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

CUDDALORE-1

PG & RESEARCH DEPARTMENT OF CHEMISTRY

PG - SYLLABUS 2018-2019

M.Sc. CHEMISTRY

CURRICULUM DESIGN TEMPLATE FROM 2018-2019

Semester	Code	Part	Course Title	Hours	Credit
I	PCH701S	III	Organic Chemistry-I	4	5
	PCH702S	III	Inorganic Chemistry-I	4	5
	PCH703T	III	Quantum Mechanics and Molecular Structure	4	5
	Elective-I			4	4
	EPCH704T	III	1. Bio-Inorganic And Supramolecular Chemistry		
	EPCH704A		2. Heterocyclics And Natural Products		
Total for Semester I				**16**	**19**
II	PCH805S	III	Organic Chemistry-II	4	5
	PCH806T	III	Inorganic Chemistry-II	4	5
	PCH807T	III	Group Theory and its Applications in Spectroscopy	4	5
	Elective-II			4	5
	EPCH808Q	III	1. Reagents and Naming Reactions		
	EPCH808A		2. Nuclear and Radiochemistry		
	PCHP201	III	Practical – I: Organic Chemistry Practical-I	4	2
	PCHP202S	III	Practical – II: Inorganic Chemistry Practical-I	4	2
	PCHP203	III	Practical – III: Physical Chemistry Practical-I	4	2
Total for Semester II				**28**	**26**

Semester	Code	Part	Course Title	Hours	Credit
III	PCH909S	III	Organic Chemistry-III	4	4
	PCH910S	III	Inorganic Chemistry –III	4	4
	PCH911S	III	Statistical Thermodynamics and its Applications	4	4
	ECHR901S	III	Human Rights	2	1
	Elective-III			4	4
	EPCH912S	III	1. Physical Methods In Organic Chemistry		
	EPCH912A		2. Bioorganic Chemistry		
	PCHP304T	III	Practical – IV: Organic Chemistry Practical -II	4	2
	PCHP305S	III	Practical – V: Inorganic Chemistry Practical –II	4	2
	PCHP306	III	Practical – VI: Physical Chemistry Practical –II	4	2
Total for Semester III				**30**	**23**

IV	PCH1013S	III	Organic Chemistry –IV	4	4
	PCH1014S	III	Inorganic Chemistry –IV	4	4
	PCH1015T	III	Reaction kinetics, Electrode Kinetics, and Photochemistry	4	4
	JPCH1016	III	Project		9
	JPCH1017	III	Seminar & Paper Presentation		1
Total for Semester IV				**12**	**22**
Grand Total				**86**	**90**

I M.Sc (CH)	ORGANIC CHEMISTRY – I For the students admitted in the year 2014	PCH701S
SEMESTER - I		HRS/WK – 4
CORE - 1		CREDIT-5

Objective:

To appreciate the applications of stereochemistry. To learn various reactions and rearrangements involving reactive intermediates like carbocations, carbanions, free radicals, carbenes and nitrenes. To learn the applications of oxidation and reduction reactions in organic synthesis.

COURSE OUTCOMES (COs)

CO1: Understanding of the concepts involved in stereochemistry and the ability to solve the problems based on stereochemistry**.**

CO2: Understanding of the principles of reaction mechanism and the ability to arrive at reasonable mechanisms for organic reactions**.**

CO3: Knowledge of the reactive intermediates such as Benzynes, Free radicals, Carbenes and Nitrenes and the reactions involving these intermediates.

CO4: Knowledge of reactions involving Carbocations, Carbanions and the ability to apply it in organic synthesis.

CO5: A sound knowledge of Oxidising and reducing agents and the ability to apply them in Organic synthesis.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: PCH701S					TITLE OF THE COURSE: ORGANIC CHEMISTRY – I								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	4	4	4	4	3	3	3	4	4	4	4	3.79	
CO2	4	4	4	4	4	4	3	3	3	4	4	4	4	3.79	
CO3	4	3	3	4	3	4	3	3	3	4	4	4	4	3.54	
CO4	3	3	4	4	3	4	3	3	3	4	4	4	4	3.54	
CO5	3	3	4	4	3	4	3	3	3	4	4	4	4	3.54	
Mean Overall Score														3.64	

Result: The Score of this Course is 3.64 (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: STEREOCHEMISTRY - I [12 Hrs]

Review of basic principles of stereochemistry – R, S notation of biphenyls and allenes. Fischer projection. Inter conversion of Sawhorse, Newman and Fischer projections. Molecules with one and two asymmetric centres. Eg. Erythro and threo compounds. Asymmetric synthesis. Cram's rule. Geometrical isomerism, E, Z - nomenclature of olefins, Geometrical and opical isomerism of disubstituted cyclopropane, cyclobutane and cyclopentanes. Stereo specific and stereo selective reactions.

UNIT – II: PHYSICAL ORGANIC CHEMISTRY [12 Hrs]

Introductory physical organic chemistry: Acids and Bases, HSAB, equilibrium constant, thermodynamic effect, kinetic effects – thermodynamic and kinetic control of organic reactions. Hammond postulate, Curtin – Hammett principle – Hammett equation – Application to organic reactions. Methods of determining reaction mechanism – Kinetic and Non-kinetic methods.

UNIT – III: REACTIVE INTERMEDIATES [12 Hrs]

Structure, reactivity, formation, stability and reactions involving free radicals, benzynes, carbenes and nitrenes. Long and short lived free radicals. Addition of free radicals to olefinic double bonds. Aromatic radical substitutions: Decomposition of diazocompounds, phenol – coupling, sandmeyer reaction, Gomberg reaction, Pschorr reaction, Ulmann reaction, Hunsdiecker reaction.

UNIT – IV: MOLECULAR REARRANGEMENTS [12 Hrs]

Structure, reactivity, formation, stability and the following rearrangements involving carbocations and carbanions: Wagner – Meerwein, Pinacol – Pinacolone ,Tiffeneau-Demjanov, Beckmann, Dienone – phenol ,Favorski, Wittig, Neber ,Stevens and Sommelet-Houser rearrangements. Hofmann, Curtius, Lossen, Schmidt and Wolff Rearrangements.

UNIT – V: OXIDATION AND REDUCTION [12 Hrs]

Mechanism – study of the following oxidation reactions–oxidation of alcohols with Cr(VI)and Mn reagents – oxidation of methylene to carbonyl, oxidation of aryl methanes – Etard reaction – allylic oxidation of olefins. Formation of C = C bonds- Wittig reaction, Formation of C – C bonds by dehydrogenation, dehydrogenation by quinines, $Hg(OAc)_2$ and $Pb(OAc)_4$. Formation of C – C bond by phenol coupling and acetylene coupling – allylic oxidation-SeO_2, oxidation of alcohol, glycols, halides and amines to aldehydes and ketones , oxidation of Oleffinic double bonds and unsaturated carbonyl compounds – oxidative cleavage of C – C bond. Synthetic importance of clemmensen and wolf Kishner reductions – modification of Wolf-Kishner reduction – Birch reduction, MPV reduction. Catalytic hydrogenation and Sommelet reaction. Reduction with $LiAlH_4$, $NaBH_4$, tritertiarybutoxy aluminium hydride, Sodium cyanoborohydride , trialkyl tin hydride and hydrazines.

Text Books:

1. E. L. Eliel "Stereochemistry of carbon compiounds", John Wiley, 1997.
2. P.S. Kalsi Stereochemistry, Conformation and mechanism, 6th edition., New Age International (P) Ltd. 2005.
3. Seyhan Ege, Organic Chemistry, AITBS, 2001.
4. F. A. Carey and R. J. Sundberg, Advanced organic chemistry, Plenum publishers Ltd. 2000.

Reference Books:

1. R.O.C. Norman, J.M. Coxon, Principles of organic synthesis, ELBS publications, 1994.

2. C. K. Ingold, Structure and Mechanism in Organic chemistry, Cornell Univ. Press.
3. Michael Smith, Organic synthesis, McGraw Hill, 1996.
4. W. Carruthers, J.Coldham, Modern methods of Organic synthesism IV edition, Academic press, 1989.
5. Clayden, Greeves, Warren, Wothers, Organic chemistry, Oxford University Press.
6. Reinhard Brukner, Advanced Organci chemistry, Academic press, Elseiver, 2002
7. Neil Isaacs, Physical Organic chemistry, ELBS, 1987.

I M.Sc (CH)	ORGANIC CHEMISTRY – I	PCH701S
SEMESTER - I	For the students admitted in the year	HRS/WK – 4
CORE - 1	2014	CREDIT-5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	INORGANIC CHEMISTRY – I For the students admitted in the year 2011	PCH702S
SEMESTER – I		HRS/WK – 4
CORE - II		CREDIT – 5

Objectives:

To know about the various types of isomerism existing in complexes. To learn the concepts of CFT and the applications of macrocyclic ligands**.** To learn about poly acids and inorganic polymers

COURSE OUTCOMES (COs)

CO1: To know about the various types of isomerism existing in complexes.
CO2: To learn the concepts of CFT and the applications of macrocyclic ligands.
CO3: To interpret the stability of various complexes.
CO4: To acquire the knowledge about the molecular polyhedral and clusters.
CO5: To learn about poly acids and inorganic polymers.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: PCH702S					TITLE OF THE COURSE: INORGANIC CHEMISTRY – I								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	2	3	2	3	3	2	4	3	4	3	3	4	2	2.92	
CO2	2	3	3	3	3	4	3	3	4	4	3	4	3	3.23	
CO3	2	3	3	3	2	3	3	3	4	3	4	4	4	3.15	
CO4	3	2	3	3	2	3	3	4	3	3	3	4	2	2.92	
CO5	3	3	3	2	3	2	3	3	3	4	3	3	3	2.92	
Mean Overall Score														3.09	

Result: The Score of this Course is 3.09 (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: ISOMERISM IN COORDINATION COMPLEXES - ORD AND CD

[12 Hrs]

1.1 Isomerism in complexes-ionization isomerism, hydrate isomerism, linkage isomerism, ligand isomerism, Coordination isomerism and polymerization isomerism- Geometrical and optical isomerism in 4 and 6 coordinated complexes.

1.2 Chirality and nomenclature of chiral complexes; Optical Rotatory Disperision and circular dichroism.

UNIT – II: MACROCYCLIC LIGANDS AND CFT [12 Hrs]

2.1 Macrocyclic Ligands: Thermodynamic and Kinetic template effect – Structure, Stability and applications of porphyrins, corrins, Schiff bases, crown ethers and crypts.

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

UNIT – III: THERMODYNAMIC AND KINETIC STABILITY OF COMPLEXES

[12 Hrs]

3.1 Metal-Ligand Equilibria in Solution: Stepwise and overall formation constants and thier interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin.

3.2 Determination of stability constants by Potentiometric, Polarograpy and Spectrophotometric techniques.

UNIT – IV: MOLECULAR POLYHEDRA: BORON HYDRIDES AND METAL CLUSTERS [12 Hrs]

1.1 Boron Hydrides: Closo, nido and arachno boranes – styx numbers – Hydro Borate ions – Carboranes – Metallocarboranes.

1.2 Metal Clusters: Structure and bonding of Binuclear compounds – $Re_2Cl_8^{2-}$ and $Mo_2Cl_8^{2-}$ - structures of three atom clusters – $Re_3Cl_{12}^{3-}$ and $Fe_3(CO)_{12}$ – Four atom tetrahedral clusters – $Co_4(CO)_{12}$ and $Ir_4(CO)_{12}$ - Six atom clusters $Rh_6(CO)_{16}$.

UNIT – V: POLYACIDS AND INORGANIC POLYMERS [12 Hrs]

5.1 Polyacids: Isopolyacids and hetereopolyacids of vanadium, chromium, molybdenum and Tungsten.

5.2 Inorganic Polymers: Silicates – structure, properties and applications – polysulphur – nitrogen compounds and poly-organophosphazenes.

Text Books:

1. J.E. Huheey, Inorganic Chemistry, 5th Edn., Harper International.1993.
2. F.A.Cotton, G.Wilkinson, Advanced Inorganic Chemistry, 5th Edn., John Wiley.1985.
3. M.F.Purcell, J.C.Kotz, Inorganic Chemistry,Saunder, 1977.
4. R. Gopalan,; V.Ramaligam, Concise Co-ordianation Chemistry , 2 nd Ed, Vikas publisihing house, 2008.

Reference Books:

1. B.Douglas, D.McDaniel, J.Alexander, Concepts and Models of Inorganic Chemistry, 3rd Edn., John Wiley,2001.

2. J.D.Lee, A New Concise Inorganic Chemistry, 3rd Edn., ELBS, 1987.
3. W.L.Jolly, Modern Inorganic Chemistry, 2nd Edn., McGraw-Hill,1991.
4. N.N.Greenwood , A.Earnshaw , Chemistry of the Elements, 2nd Edn.,BH,1997.
5. D.F.Shriver, P.W.Atkins, C.H.Langford, 3rd Edn. Inorganic Chemistry, ELBS.1999

I M.Sc (CH)	INORGANIC CHEMISTRY – I For the students admitted in the year 2011	PCH702S
SEMESTER – I		HRS/WK – 4
CORE - II		CREDIT – 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

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

I M.Sc (CH)	QUANTUM MECHANICS AND MOLECULAR STRUCTURE	PCH703T
SEMESTER - I		HRS/WK – 4
CORE – 3	For the students admitted in the year 2014	CREDIT- 5

Objective:

To study the fundamental principles of Quantum chemistry, Schrodinger wave equation and its applications.

COURSE OUTCOMES (COs)

CO1: Students learn the elements of classical mechanics, quantum mechanical postulates and Schrodinger equations.

CO2: Students acquire the knowledge about the solution of Schrodinger equation, quantum numbers and their physical significance.

CO3: Students learn the knowledge of approximation methods and the concept of hybridization.

CO4: Students learn the knowledge of Empirical MO theory.

CO5: Students understand the Basics of Popular quantum chemical calculations and Semi-empirical methods.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: PCH703T					TITLE OF THE COURSE: QUANTUM MECHANICS AND MOLECULAR STRUCTURE								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	3	3	2	4	3	5	3	2	4	4	4	3.30	
CO2	3	5	4	4	3	4	4	4	3	3	3	4	3	3.61	
CO3	4	4	4	4	3	4	4	3	3	3	3	3	4	3.54	
CO4	4	4	3	4	3	3	4	2	4	3	3	3	4	3.38	
CO5	4	4	4	3	3	4	4	3	4	3	3	3	4	3.54	
Mean Overall Score														3.47	

Result: The Score of this Course is 3.47 (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: QUANTUM CHEMISTRY I [12 Hrs]

1.1 Inadequacy of classical theory – Bohr's quantum theory and subsequent developments – the Compton effect – wave particle duality – uncertainty principle.

1.2 Wave equation for electrons – quantum mechanical postulates – the operators – Hermitian property. 1.3 Schrodinger equation – elementary application of Schrodinger's equation – the particle in box (one, two and three dimensional cases)

UNIT – II: QUANTUM CHEMISTRY II [12 Hrs]

1.1 The harmonic Oscillator – the rigid rotor – particle in a ring Schrodinger equation for hydrogen atom (no derivation is required) and the solution.

1.2 The origin of quantum numbers (angular momentum and spin) – their physical significance.

UNIT – III: QUANTUM CHEMISTRY [12 Hrs]

1.1 Approximation methods – perturbation and variation methods – application to hydrogen, helium atoms – R.S. Coupling and term symbols for atoms in the ground state.

1.2 Born Oppenheimer approximation – valence bond theory for Hydrogen molecule – LCAO – MO theory for diatomic and polyatomic molecules.

1.3 Concept of hybridization – Huckel theory for conjugated molecules (ethylene, butadiene and benzene)

UNIT – IV: EMPIRICAL MO THEORY [12 Hrs]

1.3 The simple Huckel method – Assumptions – Determinant, Energies and wave functions – Extended Huckel method – overlap – population analysis.

1.4 FMO theory – Interaction and Walsh diagrams- examples benzene,naphthalene, butadiene and cyclo butadiene.

UNIT V

5.1 Basics of Popular quantum chemical calculations: Hamiltonian and wave functions – Roothan's equations.

5.2 Semi empirical methods – slater orbital and HF- SCF methods.

Text Book:

1. R. K. Prasad, Quantum Chemistry, Wiley Eeastern, New Delhi, 2nd edition,1992.

Reference Book:

1. P.W. Atkins, Molecular Quantum Mechanics, Oxford University Press, Oxford 3rd edition, 1983

I- M.Sc (CH)	QUANTUM MECHANICS AND MOLECULAR STRUCTURE For the students admitted in the year 2014	PCH 703T
SEMESTER - I		HRS/WK – 4
CORE – 3		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

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

I M.Sc (CH)	BIOINORGANIC AND SUPRAMOLECULAR CHEMISTRY	EPCH704T
SEMESTER - I		HRS/WK – 4
ELECTIVE - 1	For the students admitted in the year 2014	CREDIT- 4

Objectives:

To learn about the various concepts and applications of Bioinorganic and Supramolecular Chemistry. To learn about the functions of metal ions in biology and function of enzymes.

COURSE OUTCOMES (COs)

CO1: Students learn about metal storage, transport and biomineralisation.
CO2: Students understand various enzymes and their importance in the biological process.
CO3: Students become familiar with metal-genetic molecular interactions.
CO4: Students learn interaction, recognitions in supramolecular chemistry.
CO5: Students understand supramolecular devices.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: EPCH704T					TITLE OF THE COURSE: BIOINORGANIC AND SUPRAMOLECULAR CHEMISTRY								HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	3	4	3	4	4	4	4	4	4	4	3	3.69	
CO2	3	3	3	3	3	3	3	3	4	3	3	4	4	3.23	
CO3	3	3	4	3	3	3	3	4	4	4	4	4	4	3.53	
CO4	3	3	3	3	3	3	3	4	4	3	4	4	4	3.38	
CO5	3	3	3	4	3	3	3	3	3	4	4	4	4	3.38	
Mean Overall Score														3.44	

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

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

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

UNIT – I **[12 Hrs]**

1.1 Metal Storage Transport and Biomineralization. Ferritin, Transferrin, and siderophores

1.2 Calcium in biology - Calcium in living cells, transport and regulation, molecular aspects of intramolecular processes, extracellular binding proteins

UNIT – II **[12 Hrs]**

2.1 Metalloenzymes – zinc enzymes – carboxypeptidase and carbonic anhydras. Iron enzymes – catalase, peroxidase and cytochrome P – 450. Copper enzymes – superoxide dismutase. Molybdenum oxatransferase enzymes – xanthine oxidase. Coenzyme vitamin B_{12}

UNIT – III **[12 Hrs]**

3.1 Metal-Nucleic Acid Interactions: Metal ions and metal complex interactions. Metal complexes – nucleic acids – binding of cisplatin with DNA

3.2 Metals in Medicine: Metal deficiency and disease, toxic affects of metals, metals used for diagnosis and Chemotherapy with particular reference to anticancer drug.

UNIT – IV: SUPRAMOLECULAR CHEMISTRY – I **[12 Hrs]**

4.1 Concepts, Nature of Supramolecular interactions, preorganization and complementarity-design principles.

4.2 Molecular recognition: - Spherical and tetrahedral recognition–Recognition of ammonium ions, neutral molecules.

4.3 Molecular receptors – Cation binding hosts-Crown ethers, Cryptands, Calixarenes - design principles -

4.4 Anion receptors – shape of anions - Recognition of anionic substrate.

4.5 Co-receptor molecules - dinuclear and polynuclear metal ion cryptates - ditopic, heterotopic co-receptors - multiple recognition in metalloreceptors.

UNIT – V: SUPRAMOLECULAR CHEMISTRY – II **[12 Hrs]**

5.1 Supramolecular devices: Light Conversion and Energy Transfer Devices, Photoinduced Electron Transfer Devices

5.2 Molecular wires, switchable molecular wires, photo switching devices.

5.3 Supramolecular racks, ladders, grids.

5.4 Supramolecular chemistry in biology.

Text Books:

1. Asim K. Das, Bioinorganic Chemistry, Vikas.
2. J.E.Huheey, Inorganic Chemistry, 5th edition, Harper international, 1993.
3. Ivano Bertini, Harry. B.Gray, J. Lippard, Valentine, Bioinorganic chemistry, 1998.
4. P.S. Kalsi, Bioinorganic and Supramolecular chemistry, 2007.

Reference Books:

1. J.L. Atwood, J.E.D. Davies, D.D. Mac Nicol, F. Vogtle, J.M. Lehn, Comprehensive Supramolecular Chemistry, Pergamon, 1996.
2. Albert L. Lehninger, David Lee Nelson, Michael M. Cox, Principles of Biochemistry, 4th Ed, 2005
3. R.W. Hay, Bioinorganic chemistry, Ellis Harwood, 1987.
4. J. M. Lehn, Supramolecular Chemistry, Concepts and perspectives, VCH, 1995.
5. J. W. Steed, J.L. Atwood, Supramolecular Chemistry, A concise Introduction, John Wiley, 2000.

I M.Sc (CH)	BIOINORGANIC AND	EPCH704T
SEMESTER - I	SUPRAMOLECULAR CHEMISTRY	HRS/WK – 4
ELECTIVE - 1	For the students admitted in the year 2014	CREDIT- 4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	HETEROCYCLICS AND NATURAL PRODUCTS	EPCH704A
SEMESTER - I		HRS/WK – 4
ELECTIVE - 1	For the students admitted in the year 2017	CREDIT- 4

Objectives:

To enable the student to understand and appreciate the importance of steroid chemistry and heterocyclic compounds. To understand the techniques involved in the extract ion and methods of determinat ion of structure of alkaloids and terpenes.

.COURSE OUTCOMES (COs)

CO1: Students understand the Nomenclature, synthesis of few heterocyclic chemicals.
CO2: Students acquire the knowledge about the Occurrence, isolation, classification, functions and general properties of alkaloids.
CO3: Students learn the structural elucidation and general properties of terpenes.
CO4: Students understand the Nomenclature and classification of steroids and steroidal alkaloids.
CO5: Students get the in depth knowledge on Anthocyanins.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: EPCH704A					TITLE OF THE COURSE: HETEROCYCLICS AND NATURAL PRODUCTS								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	4	4	4	4	4	4	4	4	3.92	
CO2	4	4	4	3	4	4	4	3	3	3	4	3	4	3.62	
CO3	3	3	3	3	3	4	3	3	3	3	4	3	4	3.23	
CO4	4	4	3	3	3	4	3	2	3	4	3	3	3	3.23	
CO5	3	3	3	3	3	4	3	3	3	3	4	2	2	3.0	
Mean Overall Score														3.4	

Result: The Score of this Course is 3.4 (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: HETEROCYCLIC CHEMISTRY [15 Hrs]

1.1 Nomenclature – react ivity – aromaticity – spect ral proper ties.

1.2 Elementary study of the following systems only – indole, isoindole – oxazole, imidazole, thiazole, pyr idines, pyr imidine, pyridazine, pyrazine, chromans, chromons, coumarins, carbazoles, uracil, uric acid, xanthiones and flavonoids. Synthesis and reactions of 5 membered (pyrrole, thiophene, furan) and 6 membered heterocyclic compounds (pyr idine), fused rings (quinoline and isoquinoline)

UNIT – II: ALKALOIDS [10 Hrs]

2.1 General methods of structural elucidation of alkaloids -a general survey.

2.2 The structural elucidation of Belladine, Papaverine, Cocaine, Atropine, Heptaphylline, Peepuloidin, Morphine. Occurrence, isolation, classif icat ion, functions and general properties of alkaloids.

UNIT – III: TERPENES [6 Hrs]

3.1 General methods of determination of structure.

3.2 Structural elucidation of Camphor, Cadinene, Vitamin A, Abietic acid, Gibberelic acid, Zinziberine and Squalene. Occurrence, isolation, classification, functions and general properties of terpenes.

UNIT – IV: STEROIDS [6 Hrs]

4.1 Conformations of stereoids - molecular rear rangements (acid and base catalysed, photochemical).

4.2 Synthesis of steroids – ring forming reaction and control of ring junction stereochemistry.

4.3 Synthesis of cholestrol, androgens, oestrone, progesterone and cortisone. (questions on complete synthesis is not included for examinat ion)

Nomenclature and classif icat ion of steroids, steroidal alkaloids

UNIT – V: ANTHOCYANINS [8 Hrs]

5.1 General nature of anthocyanins – structure of the anthocyanidins

5.2 General methods of synthesizing anthocyanidins.

5.3 Structural elucidat ion of cyanidin chloride, pelargolidin chloride.

5.4 Flavones – flavonols – isoflavones.

5.5 Biosynthesis of flavonoids – depsides – tannins.

Synthesis of delphinidin chloride, peonidin chloride, malvidin chloride, and quercetin.

Text Books:

1. O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 1, Goel Publishing House, Meerut, 1997.
2. O. P. Agarwal, Chemistry of Organic Natural Products, Vol. 2, Goel Publishing House, Meerut, 1997.
3. I. L. Finar, Organic Chemistry Vol-2, 5th edn, Pearson Education Asia, 1975.

Reference Books:

1. T.L. Gilchrist, Heterocyclic Chemistry, Longman Scientific and Tech, 1985
2. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004.
3. Pelletier, Chemistry of alkaloids, Van Nostrand Reinhold Co, 2000.
4. Shoppe, Chemistry of the steroids, Butterworthes, 1994.

I M.Sc (CH)	HETEROCYCLICS AND NATURAL PRODUCTS For the students admitted in the year 2017	EPCH704A
SEMESTER - I		HRS/WK – 4
ELECTIVE - 1		CREDIT- 4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	ORGANIC CHEMISTRY – II For the students admitted in the year 2014	PCH805S
SEMESTER - II		HRS/WK – 4
CORE – 4		CREDIT- 5

Objectives:

To learn the aspects of substitution reactions and its applications. To appreciate the principles of addition and elimination reactions.

COURSE OUTCOMES (COs)

CO1: Knowledge pertaining to stereochemistry.
CO2: Aliphatic electrophilic and nucleophilic substitution reaction mechanisms.
CO3: Addition and elimination reactions.
CO4: Aromatic electrophilic substitution reactions.
CO5: Aromatic nucleophilic substitution reactions.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: PCH805S					TITLE OF THE COURSE: ORGANIC CHEMISTRY - II								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	3	4	3	4	4	4	4	4	4	4	3	3.76	
CO2	4	3	3	3	3	3	3	3	4	3	3	4	4	3.30	
CO3	3	3	4	3	3	3	3	4	4	4	4	4	4	3.53	
CO4	4	3	3	3	3	3	3	4	4	3	4	4	4	3.46	
CO5	3	3	3	4	3	3	3	3	3	4	4	4	4	3.38	
Mean Overall Score														3.48	

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

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

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

UNIT – I: STEREOCHEMISTRY – II [12 Hrs]

Conformations of some simple 1,2 – disubstituted ethane derivatives.

Conformational analysis of disubstituted cyclohexanes and their stereochemical features. Conformation and reactivity of substituted cyclohexanol(oxidation and acylation), cyclohexanone.(reduction) and cyclohexane carboxylic derivatives (esterification and hydrolysis). Conformation and mechanism of cis and trans decalin and 9 – methyl decalin.

UNIT – II: ALIPHATIC NUCLEOPHILIC AND ELECTROPHILIC SUBSTITUTION [12 Hrs]

Substitution at saturated reaction center (carbon). SN1, SN2, SNi mechanisms – Reactivity, structural and solvent effects. Neighbouring group participation – substitution in Norbornyl and bridgehead systems – Substitution at carbon doubly bonded to oxygen. Alkylation and acylation of active methylene carbon compounds, hydrolysis of esters. SE1, SE2, SEi mechanisms – reactivity. Hell-Volhard-Zelinsky reaction, Stork – enamine reaction. Decarboxylation of aliphatic acids.

UNIT – III: ADDITION AND ELIMINATION REACTIONS [12 Hrs]

Electrophilic, nucleophilic and free radical mechanisms of addition to carbon – carbon multiple bonds – isolated and conjugated multiple bonds. Hydration, hydroxylation, hydroboration. Stereochemical aspects to be studied wherever applicable.Nucleophilic addition reactions of carbonyl compounds: Aldol, Perkin, Stobbe, Claisen, Dieckmann,Benzoin condensation. Mannich, Reformatsky, Grignard, Robinson Annulation and Shapiro reactions.

Elimination reactons: E1, E2 and E1CB mechanism. Hofmann and Saytzeff rules.

Dehydration, dehydrohalogenation and dehalogenation. Stereochemistry of E2 elimination in cyclohexane systems. Mechanism of pyrolytic eliminations. Chugaev and Cope eliminations.

UNIT – IV: AROMATIC ELECTROPHILIC SUBSTITUTION [12 Hrs]

The arenium ion mechanism – Orientation and reactivity – typical reactions – nitration, halogenation, alkylation, acylation and diazonium coupling. Reimer- Tiemann, Vilsmeyer-Hack, Gattermann, Kolbe reactions. Synthesis of di- and tri- substituted benzenes. Electrophilic substitution of furan, pyrrole, thiophene and pyridine- N- oxide.

UNIT – V: AROMATIC NUCLEOPHILIC SUBSTITUTION [10 Hrs]

Methods for the generation of benzyne intermediate and reactions of aryne intermediate. Nucleophilic substitution involving diazonium ions. Aromatic nucleophilic substitution of activated halided. Zeigler alkylation. Chichibabin reaction. Problems.

Text Books:

1. E.L. Eliel Stereochemistry of carbon compounds, John Wiley, 1997.
2. P.S. Kalsi Stereochemistry , conformation and mechanism, 6th edition, , New Age International (P) Ltd. 2005.
3. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry, Part A and B, Kluwer Academin/Plenum Publishers,2000.
4. Seyhan Ege, Organic Chemistry, AITBS, 2001.
5. Clayden, Greeves, Warren, Wothers, Organic Chemistry, Oxford Univ Press.
6. Reinhard Brukner, Advanced Organic Chemistry, Academic Press, Elseiver, 2002.

Reference Books:

1. Raj.K. Bansal,Organic Reaction Mechanism, 3rd edition, Tata McGraw Hill, 1998.
2. R.O.C. Norman, J.M. Coxon, Principle of Organic Synthesis, ELBS Publications,1994.

3. C.K. Ingold, Structure and Mechanism in Organic Chemistry, Cornell Univ. Press
4. Michael Smith, Organic Synthesis, McGraw Hill, 1996.
5. W. Carruthers, J. Coldham Modern methods of Organic Synthesis, IV Edition, Academic Press, 1989.

I M.Sc (chem)	ORGANIC CHEMISTRY – II For the students admitted in the year 2014	PCH805S
SEMESTER - II		HRS/WK – 4
CORE – 4		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	INORGANIC CHEMISTRY – II For the students admitted in the year 2014	PCH806T
SEMESTER - II		HRS/WK – 4
CORE – 5		CREDIT- 5

Objectives:

To learn about MO theory of complexes. To learn the fundamental concepts of nano technology, Lanthanides, actinides and about the applications of metal ions in biological systems. To interpret the electronic spectra of various complexes

COURSE OUTCOMES (COs)

CO1: To learn about the MO theory of complexes.
CO2: To interpret the electronic spectra of various complexes.
CO3: To learn the fundamental concepts of nanotechnology and about the Lanthanides and actinides.
CO4: To appreciate the applications of metal ions in biological systems.
CO5: To understand the theory behind the nuclear reactions and their applications.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: PCH806T					TITLE OF THE COURSE: INORGANIC CHEMISTRY - II								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	2	3	2	3	3	2	4	3	4	3	3	4	2	2.92	
CO2	2	3	3	3	3	4	3	3	3	3	3	3	3	3.00	
CO3	2	3	3	3	2	3	4	4	4	3	4	4	4	3.30	
CO4	3	2	3	3	2	3	4	4	3	3	4	4	2	3.07	
CO5	3	3	3	2	3	3	3	3	3	3	3	3	3	2.92	
Mean Overall Score														3.04	

Result: The Score of this Course is 3.04 (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: MO THEORY OF COMPLEXES AND CHEMISTRY OF LANTHANIDES AND ACTINIDES [12 Hrs]

1.1 Metal-Ligand Bonding: Limitation of crystal field theory, Molecular Orbital Theory, Evidences of metal- ligand covalency, TASO-MO concepts of Oh and Td complexes, MO energy level diagrams of sigma- and pi-bonding in Oh complexes, nature of metal-ligand pi-bonds, evidences for pi-back bonding, spectochemical series, and pi-acceptor series. Jahn-Teller Effect and its consequences.

1.2 The Chemistry of Lanthanides and Actinides: oxidation state, spectral & magnetic characteristics, coordination numbers, stereochemistry, lanthanide contraction-causes, consequences - comparison between 3d and 4f block elements - comparative account of lanthanides and actinides - nuclear and non-nuclear applications.

UNIT – II: ELECTRONIC SPECTRA OF TRANSITION METAL COMPLEXES [12 Hrs]

2.1 Electronic Spectra of Transition Metal Complexes: Spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1-d^9 states), Nephlauxetic effect - calculations of Dq, B and β parameters.

2.2 Charge Transfer spectra – Comparison of CT and d-d spectra.

UNIT – III: NANOTECHNOLOGY [12 Hrs]

3.1 Nanotechnology – Introduction – preparatory methods – chemicals methods, thermolysis, pulsed laser method – Microwave Synthesis -Basic concepts of Nano science and technology – Quantum wire – Quantum well – Quantum dot – Properties and technological advantages of Nano materials – Carbon Nanotubes and applications – Principles of SEM, TEM and AFM .

3.2 Biomedical applications of nanotechnology.

UNIT – IV: BIOINORGANIC CHEMISTRY [12 Hrs]

4.1 Bioinorganic Chemistry: Metal Ions in Biological Systems : Essential and trace metals.Na^+/K^+ Pump, Role of metals ions in biological processes, Transport and Storage of Dioxygen : Heme proteins and oxygen uptake, structure and function of haemoglobin, myoglobin, hemocyanins and hemerythrin,

4.2 Electron Transfer in Biology: Structure and function of metalloproteins in electron transport processes – cytochromes and ion-sulphur proteins, synthetic models.Nitrogenase: Biological nitrogen fixation, molybdenum nitrogenase, nitrogenases model systems.

UNIT – V: NUCLEAR CHEMISTRY [12 Hrs]

5.1 Nuclear Chemistry: Modes of Radioactive Decay: Orbital electron capture: nuclear isomerism, internal conversion, detection and determination of activity by cloud chamber, nuclear emulsion, bubble chamber, G.M., Scintillation and Cherenkov counters. Nuclear Reaction: Types, reactions, cross section, Q-value, threshold energy, compound nucleus theory: high energy nuclear reaction, nuclear fission and fusion reactions as energy sources; direct reactions; photonuclear and thermo nuclear reaction.

5.2 Stellar Energy: Synthesis of elements - hydrogen burning, carbon burning, the e, x, r, p and x processes. Nuclear Reactors: fast breeder reactors, particle accelerators, linear accelerators, cyclotron and synchrotron. Radio Analytical Methods: Isotope dilution analysis, Radiometric Titrations, Radio immuno assay, Neutron activation analysis.

Text Books:

1. J.E. Huheey, Inorganic Chemistry, 5th Edn., Harper International.1993.

2. F.A.Cotton, G.Wilkinson, Advanced Inorganic Chemistry, 5th Edn., John Wiley.1985.
3. M.F.Purcell, J.C.Kotz, Inorganic Chemistry,Saunder, 1977.
4. Mick Wilson, Kamali Kannangara, Michells Simmons and Burkhard Raguse, "Nano Technology – Basic Science and Emerging Technologies", 1st edition, Overseas Press,New Delhi,2005.
5. Arnikar, Essentials of Nuclear Chemistry, 2nd Edn., Sulthan & Chand Publishers, 1991.
6. R.W.Hay, Bioinorganic chemistry, Ellis Harwood, 1987.
7. A.K.Das, Inorganic Chemistry

Reference Books:

1. Mich Wilson, Kamali Kanengara, Geoff smith, Michelle Simmons and Burkherd Raguk, Nanotechnology Basic Science and Energy Technologies, Overseas press (I), N.D.2005.
2. R.W.Hay, Bio Inorganic Chemistry, Ellis Horwood, 1987.
3. Lehninger, Principles of Biochemistry, Van Eikeren, 1982.
4. T.M.Loehr, Iron carriers and Iron proteins, VCH, 1989.
5. Gladstone, Source book of Atomic Energy, 3rd Edn., ELBS, 1986.
6. N.N.Greenwood , A.Earnshaw , Chemistry of the Elements, 2nd Edn.,BH,1997.

I M.Sc (CH)	INORGANIC CHEMISTRY – II For the students admitted in the year 2011	PCH806T
SEMESTER - II		HRS/WK – 4
CORE – 5		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	GROUP THEORY AND ITS APPLICATIONS IN SPECTROSCOPY	PCH807T
SEMESTER - II		HRS/WK – 4
CORE - 6	For the students admitted in the year 2014	CREDIT-5

Objective:

To study the elements of group theory and the application of group theory. To study the different types of molecular spectroscopy

COURSE OUTCOMES (COs)

CO1: To study the elements of group theory and the application of group theory.
CO2: To study the different types of molecular spectroscopy
CO3: To study about the various spectroscopy in molecular level.
CO4: To understand about the normal modes and vibrational analysis.
CO5: To study about the various types of NMR spectroscopy and its importance.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: PCH807T					TITLE OF THE COURSE: GROUP THEORY AND ITS APPLICATIONS IN SPECTROSCOPY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	4	4	4	4	4	5	4	5	3	4	5	4.00	
CO2	4	4	5	4	4	3	3	4	4	4	4	3	4	3.84	
CO3	3	4	4	5	5	3	4	4	4	3	5	4	4	4.00	
CO4	3	4	3	4	4	4	4	4	4	4	4	3	4	3.76	
CO5	4	3	3	3	4	4	4	4	4	5	3	3	4	3.69	
Mean Overall Score														3.85	

Result: The Score of this Course is 3.85 (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: GROUP THEORY [12 Hrs]

1.1 Symmetry elements and symmetry operations – group multiplication table – sub groups, similarity transformation and classes – identifications of symmetry operations and determination of point groups.

1.2 Reducible and irreducible representations – direct product representation.

UNIT – II: APPLICATIONS OF GROUP THEORY [12 Hrs]

2.1 Orthogonality theorem and its consequences – construction of character table for C_2V and C_3V – hybrid orbital in non- linear molecules (CH_1, XeF_4, BF_3, SF_6 and NH_3).

2.2 Determination of representations of vibrational modes in non-linear molecules (H_2O, CH_4, BF_3 and NH_3).

2.3 Symmetry selection rules of infra- red and Raman spectra – application of group theory for the electronic spectra of ethylene and formaldehyde.

UNIT – III: PROPERTIES OF MOLECULES [12 Hrs]

3.1 Normal modes – Vibrational Analysis and Characterization of Stationary points – Electrical Properties - dipole moments, optical activity, polarizability.

3.2 Magnetic properties NMR chemical shifts, shielding, spin – spin coupling and hyperfine interactions.

UNIT – IV: SPECTROSCOPY – I [12 Hrs]

4.1 Interaction of matter with radiation – Einstein theory of transition Probability – Rotational spectroscopy of a rigid rotator – diatomic and polyatomic molecules.

4.2 Vibrational spectroscopy – harmonic oscillator – anharmonicity – vibrational spectra of polyatomic molecules – vibrational frequencies – group frequencies – vibrational coupling overtones – Fermi resonance- Raman Spectra.

4.3 Electronic spectra of polyatomic molecules – group symmetry of molecules and selection rules – types of transition – solvent effects.

UNIT – V: SPECTROSCOPY – II [12 Hrs]

5.1 Resonance spectroscopy – Zeeman effect – equation of motion of spin in magnetic fields – chemical shift – spin-spin coupling.

5.2 Calculation of coupling constants - ^{13}C, ^{19}F, ^{31}P NMR spectra – applications – a brief discussion of Fourier transformation in resonance spectroscopy. Splitting of spin energy level in magnetic field – quantum mechanical treatment.

Text Books:

1. C. N. Banwell. 1966, Fundamentals of Molecular Spectroscopy, McGraw Hill.
2. K. V. Raman, Group Theory and its Applications to Chemistry, Tata Mcgraw Hill publishing.Co. 5th edition, 1990.

Reference Book:

1. Bhattacharaya. Group Theory and its Applications

I M.Sc (CH)	GROUP THEORY AND ITS APPLICATIONS IN SPECTROSCOPY For the students admitted in the year 2014	PCH 807T
SEMESTER - II		HRS/WK – 4
CORE - 6		CREDIT-5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION –C (5x 8 = 40)
Answer **Five out of Seven**
(May contain sub divisions)
(Conceptual descriptive and Problem solving type)

I M.Sc (CH)	REAGENTS AND NAMING REACTIONS For the students admitted in the year 2014	EPCH808Q
SEMESTER - II		HRS/WK – 4
ELECTIVE – 2		CREDIT- 5

Objective:

To inculcate the problem solving nature. To learn about green chemistry

COURSE OUTCOMES (COs)

CO1: Students understand the importance of stereochemical aspects of structure and properties.
CO2: Students learn the overview of the organic reaction mechanisms.
CO3: Students learn the chemistry of organometallic compounds and its organic reactions.
CO4: Students understand the concept of photochemical reaction and its applications.
CO5: Students are motivated to know the concept of green chemistry

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: EPCH808Q					TITLE OF THE COURSE: REAGENTS AND NAMING REACTIONS								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	4	3	4	3	3	4	3	3	3	4	4	3.46	
CO2	4	3	4	3	3	4	3	3	4	3	3	4	4	3.46	
CO3	3	4	4	4	3	3	3	4	4	4	4	4	4	3.69	
CO4	4	4	3	3	4	3	3	4	4	3	4	4	4	3.62	
CO5	3	4	3	4	4	4	3	3	3	4	4	4	4	3.62	
Mean Overall Score														3.57	

Result: The Score of this Course is 3.57 (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: STEREOCHEMISTRY AND CONFORMATIONAL ANALYSIS [12 Hrs]

Recognition of chiral structures – R & S, E & Z nomenclature,(including allene,biphenyl & spiranes), diastereoisomerism in acyclic systems. Conformational analysis of simple cyclic and acyclic system& their effect on reaction. Inter conversion of Fischer, Newman and Sawhorse projections. Assymetric synthesis newer methods. Enantiotopic and diastereotopic ligands and faces.

UNIT – II: COMMON ORGANIC REACTION MECHANISMS [12 Hrs]

Methods of determining reaction mechanism – reactive intermediates – carbocations, carbanions, carbenes, nitrenes, arynes and free radicals. Nucleophilic and electrophilic substitutions and additions to multiple bonds. Elimination reactions. Kinetic isotope effects. Hammett equation – Neighbouring group participation.

UNIT – III: SELECTIVE NAME REACTIONS& REARRANGEMENTS [12 Hrs]

Hofmann, Schmidt, Lossen, Curtius, Beckmann, Fries, Claisen, Cope rearrangements. Favorskii, Stork – enamine, Mannich, Michael, Baeyer – Villiger, Shapiro, Hoffmann – Loffler – Freytag reactions. Routine functional group transformations. Hydroboration, Hydroxylation, Oppenaur Oxidation, Meerwein - Ponndorf – Verley, Clemmenson, Wolf Kishner and Birch reductions. Simmons – Smith reaction.

UNIT – IV: REAGENTS IN ORGANIC SYNTHESIS & PHOTOCHEMISTRY [12 Hrs]

Uses of complex metal hydrides, Gilman's reagent, LDA, DCC, 1,3-dithiane, trimethylsilyl iodide, tri-n-butyl tin hydride, osmium tetroxide, SeO2, DDQ, Peterson's synthesis, Wilkinson's catalyst, Baker's yeast, Merrifield resin.

Alpha cleavage given by cyclobutanones - beta cleavage reactions, formation of photoenols and photoenolisation, intermolecular hydrogen transfer &intermolecular photo reduction - Photo rearrangements:photo rearrangements of beta-gamma unsaturated ketones, 1,2 acyl shift - 1,3 acyl shift, aza di-pi methane rearrangement

UNIT – V: GREEN CHEMISTRY [12 Hrs]

Green Chemistry – Genesis and concept of Green Chemistry, Principles, Strategies

Alternative Techniques in Organic Synthesis

Use of microwave, ultrasound, ionic liquids, super-critical solvents in organic synthesis; Multi-component reactions

Text Books:

1. P. S. Kalsi. Organic Reaction stereochemistry & Mechanism. 4th edition. New Age International publishers. 2006.
2. Clayden, Greeves, Warren, Wothers. Organic chemistry. Oxford University Press. 2001.
3. Jerry March. Advanced organic chemistry. 4th edition. Wiley Interscience publications. 1999.
4. Paula Yurkanis Bruice. Organic chemistry. 3rd edition Pearson Education Inc. 2001.
5. Peter sykes. A guide book to mechanism in organic chemistry. Orient Long mann. 2002

Reference Books:

1. Seyhan Ege. Organic Chemistry. 3rd edition. D. C. Health & company.
2. Raj. K. Bansal. Organic Reaction Mechanism. 3rd edition Tata Mc. Graw Hill.
3. V. K. Ahluwalia, R. K. Parashar. Organic Reaction Mechanism. 3rd edition. Narosa publishing House.

4. Coxon, Halton; organic photochemistry, Cambridge university press, 1987
5. Claiden, Grreeves, warren, wothers; organic chemistry, Oxford university press,2001

I M.Sc (CH)	REAGENTS AND NAMING REACTIONS For the students admitted in the year 2014	EPCH808Q
SEMESTER - II		HRS/WK – 4
ELECTIVE – 2		CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	NUCLEAR AND RADIO CHEMISTRY For the students admitted in the year 2017	EPCH808A
SEMESTER - II		HRS/WK – 4
ELECTIVE – 2		CREDIT- 5

Objectives:

To make the students knowledgeable in nuclear chemistry. To familiarize the students with nuclear and radioisotopes techniques. To equip the students for their future career in nuclear industry.

COURSE OUTCOMES (COs)

CO1: Students understand subatomic particles and nuclear models.
CO2: Students learn different decays and detectors in nuclear chemistry.
CO3: Students acquire disintegration processes, nuclear reactions and fission.
CO4: Students learn about the radiation safety.
CO5: Students understand the fundamentals and the applications of radioactivity in medicine for diagnosis and therapy (nuclear medicine).

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: EPCH808A					TITLE OF THE COURSE: NUCLEAR AND RADIOCHEMISTRY								HOURS: 4	CREDITS: 5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	4	3	4	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: THE NUCLEUS [12 Hrs]

1.1 Radius of atomic nuclei: binding energy of nuclei, force between nucleons.

1.2 Nuclear moment: nuclear angular momentum, nuclear magnetic dipole moment, electric quadrupole moment - NQR

1.3 Nuclear models: liquid drop model, nuclear shell model, fermi gas model. The subatomic particles: electron, proton, neutron, antiproton, positron, meson, quacks. Mass of nuclei: isotopes, isobars, mass spectrometry- identification of isotopes.

UNIT - II: RADIOCHEMISTRY [12 Hrs]

2.1 Alpha decay: theory of emission, alpha-ray energy spectra.

2.2 Beta-decay: decay theory, electron capture, double beta decay.

2.3 Gamma ray: theory of emission, internal conversion, the Auger effect, nuclear resonance absorption. Principles of Mossbauer spectroscopy.

2.3 Counters: Geiger counters, scintillation counters, proportional counters, semiconductor detectors. Radioactive series decay: radioactive series growth and decay, determination of half - lives.

UNIT - III: NUCLEAR REACTION [12 Hrs]

3.1 Types of nuclear reactions: react ion cross sect ion-compound nucleus theory, high energy nuclear, direct nuclear , photonuclear and thermonuclear react ions.

3.2 Source of nuclear bombarding particles: Charged particle accelerators, gamma ray, X-ray and neutron sources.

3.3 Fission: Fission products and Fission yield curve, Fission energy, theory of nuclear fission, nuclear reactor, breeder reactor - nuclear reactors in India. Fusion reactions hydrogen bomb and energy of sun.

3.4 Transuranium elements: Synthesis, separation and properties of transuranium elements. Reprocessing of spent fuels. Solvent Extraction - Specific sequestering agents for transuranium elements. Nuclear react ions – one example for each category.

UNIT - IV: RADIATION CHEMISTRY [12 Hrs]

4.1 Interact ion of radiation with matter: range of alpha, beta and gamma radiations, radiation dosimetry.

4.2 Radiolysis of water: Mechanism-hydrated electron.

4.3 Radiation safety precaution: Safety standards and safe-working methods.

UNIT - V: ANALYTICAL METHOD IN NUCLEAR CHEMISTRY [12 Hrs]

5.1 Radio isotopes: Co-precipitation, ion-exchange, solvent extract ion – as a tracer, Synthesis of labeled compounds (any two), isotopic dilution and radiopharmaceuticals.

5.2 Neutron activation analysis, positron annihilation and autoradiography. Dating of objects and mechanistic study.

Text Books:

1. H. J. Arnikar, “Essentials of Nuclear Chemistry”, Wiley Eastern Ltd., New Delhi (1982)
2. A.K. Srivatsava and P. Jain, “Essential of nuclear Chemistry”, S.Chand, N.Delhi, 1989
3. G.R. Choppin, “Radiochemistry and Nuclear chemistry”, 2002.

Reference Books:

1. G. Friedlander, J. W. Kennedy, and J. M. Miller, “Nuclear and Radiochemistry”, John Wiley and Sons Inc., Japan Second Edition (1964)

2. S. Glasstone, “Source book on Atomic Energy”, Van Nostrand Co. Inc., New Jersey, Second Edition (1958)
3. R. Gopalan, “Elements of nuclear chemistry”, Sultan Chand, Delhi, 2000.

I M.Sc (CH)	NUCLEAR AND RADIO CHEMISTRY	EPCH808A
SEMESTER - II	For the students admitted in the year	HRS/WK – 4
ELECTIVE – 2	2017	CREDIT- 5

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

I M.Sc (CH)	ORGANIC CHEMISTRY PRACTICAL – I For the students admitted in the year 2008	PCHP201
SEMESTER – II I &II		HRS/WK – 4
CORE PRACTICAL –II		CREDIT – 2

COURSE OUTCOMES (COs)

CO1: Students learn the Identification of Compounds in a two-component mixture.
CO2: Students learn the preparation of some organic compounds.

(Total Marks: 100 External Marks: 60 & Internal Marks: 40)

I. Identification of Compounds in a two component mixture and Preparation of their derivatives and Determination of Boiling Points and Melting Points for Compounds and Melting Point for their derivatives.

II. Organic Preparations (Any Six from the followings)

1. Anthraquinone from Anthracene
2. Benzhydrol from Benzophone
3. Methyl Orange from Sulphanilic Acid
4. p-Nitrobenzoic acid from p-Nitrotoluene
5. m-Nitroaniline from m-Dinitrobenzene
6. Diphenylmethane from Benzylchloride
7. p-Chlorotoluene from p-Toluidine
8. 1,2,3,4-Trtrahydrocarbazole from Cyclohexanone
9. Preparation of o-Benzyl Benzoic Acid

Quantum of marks in respect of Practical Examinations:

Qualitative Organic Analysis	:	30 Marks
Preparation	:	15 Marks
Record	:	5 Marks
Practical Viva	:	10 Marks
Total	**:**	**60 Marks**

Text Books:

1. Vogel, A text book of Practical Organic Analysis, ELBS.
2. Raj K. Bansal, Laboratory manual of Organic Chemistry, Wiley Eastern Ltd.

Reference Book:

1. Mann and Saunders, Laboratory manual of Organic Chemistry.

I M.Sc (CH)	INORGANIC CHEMISTRY PRACTICAL-I For the students admitted in the year 2014	PCHP202S
SEMESTER – II I & II		HRS/WK – 4
CORE PRACTICAL –II		CREDIT – 2

COURSE OUTCOMES (COs)

CO1: To improve the skill in quantitative estimation of metal ions by complexometric titration.
CO2: To identify the metal ions qualitatively in a mixture of metal ions.
CO3: To improve the skill in the synthesis of inorganic complexes.

Objectives

- To improve the skill in quantitative estimation of metal ions by complexometric titration.
- To identify the metal ions qualitatively in a mixture of metal ions.
- To improve the skill in synthesis of inorganic complexes.

1. Semimicro qualitative analysis of mixture containing two common and two rare cations. The following are the cations to be included- W, Se, Te, Mo, Ce, Th, Ti, Zr, V,U, Li.
2. Complexometric titrations (EDTA method) – Estimation of Ca, Mg and Zn.
3. Preparation of the following
   a) Potassium tris(oxalato)aluminate(III)hydrate
   b) Sodium bis(thiosulphato)cuprate(II)
   c) Tris(thiourea)copper(I) sulphate
   d) Diisothiocyanatodipyridine manganese(II)
   e) Tetramminecopper(II) sulphate

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)

6 Hrs. Exam	**Total Marks: 60**
1. a) Qualitative analysis (semimicro)(:Mix of 4 radicals anions) (2 rare +2 common cations)	20 Marks
2. (a) Preparation	10 Marks
(b) EDTA (complexometric tiration)	20 Marks
3. (a) Practical Record Note Book	5 Marks
(b) Pratical Viva-Voce	5 Marks

I M.Sc (chem)	PHYSICAL CHEMISTRY PRACTICALS -I For the students admitted in the year 2014	PCHP203
SEMESTER – I & II		HRS/WK – 4
CORE PRACTICAL -3		CREDIT-2

COURSE OUTCOMES (COs)

CO1: Students learn the Experiments in Thermodynamics, colligative properties, phase rule, Surface Phenomenon, chemical equilibrium, and chemical kinetics.

CO2: Typical examples are given and a list of experiments is also provided from which suitable experiments can be selected as convenient.

1. Verification of Arrhenius equation
2. Determination of activity and activity coefficient from freezing point depression method.
3. Construction of vapour pressure curves for different types of solutions.
4. Molecular modeling
5. Simulations to find out symmetry of the molecule
6. Simulations to find vibrational modes and verification by using group theory.
7. Effect of ionic strength of solvents and solutions.
8. Phase diagram construction involving two component systems.
9. Adsorption isotherm
10. Reaction rate and evaluation of other kinetic parameters using polarimetry, analytical techniques and conductometry.

DETAILS OF LIST OF EXPEIMENTS FOR PHYSICAL CHEMISTRY PRACTICAL – I

1. Determine the temperature coefficient and energy of activation of hydrolysis of ethyl acetate.
2. Study the inversion of cane sugar in the presence of acid using polarimeter.
3. Study the effect of ionic strength on the rate of saponification of an ester.
4. Study the salt effect, solvent effect on the rate law of alkaline hydrolysis of crystal violet.
5. Determine the molecular weight of benzoic acid in benzene and find the degree of association.
6. Determine the activity coefficient of an electrolyte by freezing point depression method.
7. Study the phase diagram from toluidine and glycerine system.
8. Construct the boiling point composition diagram for a mixture having maximum boiling point and minimum boiling point.
9. Determine the partial molal volume of glycine/methanol/formic acid/sulphuric acid by graphical method and by determining the densities of the solutions of different compositions.
10. Determine the strength of hydrogen bond in solutions.

SCHEME OF EVALUATION: (TOTAL = 60 MARKS)

Aim & short procedure	– 10
Record	– 10
Spectral interpretation	– 10
Experiment & manipulation	- 20
Viva voce	– 10
Total	- 60

II M.Sc (CH)	ORGANIC CHEMISTRY – III For the students admitted in the year 2014	PCH909S
SEMESTER – III		HRS/WK – 4
CORE – 7		CREDIT-4

Objectives:

To learn the applications of various reaction in organic synthesis.

COURSE OUTCOMES (COs)

CO1: Students understand stereo chemical implications of pericyclic reaction in organic synthesis.

CO2: Students understand the structural and stereochemical implications on photochemical reactions.

CO3: Students get learnt the concept of aromatic character in some molecules.

CO4: Students learn the applications of various reaction in organic synthesis.

CO5: Students understand stereo chemical implications of pericyclic reaction in organic synthesis.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: PCH909S					TITLE OF THE COURSE: 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	3	3	4	3	4	3	3	4	3	3	3	4	4	3.38	
CO2	3	3	4	3	3	2	4	3	4	3	3	4	4	3.31	
CO3	3	3	4	3	3	3	4	4	4	4	4	4	4	3.62	
CO4	3	3	3	3	2	3	3	4	4	3	4	4	4	3.31	
CO5	3	3	3	4	3	3	3	3	3	4	4	4	4	3.38	
Mean Overall Score														3.40	

Result: The Score of this Course is 3.40 (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: PERICYCLIC REACTIONS [12 Hrs]

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3 – butadiene, 1,3,5 – hexatriene and allyl system. Classification. Electrocyclic reactions – cycloadditions and cheleotropic reactions. Sigmatropic rearrangements – Woodward – Hoffmann rules and correlation diagrams.Claisen and Cope rearrangements. Fluxional tautomerism , Ene reaction, Applications of concerted reactions in organic synthesis.

UNIT – II: ORGANIC PHOTOCHEMISTRY [12 Hrs]

Introduction to organic photochemistry ,Photochemical excitations, Fate of the excited molecules, Jablonski diagram, Study of photochemical reactions of alkenes, dienes, aromatic, carbonyl and conjugated systems, Norrish Type-I and IIreactions, Paterno- Buchi reaction, di-pi-methane rearrangement, Applications of photochemical reactions in Organic synthesis.

UNIT – III: REAGENTS IN ORGANIC SYNTHESIS [12 Hrs]

Applications of the following reagents in organic synthesis:AIBN, 9-BBN, DCC, CAN,PCC, Crown ethers, LDA, Lindlar's catalyst, Gilman's reagent, 1,3-Dithiane-Umpolung, Trimethylsilyl iodide, Phase transfer catalysts, Wilkinson's catalyst, Baker yeast, Organo transition metal reagents. Applications of reagents containing silicon, Phosphorus, Sulphur, selenium, palladium, rhodium, and titanium reagents in organic synthesis.

UNIT – IV: SELECTIVE NAME REACTIONS AND THEIR APPLICATIONS IN ORGANIC SYNTHESIS [12 Hrs]

Michael addition , Mannich reaction , sharpless asymmetric epoxidation, Hofmann – Loffler – Freytag reaction , Knoevenagel reaction, Peterson Olefination reaction, Skraup reaction, Barton reaction, Reformatsky reaction,Von Richter reaction, Prevost reaction and Woodward modification of the Prevost reaction.

UNIT – V: AROMATICITY [12 Hrs]

Aromaticity of benzenoid, heterocyclic and non benzenoid compounds, Huckel's rule – Aromatic systems with pi electron numbers other than six – non aromatic (cyclo octatetraene etc,) and anti-aromatic system (cyclobutadiene etc.) – system with more than 10 pi electrons – Annulenes up to C18 (synthesis of all these compounds is not expected)

Text Books:

1. S. M. Mukherji, "Pericyclic reactions", Mac Millan, India
2. Charles H. Deputy abnd Orville, L. Chapmann, "Molecular reaction and photochemistry" Prentice Hall of India Pvt., Ltd., New Delhi.
3. J. D. Coyle, Organic Photochemistry, Wiley, 1985

Reference Books:

1. R.O.C. Norman, J.M. Coxon, Principles of organic synthesis, ELBS publications, 1994.
2. C. K. Ingold, Structure and Mechanism in Organic chemistry, Cornell Univ. Press.
3. F. A. Carey and R. J. Sundberg, Advanced organic chemistry, Plenum publishers Ltd. 2000.
4. Michael Smith, Organic synthesis, McGraw Hill, 1996.
5. W. Carruthers, J.Coldham, Modern methods of Organic synthesism IV edition, Academic press, 1989.

II M.Sc (CH)	ORGANIC CHEMISTRY – III For the students admitted in the year 2014	PCH909S
SEMESTER – III		HRS/WK – 4
CORE – 7		CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(May contain sub divisions)
(Problem solving type)

II M.Sc (CH)	INORGANIC CHEMISTRY – III For the students admitted in the year 2011	PCH910S
SEMESTER – III		HRS/WK – 4
CORE – 8		CREDIT-4

Objectives:

To understand the concepts of spectral techniques and to apply these techniques for the quantitative and structural analysis of inorganic compounds. To learn the various concepts of organometallic chemistry.

COURSE OUTCOMES (COs)

CO1: To understand the bonding nature of the metal complexes and the reaction mechanisms of the metal complexes.
CO2: To learn the catalytic behavior of the metal complexes.
CO3: To gain knowledge in isolable analogy of the metal carbonyls.
CO4: To understand the EPR and photo electron spectra and the theories behind them.
CO5: To describe ^{31}P, ^{19}F NMR, and the principles, applications of NQR Mossbauer Spectroscopy.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: PCH910S					TITLE OF THE COURSE: 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	4	4	3	3	3	4	4	4	3	3	3	4	3	3.46	
CO2	4	4	4	3	3	3	3	3	4	4	4	3	4	3.54	
CO3	4	3	3	3	3	4	4	4	4	3	3	4	4	3.54	
CO4	4	4	3	3	3	3	3	3	4	3	4	4	4	3.46	
CO5	4	4	4	3	3	3	4	4	4	4	4	4	3	3.69	
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: ORGANOMETALLIC CHEMISTRY – I [12 Hrs]

1.1 Organometallic Chemistry: Carbon σ donors: Alkyls and aryls - metalation reactions - Bonding in carbonyls and nitrosyls – Metal carbene and carbyne complexes - Carbon π donors: olefins, acetylene and π-allyl systems - cyclic π donors - synthesis structure and bonding in Metallocenes.

1.2 Organometallic Reaction: Association, substitution, addition and elimination, ligand protonation, electrophilic and nucleophilic attack on ligands. Carbonylation and Decarbonylation, oxidative addition, reductive elimination and fluxionality.

UNIT – II: ORGANOMETALLIC CHEMISTRY – II [12 Hrs]

2.1. Organometallic Chemistry - Catalysis: Hydrogenation of olefins (Wilkinson's catalyst), hydroformylation of olefins using cobalt catalyst (oxo process), oxidation of olefins to aldehydes (Wacker process) .

2.2. Polymerization of Olefins: Polymerization (Zeigler – Natta Catalyst); cyclo oligomerisation of acetylene using nickel catalyst (Repee's Catalyst); polymer- bound catalysts- Olefin metathesis-ROM & RCM.

UNIT – III: INORGANIC SPECTROSCOPY - I [12 Hrs]

3.1 Inorganic Spectroscopy: Applications to inorganic systems of the following: ultraviolet, visible, infra-red and Raman spectra of metal complexes, organometallic and simple inorganic compounds with special reference to coordination sites, isomerism.

3.2 Magnetic Susceptibility and measurements – Guoy method, Faraday method, VSM and their applications.

UNIT – IV: INORGANIC SPECTROSCOPY - II [12 Hrs]

4.1 EPR Spectra: Hyperfine splitting: hyperfine splitting in isotropic systems involving one nucleus and more than one nucleus, hyperfine splitting caused by quadrupole nucleii. g value and the factors affecting g values, anisotropy in g-value, factors causing anisotropy.

4.2 EPR spectra of systems with more than one unpaired electrons: zero-field splitting, causes of ZFS, McConnel's equation, Krammer's theorem. ESR of transition metal complexes of copper, manganese and Vanadyl ions. ESR spectrum of simple organic free radicals.

4.3 Photoelectron spectroscopy (UV and X-ray) – photoelectron spectra of O_2 and N_2 molecules – Koopman's theorem, chemical shift and correlation with electronic charges.

UNIT – V: INORGANIC SPECTROSCOPY - III [12 Hrs]

5.1 Inorganic Spectroscopy: ^{31}P ,^{19}F NMR spectrum of HPF_2, P_4S_3, TiF_4, BrF_5, $SIF_6^{2-,}$ NF_3, ClO_4^-, $P_4N_4Cl_4F_2$, ClF_3 Phosphorous and Hypophosphorous acid systems - shift reagents.

5.2 NQR - Principles and applications of NQR - Mossbauer spectra – Principle, chemicals shift, Doppler shift - Mossbauer spectra of Fe and Sn systems.

Text Books:

1. J.E. Huheey, Inorganic Chemistry, 5th Edn., Harper International.1993.
2. F.A.Cotton, G.Wilkinson, Advanced Inorganic Chemistry, 5th Edn., John Wiley.1985.
3. M.F.Purcell, J.C.Kotz, Inorganic Chemistry,Saunder, 1977.
4. R.S.Drago , Physical methods in Inorganic Chemistry , 2nd Edn, ELBS, 1985.
5. Meisler, Tom, Inorganic chemistry,

Reference Books:

1. P.Powell, Principles of Organometallic Chemistry, 2nd Edn., ELBS,1991.
2. R.S.Drago , Physical methods in Spectroscopic Techniques, 2nd Edn, ELBS, 1985.

II M.Sc (CH)	INORGANIC CHEMISTRY – III For the students admitted in the year 2011	PCH910S
SEMESTER – III		HRS/WK – 4
CORE – 8		CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(May contain sub divisions)
(Problem solving type)

II M.Sc (CH)	STATISTICAL THERMODYNAMICS AND ITS APPLICATIONS	PCH911S
SEMESTER - III		HRS/WK – 4
CORE - 9	For the students admitted in the year 2014	CREDIT-4

Objective:

To study the chemical potential and its significance. To get acquainted with statistical thermodynamics

COURSE OUTCOMES (COs)

CO1: To understand the average behavior of large group of individual particles and to know the probabilities about microstates of the system.
CO2: To develop a vast knowledge in the interpretation of partition function and to relate partition function and thermodynamic function.
CO3: To get acquainted with the concept of statistical mechanics of ensemble.
CO4: To study Partial molar properties and thermodynamics of real gases.
CO5: To give the concept of thermodynamics of ideal and non-ideal binary solutions with problem solving skill.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: PCH911S					TITLE OF THE COURSE: STATISTICAL THERMODYNAMICS AND ITS APPLICATIONS						HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)							MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	2	3	3	4	3	4	3	2	3	3	3	4	3	3.07
CO2	3	4	3	3	3	4	4	3	3	3	3	3	3	3.23
CO3	2	4	3	3	3	3	3	2	3	3	3	3	3	2.92
CO4	4	4	4	3	3	4	4	4	4	3	3	4	3	3.61
CO5	4	4	3	3	2	4	4	3	3	3	3	4	3	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: STATISTICAL THERMODYNAMICS I [12 Hrs]

1.1 Objectives of statistical thermodynamics – concept of thermodynamics and mathematical probabilities – distribution of distinguishable and non-distinguishable particles.

1.2 Maxwell Boltzmann , Fermi – Dirac and Bose Einstein statistics – comparison and applications – modes of contribution to energy – Ortho and Para hydrogen – radiation law – electron in metals.

UNIT – II: STATISTICAL THERMODYNAMICS II [12 Hrs]

2.1 The partition function –Boltzmann distribution –the interpretation of the partition function – examples of partition function.

2.2 Partition function evaluation of translational, vibrational and rotational partition functions for mono, diatomic and polyatomic ideal gases.

2.3 Thermodynamic functions in terms of partition functions, isotope exchange and dissociation of diatomic molecules – application of partition functions to heat capacities of ideal gases – nuclear partition function – Einstein and Debye models.

UNIT – III: STATISTICAL THERMODYNAMICS III [12 Hrs]

Statistical mechanics of ensemble – thermodynamic functions of ensemble- canonical ensemble- properties of canonical ensemble- grand canonical ensemble- micro canonical ensemble.

UNIT – IV: THERMODYNAMICS I [12 Hrs]

4.1 Partial molar properties – Partial molar free energy (Chemical Potential) – Partial molar volume and Partial molar heat content – Their significance and determination of these quantities - Variation of chemical potential with temperature and pressure.

4.2 Thermodynamics of real gases – gas mixture – definition of fugacity – determination of fugacity – variation of fugacity with temperature and pressure.

UNIT – V: THERMODYNAMICS II [12 Hrs]

5.1 Thermodynamics of ideal and non-ideal binary solutions – dilute solutions.

5.2 Excess function for non-ideal solutions and their determination – the concept of activity and activity coefficients – determination of standard free energies – choice of standard states – determination of activity and activity coefficients for electrolytes by EMF vapour pressure measurements.

5.3 Gibbs Duhem equation and solubility product method – Thermodynamic equilibrium – Three component system.

Text Books:

1. M.C. Gupta. Statistical thermodynamics. 2nd edition.
2. Rajaram and J.C. Kuriacose, Thermodynamics For Students Of Chemistry, New Delhi: Lal Nagin Chand, 3rd editon1986.

Reference Book:

1. P.W. Atkins, Molecular Quantum Mechanics, Oxford University Press, Oxford 3rd edition, 1983.

II M.Sc (CH)	STATISTICAL THERMODYNAMICS AND ITS APPLICATIONS	PCH911S
SEMESTER - III		HRS/WK – 4
CORE - 9	For the students admitted in the year 2014	CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 8 = 40)
Answer **Five out of Seven**
(May contain sub divisions)
(Conceptual descriptive and Problem solving type)

II M.Sc (CH)	PHYSICAL METHODS IN ORGANIC CHEMISTRY	EPCH912S
SEMESTER - III		HRS/WK – 4
ELECTIVE - 3	For the students admitted in the year 2014	CREDIT-4

Objective:

To understand the concepts of spectral techniques and to apply these techniques for the quantitative and structural analysis of organic compounds.

COURSE OUTCOMES (COs)

CO1: Students learn concepts and applications of UV-Vis spectroscopy.

CO2: Students get learnt the concept IR spectroscopy and are able to find out the IR stretching frequency of organic functional groups.

CO3: Students get to know the instrumentation, ionization techniques and fragmentation patterns, of chemical compounds using mass spectrometry.

CO4: Students learn and understand the concepts of ^{1}H NMR spectroscopy and its applications.

CO5: Students learn the principles, techniques and applications of ^{13}C NMR spectroscopy for the structural elucidation.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: EPCH912S					TITLE OF THE COURSE: PHYSICAL METHODS IN ORGANIC CHEMISTRY								HOURS: 4	CREDITS: 4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	3	4	3	4	3	4	4	3	3	4	4	4	3.54	
CO2	3	3	4	3	3	4	4	3	4	3	4	4	4	3.54	
CO3	3	3	4	3	3	3	4	4	4	4	4	4	4	3.62	
CO4	3	4	3	3	4	3	4	4	4	3	4	5	4	3.69	
CO5	3	3	3	4	3	3	4	3	3	4	4	4	4	3.46	
Mean Overall Score														3.51	

Result: The Score of this Course is 3.51 (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 SPECTROSCOPY [12 Hrs]

Ultraviolet – Visible spectroscopy – Various electronic transitions – Beer-Lambert law,effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Woodward-Fieser rulesfor conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds. Octant rule, Applications of ORD and CD to stereochemical assignments.

UNIT – II: INFRA RED SPECTROSCOPY [12 Hrs]

Infra-red spectroscopy – Instrumentation and sample handling. Vibrational frequencies of different functional groups. Effect of hydrogen bonding and solvent on vibrational frequencies, overtones,combination bands and Fermi resonance. FT – IR. IR of gases,solids and polymeric materials.

UNIT – III: MASS SPECTROMETRY [12 Hrs]

Introduction, ion production – EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, of common functional groups, molecular ion peak, base peak, isotope peaks, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectrometry. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

UNIT – IV: ^{1}H -NMR SPECTROSCOPY [12 Hrs]

Basic principles. Macroscopic magnetization. General introduction to NMR techniques – CW and FT NMR techniques, magnetic anisotropy,^{1}H NMR spectral parameters – chemical shift, coupling constant, factors affecting chemical shift,coupling constant. Karplus eqution. Proton NMR spectra of simple organic molecules. Simplification of complex spectra. Nuclear Overhauser effect (NOE). Identification of Homotopic, diastereotopic and enentiotopic protons.

UNIT – V: ^{13}C NMR SPECTROSCOPY [12 Hrs]

^{13}C NMR – proton decoupled and off-resonance spectra. Factors affecting ^{13}C chemical shift – electronegativity. ^{13}C NMR spectra of simple organic molecules. DEPT and SEFT spectra. 2D NMR techniques ^{1}H -^{1}H COSY, ^{1}H - ^{13}C COSY spectra.

Text Books:

1. R.M. Silverstein, G.C. Bassler and T.C. Morrill, Spectrometric Identification of Organic compounds, John Wiley.,1997
2. D.H. Williams, I. Fleming, Spectroscopic Methods in Organic Chemistry, Tata McGraw – Hill, 1998.
3. W. Kemp, Spectroscopy, Macmillan Ltd., 1994.

Reference Books:

1. J. R. Dyer, Application of spectroscopy of Organic Compounds, Prentice Hall.
2. JagMohan, Spectroscopy of Organic compounds, Narosa Publications.
3. Pavia, Lampman and Kriz, Introduction to Spectroscopy, 3rd edition, Brooks/Cole Pubs. Co.

II M.Sc (CH)	PHYSICAL METHODS IN ORGANIC CHEMISTRY	EPCH912S
SEMESTER - III		HRS/WK – 4
ELECTIVE - 3	For the students admitted in the year 2014	CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

II M.Sc (CH)	BIOORGANIC CHEMISTRY For the students admitted in the year 2017	EPCH912A
SEMESTER - III		HRS/WK – 4
ELECTIVE - 3		CREDIT-4

Objectives:

This course aims to explain the basic concepts in Chemistry and Metabolism of Carbohydrates, amino acids, Proteins and Lipids. In addition to this, the student can gain the full understanding of various types of Nucleic acids and classification of Vitamins and Enzyme.

COURSE OUTCOMES (COs)

CO1: To study about the classification and biological role of carbohydrates.
CO2: To study about the types of amino acids and its metabolism, proteins types
CO3: To study about various types of lipids and its metabolism.
CO4: To understand about structure and function of DNA, RNA
CO5: To know about the vitamins types and its biological role.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: EPCH912A					TITLE OF THE COURSE: BIOORGANIC CHEMISTRY								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	3	4	4	4	4	4	4	3	3	3	4	3.53	
CO2	4	4	4	3	3	4	3	4	4	3	4	4	5	3.76	
CO3	4	4	3	3	4	4	4	3	3	4	5	4	3	3.69	
CO4	4	3	3	3	4	5	4	3	3	3	4	4	5	3.69	
CO5	4	3	3	3	3	4	4	4	4	4	5	3	4	3.69	
Mean Overall Score														3.67	

Result: The Score of this Course is 3.67 (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 AND METABOLISM CARBOHYDRATES [12 Hrs]

Definition, classification and biological role of carbohydrates. Monosaccharides Linear and ring structures (Haworth formula) of ribose, glucose, fructose and mannose (structural determination not required) physical and chemical properties of glucose and fructose. Disaccharides: Ring structures (Haworth formula) - occurrence, physical and chemical properties of maltose, lactose and sucrose. Polysaccharides: Starch, glycogen and cellulose - structure and properties. Glycolysis of carbohydrates.

UNIT – II: CHEMISTRY AND METABOLISM OF AMINO ACIDS AND PROTEINS [12 Hrs]

Amino acids: Various classifications, essential amino acids, physical properties (amphoteric nature and isoelectric point) and reactions.
Proteins: Classifications (based on shape, composition and solubility), physical properties.
Primary structure - End group analysis (N- terminal analysis- Edman's method, dansyl chloride method; C - terminal analysis- hydrazinolysis and bio - chemical methods)
Biological functions of proteins, Deamination, transamination reactions, Urea cycle.

UNIT – III: CHEMISTRY AND METABOLISM OF LIPIDS [12 Hrs]

Definition, classification- simple lipids (fatty acids), compound lipids and derived lipids. Properties: saponification number, Acetyl number.
Sterols: Cholesterol (structure not needed), biological importance and chemical properties. Bile acids- functions. Biological functions of lipids.

UNIT – IV: NUCLEIC ACIDS [12 Hrs]

Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides, DNA structure - various types, RNAstructure - various types.
Biological functions of DNA and RNA, Genetic code.

UNIT – V: VITAMINS [12 Hrs]

Vitamins: Definition, classification- water-soluble vitamins (B_v B_2, B_3, B_6, B_{12} and vitamin-C) and fat-soluble vitamins (A, D, E and K) - occurrence, structure, deficiency diseases, biochemical rules and daily requirements

Text Books:

1. Biochemistry C.B. Powar and G.R. Chatwal.
2. Elements of Biochemistry Ragunatha Rao

Reference Books:

1. Essential Biochemistry U. Sathyanarayanan
2. Essential Biochemistry J.L. JAIN

II M.Sc (CH)	BIOORGANIC CHEMISTRY For the students admitted in the year 2017	EPCH912A
SEMESTER - III		HRS/WK – 4
ELECTIVE - 3		CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

II M.Sc (CH)	ORGANIC CHEMISTRY PRACTICALS –II For students admitted in the year 2016	PCHP304T
SEMESTER – III		HRS/WK – 4
PRACTICAL-V		CREDIT-2

COURSE OUTCOMES (COs)

CO1: Students learn the Quantitative Organic analysis.

CO2: Students learn the double stage organic compound preparation.

(External Marks: 60 & Internal Marks: 40)

1. a)Preparation of organic compounds involving two stages.
   b) Spectral interpretation of organic molecules.

2. Quantitative Organic analysis
   i) Estimation of Phenol
   ii) Estimation of Aniline
   iii) Estimation of Glucose

Quantum of marks in respect of the Practical Examinations:

1. Preparation and spectral interpretation (10 +10)	20 marks
2. Estimation	25 marks
3. Viva-voce	5 marks
4. Record	10 marks
Total	**60 marks.**

Text Books:

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

Reference Books:

1. R.M. Silverstein, G.C. Bassler and T.C. Morrill, Spectrometric Identification of Organic compounds, John Wiley.,1997
2. D.H. Williams, I. Fleming, Spectroscopic Methods in Organic Chemistry, Tata McGraw – Hill, 1998.

II M.Sc (CH)	INORGANIC CHEMISTRY PRACTICALS –II For the students admitted in the year 2012	PCHP305S
SEMESTER – III		HRS/WK – 4
PRACTICAL-IV		CREDIT-2

COURSE OUTCOMES (COs)

CO1: To improve the skill in quantitativeestimation of metal ions by colorimetry.
CO2: To identify the methodology to estimate a metal ion in the presence of another metal ion.
CO3: To improve the skill in the synthesis of inorganic compounds

1. Preparation of coordination complexes, characterization of the products by UV Spectroscopy

a) Sodium hexanitrocobaltate (III)
b) Chloropentamminecobalt (III) chloride
c) Hexamminecobalt (III) chloride
d) Hexamminenickel (II) chloride
e) Potassium tetrachlorocuprate (II)

2. Spectral interpretation of some inorganic compounds

3. Colorimetric estimation of metal ions (Fe,Cu,Ni)

4. Estimation of metal ions by Gravimetric and Volumetric analysis (Cu, Ni, Zn, Fe)

EVALUATION PATTERN

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)

Duration: 6 Hrs **Total Marks: 60**

1.	Estimation of metal ions by Volumetric & Gravimetric method	- 20 marks
2.	Estimation of metal ions by photo colorimetric method	- 10 marks
3.	Preparation of complex	- 10 marks
4.	Spectral interpretation	- 10 marks
5.	Viva voce	- 5 marks
6.	Record	- 5 marks

II M.Sc (CH)	PHYSICAL CHEMISTRY PRACTICALS – II For the students admitted in the year 2014	PCHP306
SEMESTER – III		HRS/WK – 4
PRACTICAL-VI		CREDIT-2

COURSE OUTCOMES (COs)

CO1: Students learn various experiments in Conductometry, Potentiometry and Pulse polarography.

I. **Pulse Polorography.**

1. Determination of Half wave potential of Cd ion in KCl.
2. Determination of Half wave potential of Zn & Mn.
3. Determination of Pb and Cu in Steel.
4. Determination of Ni, Zn and Fe.
5. Analysis of Cu based Alloys.
6. Stability constants for complexes (Pb Oxalate complexes).

II. **UV- Visible Spectrophotometer**

1. Determination of concentration of Potassium Nitrate.
2. Determination of molar extinction coefficient of Potassium dichromate and Potassium permanganate.
3. Determination of concentration of para acetamol in antipyretic drug.

III. **Nephelometer**

1. Nephelometric determination of Sulphate.
2. Nephelometric determination of Phosphate.

IV. Conductometric Titrations.

1. Determination of strength of weak acid (CH_3COOH Vs NaOH)
2. Determination of strength of strong acid (HCl Vs NaOH).
3. Determination of strength of mixture of acids (HCl+CH_3COOH Vs NaOH)
4. Determination of End point in the Precipitation titration (KCl Vs $AgNo_3$)
5. Verification of Ostwald's dilution law.
6. Verification of Onsager's equation.

V. Potentiometric Titrations.

1. Determination of pH of buffer using Quinhydrone elelctrode.
2. Determination of pKa of weak acid using Std. NaoH solution.
3. Determination of strength of FAS using Redox titration (FAS Vs $KMnO_4$).
4. Determination of Single Electrode potential.
5. Determination of strength of strong acid (HCl Vs NaOH).
6. Determination of strength of weak acid (CH_3COOH Vs NaOH)
7. Determination of End point in the Precipitation titration (KCl + KI Vs $AgNo_3$)

VI. **Computational Chemistry.**

1. Computing atomic charges for H_2O molecule by AIM method.
2. Computing molecular orbital coefficients of 1,3-cyclo butadiene by HF method.
3. Geometry optimization of H_2O by HFSCF method.

SCHEME OF EVALUATION: (TOTAL = 60 MARKS)

Aim & short procedure	– 10
Record	– 10
Experiment & manipulation	- 30
Viva voce	– 10
Total	**- 60**

II M.Sc (CH)	ORGANIC CHEMISTRY - IV For the students admitted in the year 2009	PCH1013S
SEMESTER - IV		HRS/WK – 4
CORE - 10		CREDIT-4

Objectives:

To learn the chemistry of functional groups of organic compounds. To learn the modern synthetic methods and synthetic strategies. This helps in planning the synthesis of any type of organic compound and natural products.

COURSE OUTCOMES (COs)

CO1: Knowledge pertaining Alkaloids and Bioorganic chemistry
CO2: proteins peptides and their structures
CO3: Modern synthetic methods, reactions, and reagents
CO4: Knowledge pertaining to Reterosynthesis
CO5: Advanced programming techniques using pointers, files and graphics concepts.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: PCH1013S					TITLE OF THE COURSE: 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	5	5	4	5	3	4	4	4	4	4	4	4	4	4.1	
CO2	4	4	4	4	5	4	4	4	4	4	4	4	4	4.0	
CO3	5	5	4	4	5	4	5	5	5	4	5	4	4	4.5	
CO4	5	5	4	5	4	5	5	5	5	4	5	4	4	4.6	
CO5	4	4	4	4	4	5	5	5	5	4	5	4	4	4.3	
Mean Overall Score														4.3	

Result: The Score of this Course is 4.3 (Very 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 **Very High** association with Programme Outcome and Programme Specific Outcome.

UNIT – I: ALKALOIDS AND BIO ORGANIC CHEMISTRY [12 Hrs]

Total synthesis of quinine, morphine, reserpine, cocaine, hygrine and reticulene

Nucleic acids: Types of nucleic acids – DNA & RNA polynucleotide chain. Components – Structure and role of (genetic code) DNA and RNA (Nucleotides only) .

UNIT – II: PROTEINS [12 Hrs]

Peptides and their synthesis – synthesis of tripeptide. Merrifield synthesis, End group analysis of peptides, Primary,Secondary and tertiary structure of proteins, Determination of tertiary structure of proteins.

UNIT – III: MODERN SYNTHETIC METHODS, REACTIONS AND REAGENTS [12 Hrs]

Principles and synthetic processes involving phase transfer catalysis, (Nitriles from Alkyl halides, Alcohol from Alkyl halides) Polymer supported reagents(Synthesis of oligo saccharides), (Microwave assisted Organic synthesis – Esterification, deacetification and hydrolysis)Synthesis of simple organic molecules using standard reaction like acetylation,alkylation of enamines and active methylene compounds, Grignard reactions, Phosphorus and sulphur ylides,Protection and deprotection of functional groups(R-OH, R-CHO, RCO-R , R-NH_2 and R-COOH).

UNIT - IV: PLANNING ORGANIC SYNTHESIS AND RETROSYNTHETIC ANALYSIS [12 Hrs]

An introduction to retrosynthesis – Synthon, Synthetic equivalent, Target molecule, Functional group interconversion – Disconnection approach – One group disconnection – Disconnection of simple alcohols, olefins and ketones – Logical and illogical disconnections, Two group disconnection –1,2 – 1,3 – 1,4 – 1,5 and 1,6 – dioxygenated skeletons and dicarbonyls. Retro Diels – Alder reactions. (Synthesis of the following target molecules: cyclohex-3-ene carbaldehyde, 1-phenylpentan-3-one,1-bromo-3-methylbut-2-ene, (E)-3-(4-nitrophenyl) acrylaldehyde, Pentane-2,4- dione,ethyl-2-oxocyclopentane carboxylate, nonane-3,7-dione, 2-amino-3-methyl butanoic acid, 2,3-dimethylbutane-2,3-diol

UNIT - V: HETEROCYCLES, VITAMINS AND STEROIDS [12 Hrs]

Imidazole, Oxazole, Thiazole, Flavones, isoflavones, anthocyanins, pyrimidines (cytocine and L racil only) and purines(adenine, Guanine only). Synthesis of parent and simple alkyl or aryl substituted derivatives are expected. Synthesis of vitamin A1 (Reformatsky and Wittig reaction methods only). Conversion of cholesterol to progesterone, estrone and testosterone.

Text Books:

1. Guidebook to organic synthesis by Ramond K. Mackie and David M. Smith, ELBS Publication.
2. Chemistry of alkaloids by Pelletier.
3. Introduction to alkaloids by G.A Swan
4. Organic chemistry V Edition, 1986, Vol – II by I.L. Finar, ELBS Publication
5. Biochemistry by Lubert Stryer,WH.Freeman and Co., New York

Reference Books:

1. Organic Synthesis by R.E. Ireland, Prentice Hall of India, Geol Publishing House
2. Principles of organic synthesis by R.O.C. Norman,Champan and Hall,NY, 1980

3. Advanced Organic Chemistry by Francis .A.Carey, Richard J.Sandberg, 3rd Edition, Plenum, Press, New York,1990
4. Advanced Organic Chemistry by Jerry March, IV edition, Wiley Eastern Ltd., New Delhi
5. Workbook for organic synthesis , The disconnection approach by Stuart Warren, John Wiley & Sons (Asia) Pvt. Ltd.,

II M.Sc (CH)	ORGANIC CHEMISTRY - IV For the students admitted in the year 2009	PCH1013S
SEMESTER - IV		HRS/WK – 4
CORE - 10		CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five out of Seven**
(May contain sub divisions)
(Problem solving type)

II M.Sc (CH)	INORGANIC CHEMISTRY - IV For the students admitted in the year 2016	PCH1014S
SEMESTER - IV		HRS/WK – 4
CORE - 11		CREDIT-4

Objectives:

To learn about the reaction mechanisms of transition metal complexes. To acquire the knowledge of solid state chemistry.

COURSE OUTCOMES (COs)

CO1: To learn about the reaction mechanisms of transition metal complexes.
CO2: To acquire the knowledge of photochemistry.
CO3: To describe about the electron transfer reactions.
CO4: To gain knowledge on solid state chemistry.
CO5: To describe electronic and magnetic properties of molecules.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: PCH1014S					TITLE OF THE COURSE: 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	4	4	4	3	3	4	4	4	4	3	4	3	3	3.61	
CO2	3	3	3	3	3	3	3	4	3	4	4	3	3	3.23	
CO3	4	4	4	3	3	4	4	4	3	3	3	3	3	3.46	
CO4	3	3	4	3	3	4	3	3	3	3	3	3	3	3.15	
CO5	4	4	4	4	3	4	3	3	4	4	4	4	4	3.78	
Mean Overall Score														3.45	

Result: The Score of this Course is 3.45 (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: REACTION MECHANISM OF TRANSITION METAL COMPLEXES-I [12 Hrs]

1.1 Energy profile of a reaction, inert and labile complexes, substitution reactions of octahedral complexes, acid hydrolysis, base hydrolysis, conjugate base mechanism, anation reactions.

1.2 Synthesis of Platinum & Cobalt complexes by substitution reactions.

UNIT – II: REACTION MECHANISM OF TRANSITION METAL COMPLEXES-II [12 Hrs]

2.1 Substitution reactions in square planar complexes, mechanism of Substitution reactions-trans effect – theories of trans effect. Reactivity of platinum complexes, influences of entering, leaving and other groups and central metal ion.

2.2 Inorganic Photochemistry: photo-substitution, photoredox & isomerisation process, application of metal complexes in solar energy conversion.

UNIT – III: ELECTRON TRANSFER REACTIONS [12 Hrs]

3.1 Electron transfer reactions: Outer and Inner sphere processes, atom transfer reaction. Formation and rearrangement of precursor complexes, the nature of binding ligand, successor complexes, Marcus theory.

3.2 Complementary, Non-complementary and two electron transfer reactions.

UNIT – IV: SOLID STATE CHEMISTRY - I [12 Hrs]

4.1 Solid state reactions : General principles, coprecipitation as a precursor to solid state reactions , kinetics of solid state reactions – types of void – types of crystal structures – NaCl, Rutile, Wurtzite, Zincblende and CaF_2

4.2 Crystal defects and non-stoichiometry: perfect and imperfect crystals, intrinstic and extrinsic defects – point defects, line and plane defects, – schottky defects and Frenkel defects. Thermodynamics of schottky defects and Frenkel defect formation, colour centres, non-stoichiometry defect.

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

5.1 Electronic Properties and Band Theory, band structure of metals, insulators and semiconductors. , intrinstic and extrinsic semiconductors, doping semiconductors, super conductors – theories and applications

5.2 Optical properties- Optical reflectance, photoconduction- photoelectric effects Magnetic properties- Classification of materials: para, dia, ferro , ferri , antiferro magnetism - magnetic domains , hysteresis.

Text Books:

1. J.E. Huheey, Inorganic Chemistry, 5th Edn., Harper International.1993.
2. M.F.Purcell, J.C.Kotz, Inorganic Chemistry,Saunder, 1977.
3. W.R.West, Solid State Chemistry and its Applications, John Wiley and Sons, New York, 1984.

Reference Books:

1. G.J.Ferraudi, Inorganic Photochemistry, 1973.
2. A.W.Adamson, E.D.Fleishcer, Concepts in Inorganic Photochemistry, 1963.
3. L. E. Smart, E. A. Moore, Solid State Chemistry – An introduction 3rd ed, Taylor and Francis group 2005.
4. F.A.Cotton, G.Wilkinson, Advanced Inorganic Chemistry, 5th Edn., John Wiley.1985.
5. H.V.Keer, Principles of Solid State, Wiley Eastern Limited, 1993.

II M.Sc (CH)	INORGANIC CHEMISTRY - IV For the students admitted in the year 2016	PCH1014S
SEMESTER - IV		HRS/WK – 4
CORE - 11		CREDIT-4

Question paper pattern

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment / Seminar	10 marks
Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 7 = 35)
Answer **Five** out of **Seven**
(May contain sub divisions)
(Problem solving type)

II M.Sc (CH)	REACTION KINETICS, ELECTRODE KINETICS AND PHOTO CHEMISTRY	PCH1015T
SEMESTER - IV		HRS/WK – 4
CORE - 12	For the students admitted in the year 2014	CREDIT-4

Objective:

To study the chemical potential and its significance. To study the effect of temperature on reaction rate. To study the different types Enzyme catalysis and Kinetics of complex reactions.

COURSE OUTCOMES (COs)

CO1: To study the chemical potential and its significance.
CO2: To study the effect of temperature on the reaction rate.
CO3: To study the different types of Enzyme catalysis and Kinetics of complex reactions.
CO4: To understand about the kinetics of unimolecular and bimolecular photo physical processes.
CO5: To study about types of photochemical reactions and radiation chemistry.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: PCH1015T					TITLE OF THE COURSE: REACTION KINETICS, ELECTRODE KINETICS, AND PHOTOCHEMISTRY								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	4	3	3	5	4	3	4	3	3	3	4	3.61	
CO2	3	3	4	4	4	4	5	4	4	3	4	5	4	3.46	
CO3	3	4	4	4	4	5	5	4	4	3	3	4	5	4.00	
CO4	4	4	3	4	4	4	4	3	3	5	3	4	3	3.69	
CO5	3	4	4	4	4	3	3	3	4	4	4	4	4	3.69	
Mean Overall Score														3.69	

Result: The Score of this Course is 3.69 (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: CHEMICAL KINETICS - I [12 Hrs]

1.1 Effect of temperature on reaction rates – collision theory of reaction rate – molecular beams – collision cross sections – effectiveness of collisions – probability factor.

1.2 Potential energy surfaces – partition function and activated complex – erying equation – estimation of free energy, enthalpy and entropy of activation and their significance.

1.3 Reactions in solutions – effect of pressure, dielectric constant and ionic strength on reactions in solutions – kinetic isotope effects.

1.4 Acid base catalysis – mechanism of acid base catalysed reactions – Bronsted catalysis law.

UNIT – II: CHEMICAL KINETICS – II [12 Hrs]

2.1 Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reactions, chain reactions – general treatment of chain reactions – chain length – rice Herzfeld mechanism – explosion limits.

2.2 Catalysis by enzymes – rate of enzyme reactions – effect of substrate concentration, pH and temperature on enzyme catalysed reactions – Inhibition of enzyme catalysed reactions.

2.3 Study of surfaces – Langmuir and BET adsorption isotherms – study of kinetics of surface reactions – catalytic by metals, semiconductor oxides – mechanism of heterogeneous catalytic reactions – the absorption coefficient and its significance.

2.4 Study of fast reactions – relaxation methods – temperature and pressure jump methods – stopped flow and flash photolysis methods.

UNIT – III: ELECTRODE KINETICS [12 Hrs]

3.1 Mean ionic activity and mean ionic activity coefficient – concept of ionic strength, Debye- Huckel theory of strong electrolytes – activity coefficient of strong electrolytes – determination of activity coefficient by electrical method – Debye – Huckel limiting law qualitative and quantitative verification – limitation of Debye Huckel limiting law at appreciable concentrations of electrolytes – Huckel equation – Debye – Huckel – Bronsted equation.

3.2 Electrode – electrolyte interface – adsorption at electrified interface – electrified double layer – electro capillary phenomenon – Lipmann equation – structure of double layers – Helmholtz – Perrin, Guoy – Chapman and Stern model of electrical double layers.

3.3 Irreversible thermodynamics – forces and fluxes – linear force – flux relation – phenomenological equations – Onsagers theorem diffusion – electro kinetic phenomena – membrane potential.

UNIT – IV: PHOTOCHEMISTRY – I [12 Hrs]

4.1 Absorption and emission of radiation – Franck – Condon Principle – decay of electronically excited states – Jablonski diagram – radiative and non radiative processes – fluorescence and phosphorescence – spin forbidden radiative transition – internal conversion and intersystem crossing – energy transfer process.

4.2 Kinetics of unimolecular and bimolecular photo physical processes – excimers and exciplexes – static and dynamic quenching – Stern Volmer analysis.

UNIT – V: PHOTOCHEMISTRY II [12 Hrs]

5.1 Experimental methods – quantum yield and life time measurements – steady state principle – quantum yield and chemical actinometry.

5.2 Kinetics of photochemical reactions: hydrogen and halogen reactions, photoredox, photo substitution, photoisomerisation and photosensitized reactions – photovoltaic and photo galvanic cells, photo assisted electrolysis of water, aspects of solar energy conversion.

5.3 Radiation chemistry – Interaction of high energy radiation with matter – primary and secondary processes – G value – radiolysis of water – hydrated electron.

Text Books:

1. J.Rajaram and J.C.Kuriacose, kinetics and mechanism of chemical transformation. India: Macmillan India Ltd. 1993.
2. K.K. Rohatgi Mukherjee, Fundamentals of Photochemistry, Wiley Eastern Ltd, 1978.

Reference Book:

1. K.J. Laidler, Chemical Kinetics. New York: Harpet and Row, 2nd Indian edition.., 1987.

Question paper pattern for Post graduate

THEORY EXAMINATION

Continuous internal assessment (CIA) (25 marks)

1.	Two internal Examinations	15 marks
2.	Assignment / Seminar	10 marks
	Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

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

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

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

SECTION – C (5 x 8 = 40)
Answer **Five out of Seven**
(May contain sub divisions)
(Conceptual descriptive and Problem solving type)

Question paper pattern for Post graduate

THEORY EXAMINATION

Continuous internal assessment (CIA) (25 marks)

3.	Two internal Examinations	15 marks
4.	Assignment / Seminar	10 marks
	Total	**25 marks**

External Examination (75 marks)

Question Pattern

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

SECTION – A (20 x 1 = 20)

Answer **ALL** the Questions

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

SECTION – B (10 x 2 = 20)

Answer any **Ten** out of **Twelve**

SECTION – C (5x 7 = 35)

Answer **Five out of Seven**

(Each question should contain a maximum of two subdivisions)

NOTE:

1. Equal weightage will be given for all units.

2. For Physical Chemistry Papers = 20 % of the questions are problems.