E-mail : josecol27998@gmail.com
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1.1.2: The programmes offered by the institution focus on employability / entrepreneurship / skill development and their course syllabi are adequately revised to incorporate contemporary requirements

SYLLABUS OF THE COURSES FOCUSING EMPLOYABILITY / ENTREPRENEURSHIP / SKILL DEVELOPMENT

Colour Coding

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

B.Sc. CHEMISTRY

Syllabus

I B.Sc. (CH)	ORGANIC CHEMISTRY – I	19CH101
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: 19CH101					COURSE TITLE: 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]**

IUPAC nomenclature of organic compounds- naming of simple organic molecules, practising line formula for organic molecules. The geometry of molecules – Hybridisation - sp^3, sp^2, sp with examples. Cleavage of Bonds – Homolytic and heterolytic cleavage. Bond energy, Bond length, and Bond angle. Electron displacement effects – inductive, inductomeric, electromeric, resonance, hyperconjugation and steric effects. Reactive Intermediates: Carbocations, Carbanions, Carbenes, and free radicals.

UNIT – II: ALKANES & CYCLOALKANES **[12 Hrs]**

Alkanes – methods of preparation: Wurtz reaction, hydrogenation of alkenes, hydrolysis of Grignard reagents, Kolbe's method. Physical and Chemical properties of alkanes. Cycloalkanes – Preparation using Wurtz's reaction – Dieckmann's ring closure and reduction of aromatic hydrocarbons. Substitution and ring-opening reactions of cycloalkanes.
Bayer's strain theory and theory of strainless rings.

UNIT – III: ALKENES **[12 Hrs]**

Alkene Nomenclature - structure and bonding - Isomerism in Alkenes – properties – stability. Preparation of Alkenes – Elimination reactions: Dehydration of Alcohols, Dehydrohalogenation of Alkyl halides. E1 and E2 mechanism. Hofmann and Saytzeff's rules – Problems related to this mechanism. Addition Reactions of Alkenes: Hydrogenation, Halogenation, Hydrohalogenation - mechanisms – Markovnikov's 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]**

Alkynes – Sources of Alkynes - Nomenclature – the acidity of alkynes – addition reactions – hydrogenation, Hydrohalogenation, Hydration with $HgSO_4$. Preparation of Alkynes by elimination reactions, Ozonolysis of alkynes Alkylation of alkynes through acetylides. Dienes - preparation of dienes, classes of dienes - conjugated, isolated and cumulative - stability of dienes - the addition of hydrogen halides & halogens to conjugated dienes - Polymerization of dienes– Diels-Alder reaction – Problems. Allenes – Structure and preparation.

UNIT – V: STEREOCHEMISTRY – I **[12 Hrs]**

Conformational isomerism: Conformers, Dihedral angle, torsional strain. Conformational analysis of ethane and n-butane. 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. Morrison R T, Boyd R N and Batcharjee S K, Organic Chemistry, 7th Ed., (2009), Pearson New York
3. Paula Yurkanis Bruice - Organic Chemistry, Prentice Hall- 1999.

REFERENCE BOOKS:

1. Ahluwalia and Parassar- Organic Reaction mechanisms, Narosa Publishers.2004.

2. Bahl & Arun Bahl- Advanced Organic Chemistry, Sultan Chand-1996.
3. Seyhan Ege- Organic Chemistry-A.I.T.B. S Publishers-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)	KINETIC THEORY OF GAS AND CHEMICAL KINETICS	19CH102
SEMESTER – I		HRS/WK – 4
CORE-2		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: 19CH102					COURSE TITLE: 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]**

Dimensions of units and its conversion-Temperature, Mass, Length, Charges and Energy. The perfect gas equation of state – Boyle's law, Charle's law, and Avogadro's principle. Real gas equation –critical temperature – compression factor - Virial equations of state –Vanderwaals equation of state- Boyle temperature -Joule –Thomson effect- Linde refrigerator. Numerical conversion problems related to Temperature, Mass, Length, Charges, and Energy.

UNIT – II **[12 Hrs]**

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. Combined gas equation- Standard temperature and pressure. A mixture of gases: partial pressures- Dalton's law. Diffusion and effusion-Molecular collisions. Numerical problems related to partial pressures.

UNIT – III **[12 Hrs]**

Concept of equilibrium- law of mass action – relationship between Kp & Kc – effect of concentration, pressure, partial pressure, temperature & volume – Le Chatlier's principle. Adsorption – terminologies – Gibbs adsorption isotherm – Friendlich – Langmuir – BET theory – adsorption isotherms – applications of adsorption. Numerical problems related to molecular velocities and types of velocities

UNIT – IV **[12 Hrs]**

Concepts of reaction rates- rate and units of the rate of a reaction- dependence of rate on concentration- rate expression and rate constant- order and molecularity. Integrated rate equations-zero order, first order, and pseudo-first-order reaction-half-life of a reaction - temperature dependence of the rate of a reaction- the effect of the catalyst. Numerical problems in the determination of rate and order and in the effects of temperature in kinetics and Arrhenius equation.

UNIT – V **[12 Hrs]**

Solutions- types of solutions- concentration units of solutions- ideal and non-ideal solutions. Colloids- various types of classification – emulsions-applications of colloids. Mesophases and disperse systems – liquid crystals- classification- surface, structure, and stability- electrical double layer. Numerical problems related to concentration terms and activity coefficients.

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)	INORGANIC QUANTITATIVE ANALYSIS	19CHP101
SEMESTER –I		HRS/WK – 3
CORE PRACTICAL – I		CREDIT – 2

COURSE OUTCOMES (COs):

CO1: Students 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 K2Cr2O7 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: SultanChand& Sons
2. Basset.J.et al.1985. Vogel's Textbook of Quantitative Inorganic Analysis, (4th edition) ELBS Longman.

SCHEME OF EVALUATION:

Error up to 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 CHEMISTRY – I	21CH203
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: 21CH203					COURSE TITLE: 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]

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. 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. Electronegativity - Pauling's and Mulliken scale- Alfred Rochow's scale. Applications of electronegativities.

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

Chemistry of Alkali metals: Occurrence, comparative study of elements - oxides, halides, hydroxides and carbonates. Exceptional properties of Li. diagonal-relationship of Li with Mg. 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. Hydrogen bonding – Intra and Intermolecular hydrogen bonding – properties of hydrogen-bonded Nitrogen, Oxygen, Fluorine and sulphur compounds.

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

Chemistry of p – block elements – Boron family- semi metals - group discussion – anomalous behaviour of B - diagonal relationship between B & Si - electron deficiency & electron acceptor behaviour of BX_3. Boron hydrides - VBT & MOT approaches of diborane and tetraborane. Structure of Borax, sodium borate, sodium tetraborate, or disodium tetraborate and Boric acid. Compounds of Boron with Nitrogen - preparation and structure of Borazole and Boron nitrides

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

Ionic Bond: Conditions for the formation of ionic bond – formation of NaCl – Hydration energy – Lattice energy and their applications – Born Haber cycle– General properties of ionic compounds. Covalent bonding: Polarization and Fajan's rule, Effects of polarization, VBT conditions for the formation of covalent bond – hybridization- sigma and pi bonds - Characteristics of Covalent Compounds. Hannay smith equation. Acid-Base concepts – Lewis, Lowry-Bronsted, Luxflood, Usanovich concepts & HSAB approach.

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

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, BF_4-, BO_3^{3-}, NH^{4+}, I^{3-}. 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. Qualitative molecular energy level diagram of homo and hetero diatomic molecules – H2, 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)	ANALYTICAL CHEMISTRY- I	20CH204
SEMESTER – II		HRS/WK – 4
CORE-IV		CREDIT – 3

OBJECTIVE:

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: 20CH204					COURSE TITLE: 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 – the 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 the law of normalities for acid, Alkali titrations – the 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, and transistors), measuring instruments for pressure, temperature, current,and voltage.

UNIT – V **[12 Hrs]**

Chromatographic technique – the principle of chromatography – definition of the terms – Rf value – paper chromatography – principle and applications – thin layer chromatography – theory and applications - Column chromatography – principle 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)	INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS	CHP202
SEMESTER – II		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, Textbook of quantitative chemical analysis, 6th Edition, Prentice-Hall, 2000.

SCHEME OF EVALUATION:

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

II B.Sc (CH)	INORGANIC CHEMISTRY-II	CH305A
SEMESTER – III		HRS/WK – 4
CORE-V		CREDIT – 3

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: CH305A					COURSE TITLE: INORGANIC CHEMISTRY-II								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	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]

Principles of acid-base equilibria - 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. Types of solvents- protic and aprotic solvents, amphiprotic and amphoteric solvents – aqueous and non-aqueous solvents and Physical properties of 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]

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. 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]

Nitrogen family - Comparative study of N, P, As, Sb, Bi oxides – preparation and structure of 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 – roperties 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.

Oxygen family: Comparative study of O, S, Se, Te elements – anomalous behaviour 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 – Structure of Dithionic and Polythionic acids. Chemistry of ozone.

UNIT – IV: HALOGENS [12 Hrs]

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 – estimation of available of chlorine in bleaching powder. Oxyacids of halogens – Sodiumhypochloride and Sodium chlorite(structure and properties) – 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, Textbook 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, Principles 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)	ANALYTICAL CHEMISTRY- II	CH306S
SEMESTER – III		HRS/WK – 4
CORE-VI		CREDIT – 3

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					COURSE TITLE: ANALYTICAL CHEMISTRY- II								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	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.

The principle involved in thermogravimetric analysis and differential thermal analysis- Discussion of various components with block diagram- Characteristics of TGA, DTA & DSC - Factors affecting TGA & DTA curves.

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- Vacuum distillation - Steam distillation

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

Principle – concentration polarization - convention- migration and diffusion currents- Ilkovic equation (derivation not required) and significance - Activation energy - experimental assembly- electrodes- capillary solutions- current voltage curve - Polarography as an analytical tool in quantitative & qualitative analysis. Cyclic Voltammetry – basic principle & uses. Polarimetry principle- instrumentation- comparison of strengths of acids- Estimation 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 a description of components with the 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 the 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)	PRACTICAL CHEMISTRY – III	19CHP303
SEMESTER – III	QUALITATIVE ORGANIC	HRS/WK – 3
CORE PRACTICAL –III	ANALYSIS	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). (Microscale)

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
iii).	Record	:	10 marks
	Total	**:**	**60 marks**

II B.Sc. (CH)	ORGANIC CHEMISTRY - II	19CH407
SEMESTER – IV		HRS/WK – 4
CORE-VII		CREDIT – 3

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 aldehydesa and ketones.
CO5: Reaction of carboxylic acids.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: 19CH407					COURSE TITLE: ORGANIC CHEMISTRY - II								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: ALIPHATIC NUCLEOPHILIC SUBSTITUTION **[12 Hrs]**

Nucleophiles – Nucleophilicity. Aliphatic nucleophilic substitution – Mechanisms of SN1, SN2, and SNi. Energy Profile diagrams – Effects of nature of substrates, solvent, nucleophile, and leaving groups. Leaving ability of the leaving groups. Basicity and Nucleophilicity – a comparison. Substitution Vs elimination – with examples. Stereochemistry of Substitution reactions – a brief introduction.

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

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. Aromatic electrophilic substitution. Mechanisms of Nitration, halogenation, Sulfonation. Friedel – Crafts alkylation and acylation. Substituent effects in Aromatic electrophilic substitution. Reactivity and orientation. Ortho-para ratio. Problems. Synthesis of simple substituted benzenes using the above reactions. Aromatic nucleophilic substitutions. The addition-elimination mechanism AdE2. The elimination-addition mechanism – Benzyne, SN_1 mechanism.

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

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. Reactions of alcohols – oxidation, esterification, and dehydration. Cleavage of Diols using periodic acid (HIO4) and lead tetraacetate. Allyl alcohol – its preparation. Allylic substitution using N-bromosuccinimide (NBS).

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

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

UNIT – IV: ALDEHYDES AND KETONES **[12 Hrs]**

Nomenclature and classification Preparation of aldehydes and ketones: Rosenmund and Gattermann -Koch reactions. Reactivity of carbonyl groups, the acidity of alpha hydrogen. Reactions: Mechanism of enolization reactions, nucleophilic addition, oxidation and reduction reactions, addition reactions with Grignard reagents, cyanide and bisulphate. Preparation of derivatives of ammonia and alcohols. Mechanism of aldol, Cannizaro Perkin, Knoevenagel reactions. Benzoin condensation, Claisen reactions. Mechanisms of reductions with $NaBH_4$, $LiAlH_4$, Wolff- Kishner, Clemmensen, and MPV reductions.

UNIT – V: CARBOXYLIC ACIDS **[12 Hrs]**

Carboxylic acids – nomenclature. Ionization of carboxylic acids – acidity constants. Comparison of acid strengths of substituted haloacids and substituted benzoic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Conversion of acids to their derivatives.

Dicarboxylic acids – nomenclature. Preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids.

TEXT BOOKS:

1. Francis A.Carey, - Organic Chemistry- Tata McGraw Hill-1999.
2. M.K.Jain and S.C.Sharma, Modern Organic Chemistry, Vishal Publishing Co.

3. Morrison R T, Boyd R N and Batcharjee S K, Organic Chemistry, 7th Ed., (2009), Pearson New York.
4. Paula Yurkanis Bruice - Organic Chemistry, Prentice Hall- 1999.

REFERENCE BOOKS:

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

II B.Sc (CH)	INTRODUCTION TO MOLECULAR STRUCTURE	19CH408
SEMESTER – IV		HRS/WK – 4
CORE-VIII		CREDIT – 3

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: 19CH408					COURSE TITLE: INTRODUCTION TO MOLECULAR STRUCTURE							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	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]**

Quantum Chemistry – the failures of classical physics-black body radiation – Photo electric effect –diffraction of electrons. Schrodinger equation – the born interpretation - uncertainty principle. Quantum numbers - wave functions – s orbitals-p and d orbitals and their mathematical expressions-electron spin. Illustrative problems of surface temperatures and total radiation emission calculations of other planets, stars and Black body.

UNIT – II **[12 Hrs]**

Chemical bond-classification of bonds-potential energy curves-VBT-diatomic molecules-polyatomic molecules-promotion and hybridization-resonance. Molecular orbitals-linear combinations of atomic orbitals- bonding orbitals -anti bonding orbitals-structure of diatomic molecules- hydrogen and helium molecules- period 2 diatomic molecules.

UNIT – III **[12 Hrs]**

Electric and magnetic properties – Clausius - Mosotti equations – Debye equation – measurement of dipole moments – dependence of polarizability on frequency. Molar refractivity – dipole moments and molecular structure – magnetic permeability – magnetic susceptibility – diamagnetism – Para magnetism – measurement of magnetic susceptibility

UNIT – IV **[12 Hrs]**

Group theory – symmetry elements and operations –classes and subgroups –group multiplication table- postulates of a group. 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]**

General features of spectroscopy – experimental techniques – intensities & line widths. Rotational spectroscopy-the rotational energy levels of molecules-rotational transitions-microwave spectroscopy-rotational Raman spectra. Vibrational spectroscopy – the vibrations of molecules –transitions- vibrational Raman spectra of diatomic molecules-vibrations of polyatomic molecules and vibrational Raman spectra of polyatomic molecules. Electronic transitions – UV and visible spectra –Franck Condon principle-measures of intensity-spin selection rules, spectral transitions and types of transitions.

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 Eastern, New Delhi, 2nd edition,1992
4. C.N Banwell, fundamentals of molecular spectroscopy, Chapman and hall 4th edition, 1991.

II B.Sc (CH)	PRACTICAL CHEMISTRY – IV PHYSICAL METHODS	CHP404
SEMESTER – IV		HRS/WK – 3
CORE PRACTICAL –IV		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 decolourization of impure naphthalene from ethanol.

Part - III

Viscosity, Surface Tension

1. To determine the percentage composition of a given mixture by the 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 the 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	19CH509
SEMESTER – V		HRS/WK – 4
CORE – IX		CREDIT –4

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.
CO3: Students acquire the knowledge in carbonyl compounds.
CO4: 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: 19CH509					COURSE TITLE: ORGANIC CHEMISTRY - III								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	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]

Nomenclature and classification, Preparation. Nitrocompounds: aliphatic and aromatic nitro compounds, classification, general properties. Reactions: reduction by a chemical and electrolytic method. Di- and tri-substitution of aromatic nitro compounds: synthesis of o-, m-, p- dinitrobenzenes and trinitrobenzene. Aromatic Amines. Preparation of primary, secondary and tertiary amines. Reactions: basicity of amines, the effect of substituents on the basicity of aromatic amines. Diazonium salts: Preparation, diazotization reaction, Sandmeyer, and coupling reactions.

UNIT – II: STEREOCHEMISTRY – II [12 Hrs]

Conformational analysis of cyclohexane, mono and disubstituted cyclohexanes – Factors affecting the stability. Optical isomerism, optical activity, optical and specific rotations, conditions for optical activity. Asymmetric centre, chirality, achiral molecules, (+) and (-) and D and L notations, elements of symmetry, racemization, methods of racemization, methods of resolution, asymmetric synthesis (partial and absolute synthesis), Walden inversion. Projection formula: Fischer, flying wedge, sawhorse and Newmann projection formulae and their interconversions-notations 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. Optical activity in compounds not containing asymmetric carbon atoms namely biphenyls, allenes, and spiranes.

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

Carbonyl polarization – reactivity – the acidity of alpha hydrogen- malonic – acetoacetic and cyanoacetic esters – characteristic reactions of active methylene group – synthetic uses of malonic, acetoacetic and cyanoacetic esters. Diazomethane and diazoacetic ester: Preparation, structure and synthetic applications. Tautomerism: Definition- keto-enol tautomerism- identification, acid and base-catalyzed mechanisms, evidence – amido – imidol and nitro-acinitro tautomerisms.

UNIT – IV: MOLECULAR REARRANGEMENTS [12 Hrs]

Classification as anionotropic, cationotropic, free radical, inter and intramolecular rearrangement. Pinacol-pinacolone rearrangement –mechanism, evidence for carbonium ion intermediate formation – migratory aptitude. Beckmann, Hoffmann, Curtius, Lossen Smith, Benzillic acid and Baeyer Villiger rearrangements. Fries rearrangement (two mechanisms)

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

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 – interconversion of aldoses and ketoses. Structural elucidation of sucrose and maltose. Structure and properties of starch and cellulose.

Amino acids: Classification and structure of amino acids – Gabriel phthalimide synthesis – Strecker synthesis – Erlenmeyer synthesis – Zwitterion, isoelectric point – peptide – Merrifield synthesis – End group analysis

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. M.K.Jain and S.C.Sharma, Modern Organic Chemistry, Vishal Publishing Co.
4. Finar.I. L. Organic chemistry, 6th edition, ELBS, 1990.
5. O. P. Agarwal, Chemistry of organic natural products vol 1, Goel publishing house, 2002.
6. Gurdeep Chatwal, Chemistry of organic natural products, vol 1, Goel publishing house, 2002.
7. 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 York, 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 eastern ltd, 1993.

III B.Sc (CH)	INORGANIC CHEMISTRY – III	19CH510
SEMESTER – V		HRS/WK – 4
CORE – X		CREDIT – 4

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: 19CH510					COURSE TITLE: INORGANIC CHEMISTRY – III								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	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]**

Chemistry of d-block elements - Characteristics of d-block elements - occurrence - oxidation states, magnetic properties, and colour. Metallurgical processes: Methods involved in ore concentration – magnetic separation, hydraulic washing, leaching, froath floatation process – conversion of concentrated ore in to metallic oxide – roasting, calcination, smelting – reduction of metal oxide – chemical method, reduction by other metals, electrolytic reduction – refining – bessemerisation, cupellation, electrolytic refining, Van Arkel method, vapour phase refining. Metallurgy of Ti, V, W, Cr.

UNIT – II: COORDINATION CHEMISTRY I **[12 Hrs]**

Coordination Chemistry: Definition of terms used – the difference between double salts and coordination complexes - Nomenclature of Co-ordination complexes - Classification of ligands. Isomerism in complexes – ionization isomerism, hydrate isomerism, linkage isomerism, ligand isomerism, and coordination isomerism and polymerization isomerism - Geometrical and optical isomerism in tetra and hexacoordinated complexes – fac & mer isomers.

UNIT – III: COORDINATION CHEMISTRY II **[12 Hrs]**

Werner's theory - Sidgwick's theory - EAN rule, - Valence bond theory – hybridization - geometry and magnetic properties - the failure of VBT. Crystal field theory - Splitting of d-orbitals in octahedral, tetrahedral and square planar complexes - crystal field stabilization energy - calculation of CFSE in octahedral complexes - low spin and high spin complexes – explanation of magnetic properties and colour of complexes using CFT

UNIT – IV: COORDINATION CHEMISTRY III **[12 Hrs]**

Consequences of CFSE on atomic radii, lattice energy, the heat of hydration - factors affecting CFSE – oxidation state, spectrochemical series, principal quantum number, geometry. Comparison of VBT and CFT. Trans effect and Jahn-Teller effect and its consequences

UNIT – V: SOLID STATE CHEMISTRY **[12 Hrs]**

X-ray diffraction – Bragg's equation - the principle of X-ray diffraction - comparison of X-ray, electron and neutron diffraction. Radius ratio and coordination number of Crystal structure – NaCl, Rutile, Wurtzite, Zincblende, and CaF_2, - Crystal defects – Schottky, Frenkel, types of 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 Coordination Chemistry, 2nd Ed, Vikas publishing house, 2008.
2. R. Gopalan, Inorganic Chemistry for Undergraduates, university press Pvt Ltd, 1sted, 2009.
3. B.R. Puri, L.R.Sharma, K.C.Kalia, Principles of Inorganic Chemistry, Lal Nagin Chandand co. Delhi 1996.
4. J. D. Lee, Concise Inorganic Chemistry, 5thed, Blackwell Science, London 1996.

REFERENCE BOOKS:

1. W. R. West, Solid State Chemistry and Its Applications, John Wiley and Sons, New York, 1984.
2. W. L. Jolly, Modern Inorganic Chemistry, 2nded, Mc-Graw Hill 1991.

3. J.E.Huheey, E.A.Keiter, R.L.Keiter, Inorganic Chemistry Principles of Structure and Reactivity, 4thed, Harper and Collins 1993.
4. L. E. Smart, E. A. Moore, Solid State Chemistry – An introduction 3rded, Taylor and Francis group 2005.

III B.Sc (CH)	EQUILIBRIUM THERMODYNAMICS OF GASEOUS SYSTEMS	CH511S
SEMESTER - V		HRS/WK – 4
CORE – XI		CREDIT - 4

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					COURSE TITLE: EQUILIBRIUM THERMODYNAMICS OF GASEOUS SYSTEMS								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	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]**

Thermodynamics-the conservation of energy-systems and surroundings-work and heat- the measurement of work- the measurement of heat. Internal energy –enthalpy- the temperature variation of the enthalpy.

UNIT – II **[12 Hrs]**

Thermo chemistry-physical change-the enthalpy of phase transition-atomic and molecular change. Chemical change – standard enthalpy changes- the combination of reaction enthalpies-standard Enthalpies of formation –a variation of reaction enthalpy with temperature.

UNIT – III **[12 Hrs]**

II law of thermodynamics-entropy –The Carnot Cycle – Carnot theorems – Entropy and Carnot cycle – Entropy a measure of randomness and probability. The direction of spontaneous change-entropy and II law-entropy changes for typical processes- entropy changes in the surroundings.

UNIT – IV **[12 Hrs]**

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. The spontaneity of Chemical reactions –Gibbs free energy – focusing on the system properties of the Gibbs energy.

UNIT – V **[12 Hrs]**

Phase equilibria-thermodynamics of transition –condition of stability- variation of Gibbs energy with pressure- variation of Gibbs energy with temperature. Phase diagrams –phase boundaries-location of phase boundaries-characteristic points - Phase rule –phase diagram for typical materials.

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)	ANALYTICAL TECHNIQUES	ECH512
SEMESTER – V		HRS/WK – 4
SDC- I		CREDIT- 3

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					COURSE TITLE: ANALYTICAL TECHNIQUES								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	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]**

Introduction: Introduction to instrumental methods of chemical analysis.

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

IR-spectroscopy: Introduction – source - monochromators –sample cells & sampling substances – a sampling of solids – detector – bolometers – thermocouples – thermisters – Golay cell – photoconductivity cell – single beam & double beam spectrometers.

UNIT – II **[12 Hrs]**

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

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

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

UNIT – III **[12 Hrs]**

NQR spectroscopy: Introduction – Instrumentation

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

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

UNIT – IV **[12 Hrs]**

Mossbauer spectroscopy: Introduction – instrumentation

Atomic absorption spectroscopy: Introduction – instrumentation –radiation source – chopper – production of the atomic vapour – nebulization of the liquid sample – monochromators – detectors – amplifiers

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

UNIT – V **[12 Hrs]**

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

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

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., honours 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)	FORENSIC CHEMISTRY	ECH512A
SEMESTER - V		HRS/WK – 4
SDC – I		CREDIT- 3

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					COURSE TITLE: FORENSIC CHEMISTRY								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	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 ADULTERATION **[12 Hrs]**

Contamination of wheat, rice, dhal, milk, butter, etc. with clay, sand, stone, water and toxic chemicals (e.g. Kasseri dhal with mentanil yellow).Food poisons: natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, Follidol), Chemical poisons (KCN). First aid and Antidotes for poisoned persons.Heavy metal (Hg, Pb, Cd) Contamination of Seafood. Use of neutron activation analysis in detecting poisoning (e.g., as in human hair)

UNIT – II: TRANSPORTATION **[12 Hrs]**

Drunken driving: breath analyzer for ethanol. Incendiary and timed bombs in the road and railway tracks. Defusing live bombs. Hit -and-go traffic accidents: paint analysis by AAS. The soil of toxic and corrosive chemicals (e.g., conc.acids) from tankers.

UNIT – III: CRIME DETECTION **[12 Hrs]**

Accidental explosions during the manufacture of matches and fireworks (as in Sivakasi). Human bombs, possible explosives (gelatin sticks, RDX). Metal detector devices and other security measures for VVIP. The 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, the 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 chromatography. Detecting steroid consumption among athletes and racehorses.

TEXT BOOKS:

1. Jay A. Siegel, Forensic chemistry- Fundamentals and applications, Wiley, 2015
2. Suzanne Bell, Forensic chemistry- Second edition, Pearson, 2012.

REFERENCE BOOK:

1. Kelly M. Elkins, Introduction to Forensic chemistry,1st edition-2019.

III B.Sc. (CH)	CHEMISTRY OF INDUSTRIAL PRODUCTS	21ECH513
SEMESTER - V		HRS/WK – 4
ELECTIVE - II		CREDIT- 3

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: 21ECH513					COURSE TITLE: CHEMISTRY OF INDUSTRIAL PRODUCTS								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	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]**

Saponification of oils and fats – Manufacture of soaps – Formulation of Toilet soaps–Different ingredients used–Their functions. Mechanism of action of soaps –Soft soaps–Shaving soaps and creams - Testing procedures and limits.

Anionic detergents: Manufacturere 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). Cationic detergents: Examples– Manufacture and applications. Non-ionic detergents: Examples–Manufacture of ethylene oxide condensate.

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

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

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

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

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

Nail polishes: Nail polish preparation – Nail polish removers – Article removers – Lipsticks – roughs, eyebrow pencils – Ingredients and functions – hazards.

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

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

Introduction– manufacture of cane sugar– recovery of sugar from molasses–manufacture of sucrose from beetroot–testing and estimation of sugar.

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

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

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

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. Bahl and Arun Bahl, Organic chemistry, S. Chand and Sons, New Delhi,2005
2. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2004
3. Gobala Rao. S, Outlines of chemical technology, Affiliated East-West Press, 1998.
4. Kafaro, Wasteless chemical processing, Mir Publishers, 1995.

REFERENCE BOOKS:

1. Gobala Rao. S, Outlines of chemical technology, Affiliated East-West Press, 1998
2. Kafaro, Wasteless chemical processing, Mir Publishers, 1995.
3. Sawyer. W, Experimental cosmetics, Dover Publishers, New York, 2000.
4. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 2004

III B.Sc (CH)	FOOD CHEMISTRY	ECH513A
SEMESTER – V		HRS/WK – 4
ELECTIVE –I		CREDIT- 3

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					COURSE TITLE: FOOD CHEMISTRY								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	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 with 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 sweeteners - Saccharin - Cyclamate and aspartate. Food flavours - esters, aldehydes, and heterocyclic compound. Food colours. Emulsifying agents – preservatives - leavening agents. Baking powder - yeast -tastemakers - MSG vinegar.

UNIT – IV: BEVERAGES **[12 Hrs]**

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

UNIT – V: EDIBLE OILS **[12 Hrs]**

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

TEXT BOOK:

1. Swaminathan M., Food Science and Experimental Foods, Ganesh and Company.

REFERENCE BOOKS:

1. Jayashree Ghosh, Fundamental concepts of Applicated chemistry, S. Chand & Co. Publishers.
2. Thanlamma Jacob, Text Books of applied chemistry for Home Science and allied Sciences, Macmillan.
3. Food Science-B.Srilakshmi-III Editio-New Age International Publishers 2005

III B.Sc (CH)	PHYSICAL CHEMISTRY PRACTICALS	CHP605
SEMESTER – V		HRS/WK – 3
CORE PRACTICAL- VII		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) The distribution coefficient of Iodine between water and CCl_4.
c) The distribution coefficient of Iodine between water and Benzene.

2. Kinetics:
a) Acid-catalyzedthe 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 the 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)

1. Aim & Short procedure	: 10 marks
2. Experiment	: 15 marks
3. Manipulation	: 10 marks
4. Accuracy of the report	: 10 marks
5. Viva	: 5 marks
6. Record	: 10 marks

III B.Sc (CH)	GRAVIMETRIC ESTIMATION	CHP606
SEMESTER - V		HRS/WK – 4
CORE PRACTICAL-V		CREDIT- 2

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.

GRAVIMETRIC ESTIMATIONS

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 in-charge.

External Examination: **(60 MARKS)**

1. Experiment	:	20 marks
2. Manipulation	:	15 marks
3. Accuracy of the report	:	10 marks
4. Viva	:	5 marks
5. Record	:	10 marks

III B.Sc (CH)	ANALYTICAL CHEMISTRY PRACTICALS	CHP607
SEMESTER – V		HRS/WK – 3
CORE PRACTICAL – VI		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 and amount of strong acid (HCl Vs NaOH).

b) Verification of Onsager's equation.

c) Determination of strength and amount of a mixture of acids (HCl + CH_3COOH Vs NaOH).

3. Potentiometry:

a) Determination of single electrode potential.

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

4. Colourimetry:

Determination of unknown concentration using a photoelectric colourimeter.

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 staff in charge.

External Examination: (60 MARKS)

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

III B.Sc (CH)	ORGANIC CHEMISTRY -IV	19CH614
SEMESTER - VI		HRS/WK – 4
CORE – XII		CREDIT- 4

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: 19CH614					COURSE TITLE: ORGANIC CHEMISTRY -IV								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	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]

Principles – Type of transitions - Woodward – Fieser rules as applied to conjugated dienes and α, β – unsaturated ketones. Characteristic IR absorption frequencies of important functional groups – fingerprint region –The effect of intermolecular and intramolecular hydrogen bonding in IR. Problems based on IR and UV spectra. Problems using Woodward – Fieser rules.

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

Principles of nuclear magnetic resonance – chemical shift - shielding and deshielding of protons – spin-spin splitting of neighbouring protons. Coupling constants and their application. Applications of ^{1}H NMR in the structural determination of simple organic compounds.

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

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

UNIT - III: OXIDATION AND REDUCTION [12 Hrs]

Oxidation with Cr(VI) and Mn(VII) reagents, Oxidation by peracids and DMSO with oxalyl chloride. Catalytic hydrogenation and dehydrogenation.

Reductions with LAH, $NaBH_4$, and DIBAL. Birch reduction, Hydroboration and oxidation of alkenes and alkynes.

UNIT - IV: PERICYCLIC AND PHOTOCHEMICAL REACTIONS [12 Hrs]

Electrocyclic reactions of 4 and 6 pi - electron systems, Cycloaddition reactions – 2 + 2 and 4+2 additions, Sigmatropic rearrangements - 1,3; 1,5 and 3,3 sigmatropic rearrangements. Claisen and Cope rearrangements. Photochemical reactions of carbonyl compounds: Norrish type – I and II reactions

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

Preparation, properties, and uses of furan, pyrrole, thiophene, pyridine, and piperidine. Comparative study of basicity of pyrrole, pyridine, and piperidine with amines. Six-membered rings: synthesis and reactions of quinoline, isoquinoline, and indole. Skraup synthesis, Bischler – Napieralski and Fischer- Indole Synthesis.

Terpenoids: Classification, isoprene rule, isolation, the structures of geraniol, citral, menthol, α-pinene, and camphor. Structural elucidation of menthol. Alkaloids: definition, occurrence, extraction of alkaloids from plants, structural elucidation of coniine, piperine.

TEXT BOOKS:

1. Francis A.Carey, - Organic Chemistry- Tata McGraw Hill-1999.
2. M.K.Jain and S.C.Sharma, Modern Organic Chemistry, Vishal Publishing Co.
3. Morrison R T, Boyd R N and Bhattacharjee S K, Organic Chemistry, 7th Ed., (2009), Pearson New York.
4. Paula Yurkanis Bruice - Organic Chemistry, Prentice Hall- 1999.
5. Finar. I. L. Organic chemistry, 6th edition, ELBS, 1990.
6. M.K.Jain and S.C.Sharma, Modern Organic Chemistry, Vishal Publishing Co.
7. O. P. Agarwal, Chemistry of organic natural products vol 2, Goel publishing house, 2002.
8. Gurdeep Chatwal, Chemistry of organic natural products, vol 2, Goel publishing house, 2002.
9. Bahl and Arun Bahl, Organic chemistry, S. Chand and Sons, New Delhi,2005
10. William Kemp, Organic Spectroscopy, 3rd edition, sarmaha publishers, 2002
11. 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 York, 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 eastern ltd, 1993.
5. Silverstein and Bassler, Spectrometric identification of organic compounds, John Wiley and sons.

III B.Sc (CH)	INORGANIC CHEMISTRY - IV	19CH615
SEMESTER – VI		HRS/WK – 4
CORE – XIII		CREDIT- 4

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: 19CH615					COURSE TITLE: INORGANIC CHEMISTRY - IV								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	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]**

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

Nuclear Chemistry - Introduction of the 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: cloud chamber and GM counter - radioactive series including neptunium series-group displacement law – the 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]**

Artificial radioactivity-induced radioactivity-uses of radioisotopes-hazards of radiation-nuclear fission- nuclear fusion-thermonuclear reaction-energy source of the sun and stars. 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]**

Bioinorganic chemistry: Role of metal ions in biological systems Heme proteins – Fe - transport and storage of Dioxygen, structure, and function of hemoglobin, myoglobin. Zn - Carboxypeptidase, Carbonic anhydrase – Mg - chlorophyll. Co-VitaminB_{12} - Mo-Nitrogen fixation - $Na^+/K^+$and Ca^{2+}-pump.

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

Organo Metallic Chemistry – Compounds with transition metals to carbon bonds – classification of ligands – nomenclature- 18 electron rule – Organometallic – metal alkyls – metal alkylidenes, metal alkylidynes. Pi - Acceptor ligands, bonding, hybridizations, structures and properties of carbonyls of Ni, Cr, Fe, Co, Mn, W & V.

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

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). Polymerization of olefins (Zeigler-Natta catalyst); cyclo oligomerization of acetylene using nickel catalyst (Repee's catalyst); Polymer-bound catalyst-water gas shift reaction

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 Chandand 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, 3rdedition. 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 Chemistry, W.B Saunder Company, 1977
4. Ivano. ; Harry B. Gray. ; Stephen J. Lippard.; Valentine, Bioinorganic Chemistry, 1sted, University science book, 1998

III B.Sc (CH)	THERMODYNAMICS OF IDEAL AND NON-IDEAL SOLUTIONS	CH616T
SEMESTER – VI		HRS/WK – 4
CORE – XIV		CREDIT - 4

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					COURSE TITLE: THERMODYNAMICS OF IDEAL AND NON-IDEAL SOLUTIONS								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	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]**

The properties of the mixture- thermodynamic description of mixture-measures of concentration –partial molar properties –spontaneous mixing-ideal solutions- Ideal –dilute Solutions. Real solutions –Colligative properties-modification of boiling and freezing points-Osmosis. Phase diagrams of the mixture- a mixture of volatile liquids-liquid – liquid phase diagrams-liquid – solid-phase diagrams-ultra purity and controlled impurity.

UNIT – II **[12 Hrs]**

The principle of chemical equilibrium-reaction Gibbs energy –a variation of ΔG with composition –reactions at equilibrium-standard reaction Gibbs energy. The response of equilibria to the conditions- the presence of a catalyst – the effect of temperature- effect of compression.

UNIT – III **[12 Hrs]**

Consequences of equilibrium-proton transfer equilibrium –Bronsted-Lowry theory –protonation and deprotonation- amphiprotic systems. Salts in water- Acid-base titrations –buffer action-indictors –solubility constants –common -ion effect.

UNIT – IV **[12 Hrs]**

Electrochemistry –migration of ions- conductivity-specific, equivalent and molar conductance-ion mobility-Transport number and its determination (Hittorf's and moving boundary method). Electrochemical cells-half reactions and electrodes –reactions at electrodes. Fuel cells (H_2-O_2 and hydrocarbon-O_2)-Batteries-Primary and Secondary batteries.

UNIT – V **[12 Hrs]**

Electrochemical cells-varieties of cell- the cell reaction –the cell potential –cells at equilibrium –a standard potentials-the variation of potential with the pH-the determination of pH. Applications of standard potential-the electrochemical series-the determination of thermodynamic functions.

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)	MEDICINAL CHEMISTRY	ECH617T
SEMESTER – VI		HRS/WK – 4
ELECTIVE – II		CREDIT-3

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					COURSE TITLE: MEDICINAL CHEMISTRY								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	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]**

Development of new drugs– procedures followed in drug design–concepts of prodrugs and soft drugs–structure-activity relationship (SAR). Theories of drug activity: Occupancy theory–rate theory–induced fit theory–Quantitative structure-activity relationship. Concepts of drug receptors: Elementary treatment of drug-receptor interactions. Introductions to pharmacokinetics and pharmacodynamics

UNIT – II: ANTIBIOTICS **[12 Hrs]**

Antibiotics Cell wall biosynthesis– inhibitors– β-lactum rings–antibiotics inhibiting protein synthesis. SAR of penicillin G – penicillin V– chloramphenicol– ciprofloxacin– tetracycline – streptomycin.

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

Antineoplastic Agents

Introduction– cancer chemotherapy– special problems–the role of alkylating agents and antimetabolites in the treatment of cancer. SAR of uracil– mustards– 6-mercaptopurine – Hormone and natural products.

Cardiovascular Drugs

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

UNIT – IV: ANTIINFECTIVE DRUGS **[12 Hrs]**

Introduction and general mode of action. SAR of sulphonamides – nalidixic acid –amino salicylic acid – isoniazid-chloroquine.

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

Introduction – neurotransmitters– CNS depressants– a general anaesthetic– mode of action of hypnotics– sedatives– anti-anxiety drugs– benzodiazepines– buspirone– neurochemistry of mental diseases.

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 Textbook 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)	AGRICULTURAL CHEMISTRY	ECH617A
SEMESTER – VI		HRS/WK – 4
ELECTIVE – II		CREDIT-3

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					COURSE TITLE: AGRICULTURAL CHEMISTRY								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	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.The 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 from gobar gas plants.Use of fertilizers: urea, DAP, Superphosphate, Gypsum, NPK-mixed fertilizers, Optimal addition of Fertilizers to obtain estimated yields.

UNIT – III: PESTICIDES –I **[12 Hrs]**

Insecticides: stomach and contact poisons. Plant derivatives: pyrethrins, Nicotine,and rotenoneSynthetic organic: carbophos, carbaryl, p-DCB, dimethoate, Butachlor, Endrin, Aldrin (Chemical name and uses). Rodenticides.

UNIT – IV: PESTICIDES –II **[12 Hrs]**

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

UNIT – V: PLANT GROWTH REGULATORS **[12 Hrs]**

3-Indole acetic acid: NAPHTHALENE ACETIC ACID: Ethepon (2-chloroethyl phosphoric acid): Alar (succinic acid-2, 2-dimethylhydrazine :) 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)	POLYMER CHEMISTRY	21ECH618
SEMESTER – VI		HRS/WK – 4
ELECTIVE – III		CREDIT- 3

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: 21ECH618					COURSE TITLE: POLYMER CHEMISTRY								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: BASICS **[12 Hrs]**

Importance of polymers. Basic concepts: Monomers–repeating units – degree of polymeriztation–Linear, branched and network polymers. Classification of polymers: Polymerisation – condensation, addition, radical chain-ionic, and coordination and copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems

UNIT – II: STRUCTURE AND PROPERTIES **[12 Hrs]**

Morphology and order in crystalline and amorphous polymers – differences between them – configurations of polymer chains Crystal structures of polymers. Crystallinity of the 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 **[12Hrs]**

Plastics, elastomers, and fibres: 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]**

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

Polyethene, Polyvinylchloride, polyamides, phenolic resins, epoxy resins,and silicone polymers. 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. F.W. Billmeyer Jr, Wiley Textbook of Polymer Science,
2. V. R. Gowariker, N. V. Viswanathan, and J. Sreedhar, Polymer Science, New Age International(P) Ltd., 2005

Reference Books:

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

III B.Sc (CH)	GREEN CHEMISTRY	ECH618A
SEMESTER – VI		HRS/WK – 4
ELECTIVE – III		CREDIT- 3

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					COURSE TITLE: GREEN CHEMISTRY								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	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]

Need for green chemistry – principles of green chemistry – atom economy- definition with an example (ibuprofen synthesis) – green oxidant – hydrogen peroxide. Microwave-assisted organic synthesis – apparatus required – examples of MAOS (synthesis of fused anthraquinones, acetalization of a byproduct of the sugar industry, 1, the 3-dipolar cycloaddition of nitrones to fluorinated dipolarophiles, Leukart reductive amination of ketones) – advantages and disadvantages of MAOS. Organic reactions by sonication method – apparatus required – examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).

UNIT – II: GREEN REACTIONS [12 Hrs]

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

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. Supercritical CO_2 – preparation, properties and applications (decaffeination, dry cleaning) – environmental impact. Diels-Alder reaction in water – catalysis in water (aerobic oxidation of alcohols catalyzed by Pd(II) / bathophenanthroline).

UNIT – IV: BASICS OF NANOCHEMISTRY [12 Hrs]

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. Nanoparticles: Introduction – types of nanoparticles – preparation, properties, and uses of gold, silicon, silver, zinc oxide, iron oxide, alumina and titania nanoparticles.
Techniques to synthesize nanoparticles – top-down and bottom-up approaches – common growth methods.

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

Preparation, properties, and applications of carbon nanotubes, nanorods, nanofiberandnanoclay – toxic effects of nanomaterials. Electron microscopes – scanning electron microscopes (SEM) – transmission electron microscopes (TEM) – scanning probe microscopy – atomic force microscopy (AFM) – scanning tunnelling 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 Distributors, 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. Zecchini, 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).

II B.Sc.(PH)	ALLIED CHEMISTRY FOR PHYSICS	20ACH301
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: 20ACH301					COURSE TITLE: 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, the 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 – electromagnetic radiation, characteristics of electromagnetic radiation, electromagnetic spectrum. Types of spectroscopy - absorption & emission spectra. IR: Types of vibration. UV: Beer-Lambert law, Electronic energy levels - electronic transition – Chromophores, Auxochrome - Bathochromic shift, Hypsochromic shift, Hyper and hypochromic shifts. Colligative properties (without derivation): Lowering of Vapour pressure, Raoult's law, Osmosis, osmotic pressure, elevation of boiling point, freezing point depression.

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: Superconductivity -characters of Superconductors- types of Superconductors- application of Superconductors.

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. 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 PRACTICAL	ACHP301
SEMESTER – III		HRS/WK – 3
ALLIED PRACTICAL – I		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**

B.A., B.Sc.	ENTREPRENEURIAL CHEMISTRY	NCHEC401
SEMESTER – IV		HRS/WK - 3
NON MAJOR ELECTIVE		CREDIT- 3

COURSE OUTCOME:

i) To get the knowledge about soaps and its manufacture.
ii) To get the knowledge of different types of detergents.
iii) To get the knowledge of different types of Face and skin powders.
iv) To get the knowledge of different types of solid disinfectants.
v) To get the basic and synthetic knowledge of floor cleaning agents.

UNIT-I: SOAPS

Soap - Definitions – Composition of Soaps - Manufacture of soaps – Hot process – cold process – Modern continuous process. Hand Sanitizers – types.

UNIT-II: DETERGENTS

Detergents – Definition – types – Anionic, Cationic and Non-ionic detergents – Examples. – Sodium alkylsulphates and sodium alkylbenzenesulphonates. – Manufacture of Detergents.

UNIT-III: COSMETIC POWDERS

Face and skin powders - chemical ingredients used - their functions – Different types of powders.

UNIT-IV: SOLID DISINFECTANTS

Disinfectants - chemical ingredients used - their functions – Different types – Manufacture of disinfectants. Bleaching powder - Ingredients and their functions – Preparation and uses.

UNIT-V: LIQUID DISINFECTANTS

Preparation of Phenyle – White, Black and Multi-coloured – chemical ingredients and their functions – uses.

TEXT BOOKS:

1. Bahl & Arun Bahl- Advanced Organic Chemistry, Sultan Chand-1996.
2. Gobala Rao. S, Outlines of chemical technology, Affiliated East-West Press, 1998.
3. Kafaro, Wasteless chemical processing, Mir Publishers, 1995.

REFERENCE BOOKS:

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