron microscopes – scanning electron microscopes (SEM) – transmission electron microscopes (TEM) – scanning probe microscopy – atomic force microscopy (AFM) – scanning tunneling electron microscope (STEM) – basic principles only.

Text Books:

1. Green Chemistry: Environmental Friendly Alternatives, Rs. Sanghi and M.M.Srinivatava, Narosa Publishing House, New Delhi.
2. Green Chemistry, V.K. Ahluwalia, Narosa, New Delhi (2011).
3. Nanotechnology, S.Shanmugam, MJP Publishers, Chennai. (2010).
4. A Handbook on Nanochemistry, Patrick Salomon, Dominant Publishers and Distributers, New Delhi.
5. Nanobiotechnology, S. Balaji, MJP Publishers, Chennai. (2010).
6. Nano: The Essentials, T. Pradeep, Tata Mc-Graw Hill, New Delhi (2007).

Reference Books:

1. Methods and Reagents for Green Chemistry, P. Tundo, A. Perosa and F. Zechini, John Wiley & Sons Inc., New Jercy, (2007).
2. The Chemistry of Nanomaterial: Synthesis, Properties and Applications, Vol. I and II, CNR Rao, Springer (2006).
3. Nanotechnology: Basic Science and Emerging Technologies, Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Overseas Press (2005).
4. Nanochemistry, G. B. Segreev, Elsevier, Science, New York, (2006).

III B.Sc (CH)	GREEN CHEMISTRY For the students admitted in the year 2017	ECH618A
SEMESTER - VI		HRS/WK – 4
ELECTIVE - IV		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	10 marks
Assignment / Seminar	10 marks
Attendance	5 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

Time: 3 Hours **Max. Marks: 75**

SECTION – A (20 x 1 = 20)
Answer **ALL** the Questions

I. Choose the correct answer	(10 x 1 = 10)
II. Fill up the blaks	(5 x 1 = 5)
III. Match the following	(5 x 1 = 5)

SECTION – B (10 x 2 = 20)
Answer any **Ten** out of **Twelve**

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(Each question should contain maximum of 2 sub divisions)