COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*36*
SEMESTER	**:**	*1*	**CREDITS**	**:**	*2*
SUBJECT TITLE	**:**	**Theoretical and Inorganic Chemistry-I**	**SUBJECT CODE**	**:**	**15U1CRCHE01**
COURSE TEACHERS	**:**	*Dr. Midhun Dominic C.D (MDCD), Dr. Ignatious Abraham(IGA)*			
Instructional Hours	**:**	*Two Hours per week*			

Sessions	Topic/Module	Method of teaching *
1	**Module 1-(Chemistry as a discipline of science): 3 h** What is Science? - Scientific statements - Scientific methods – Observation - Posing a question - .	Conventional Teaching
2	Formulation of hypothesis – Experiment – Theory – Law - Revision of scientific theories and laws. Evolution of chemistry - Alchemy - Branches of chemistry	Conventional Teaching
3	Components of a research project - Introduction, review of literature, scope, materials and methods, results and discussion, conclusions and bibliography.	Conventional Teaching
4	**Module II Basic Concepts in Chemistry (3h)** Atomic mass and Molecular mass. Isotopes, isobars and isotones – Mole concept – Molar volume – Oxidation and reduction – Oxidation number and valency - Variable valency - Equivalent mass.	Conventional Teaching
5	Methods of expressing concentration: Weight percentage, molality, molarity, normality, formality, mole fraction, ppm and millimoles.	Conventional Teaching
6	Numerical Problems related to basic concepts.	Conventional Teaching
7	**Module 3: Analytical Chemistry I (9 hrs)** **Quantitative Analysis**. Primary standard-secondary standard, quantitative dilution –	Conventional Teaching
8-9	problems.	Conventional Teaching

10-11	Calibration of volumetric apparatus. Acid base titrations- titration curves – pH indicators.	Conventional Teaching
12	Redox titrations – Titration curve - Titrations involving $KMnO_4$ and $K_2Cr_2O_7$- Redox indicators.	Conventional Teaching ASSIGNMENT I
13	Complexometric titrations – EDTA titrations - titration curves – metal ion indicators and characteristics.	Conventional Teaching
14	**Errors in Chemical Analysis.** Accuracy, precision, Types of error- absolute and relative error, methods of eliminating or minimizing errors.	Conventional Teaching ICT
15	Methods of expressing precision: mean, median, deviation, average deviation and coefficient of variation. Significant figures and its application.	Conventional Teaching
16	**Module IV:Atomic Structure(9h)** Introduction to atomic structure based on historical development – Rutherford's atom model and its limitations –	Conventional Teaching
17	Failure of classical physics – Black body radiation –	Conventional Teaching
18	Compton Effect - Planck's quantum hypothesis -	Conventional Teaching
19	Photoelectric effect	Conventional Teaching
20	Generalization of quantum theory - Atomic spectra of hydrogen and hydrogen like atoms – Ritz-combination principle–	Conventional Teaching
21	Bohr theory of atom – Calculation of Bohr radius, velocity and energy of an electron -	Conventional Teaching
22	Explanation of atomic spectra – Rydberg equation – Limitations of Bohr theory - Sommerfield modification -	Conventional Teaching
23	Louis de Broglie's matter waves – Wave-particle duality	Conventional Teaching ICT

24	Electron diffraction - Heisenberg's uncertainty principle	Conventional Teaching
25	**Module (V)** **Quantum Mechanical Model of Atom (12 hrs)** Operator algebra – Linear and Hermitian operators –	Conventional Teaching
26	Laplacian and Hamiltonian operators	Conventional Teaching ASSIGNMENT II
27	Eigen functions and Eigen values of an operator	Conventional Teaching
28	Postulates of quantum mechanics - Well behaved functions	Conventional Teaching
29	Time independent Schrödinger wave equation - Application to particle in a one dimensional box –	Conventional Teaching
30	–-.Normalization of wave function - Particle in a three-dimensional box- Degeneracy.	Conventional Teaching ICT
31	Application of Schrödinger wave equation to hydrogen atom –	
32	Conversion of Cartesian coordinates to polar coordinates - The wave equation in spherical polar coordinates (derivation not required) -	Conventional Teaching
33	Radial and Angular functions (derivation not required) – Orbitals and concept of Quantum numbers (n, l, m).Radial functions - Radial distribution functions and their plots – Shapes of orbitals (s, p and d).	Conventional Teaching
34	Schrödinger equation for multi-electron atoms: Need for approximation methods.	Conventional Teaching
35	Electron spin – Spin quantum number - Pauli's Exclusion principle -	Conventional Teaching
36	Hund's rule of maximummultiplicity - Aufbau principle – Electronic configuration of atoms	Conventional Teaching

References

1. Jeffrey A. Lee, *The Scientific Endeavor: A Primer on Scientific Principles and Practice,* PearsonEducation, 1999.

2. C.N.R. Rao, *Understanding Chemistry*, Universities Press India Ltd., Hyderabad, 1999.

3. Robert H. Hill and David Finster, *Laboratory Safety for Chemistry Students*, 1st Edition, Wiley, Hoboken, NJ, 2010.

4. M.C. Day and J. Selbin, *Theoretical Inorganic Chemistry*, East West Press, New Delhi, 2002.

5. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.

6. Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, New Delhi, 2012.

7. J. Mendham, R.C. Denney, J. D. Barnes and M. Thomas, *Vogel's Text Book of Quantitative Chemical Analysis*, 6th Edition, Pearson Education, Noida, 2013.

8. A.K. Chandra, *Introductory Quantum Chemistry*, 4th Edition, Tata McGraw Hill Publishing Company, Noida, 1994.
9. R.K. Prasad, *Quantum Chemistry*, 4th Edition, New Age International(P) Ltd., New Delhi, 2012.

10. B.K, Sen, *Quantum Chemistry – Including Spectroscopy*, 3rd Edition, Kalyani publishers, NewDelhi, 2010.

References

1. T.F Gieryn, *Cultural Boundaries of Science*, University of Chicago Press, Chicago, 1999.

2. H. Collins and T. Pinch, *The Golem: What Everyone Should Know about Science,* Cambridge University Press, Cambridge, 1993.

3. C.R. Kothari, *Research Methodology: Methods and Techniques*, 2nd Revised Edition, New Age International Publishers, New Delhi, 2004.

4. *Guidance in a Nutshell - Compilation of Safety Data Sheets*, European Chemicals Agency, Finland, Version 1.0, December 2013.

5. J. D. Lee, Concise Inorganic Chemistry, 5thedn., Blackwell Science, London (Chapter 1)

1. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rdedn., Oxford University Press(Chapter 1)

2. B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models in Inorganic Chemistry (Chapter 1)

3. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, *Fundamentals of Analytical Chemistry*, 8th Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004

4. D.A. McQuarrie, *Quantum Chemistry*, 2nd Edition, University Science Books, California, 2008.

5. M.C. Day and J. Selbin, *Theoretical Inorganic Chemistry*, East West Press,New Delhi, 2002.

11. P.W. Atkins and R.S. Friedman, *Molecular Quantum Mechanics*, 3rd Edition,Oxford University Press, New York, 1997.

12 I.N. Levine, *Quantum Chemistry*, 6th Edition, Pearson Education Inc., New Delhi, 2009.

13. Jack Simons, *An Introduction to Theoretical Chemistry*, 2nd Edition, Cambridge University Press,Cambridge, 2005.

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*36*
SEMESTER	**:**	*2*	**CREDITS**	**:**	*2*
SUBJECT TITLE	**:**	*Theoretical and Inorganic Chemistry-II*	**SUBJECT CODE**	**:**	*15U2CRCHE02*
COURSE TEACHERS	**:**	*Dr. Ignatious Abraham(IGA), Midhun Dominic C D(MD)*			
COURSE OUTCOMES (COs)	**:**	**CO1** - *Ability to understand the basics of periodicity in the properties of the elements, chemical bonding, nuclear chemistry and different analytical techniques* **CO2** - *Ability to apply valence bond and molecular orbital theories to explain the bonding characteristics of different chemical systems.* **C03** - *Ability to interpret the properties such as dipole moment, bond length, magnetic behaviour and bond energy of molecular systems in the light of VB or MO theory.* **CO4** - *Ability to explore and reflect about the wide range of possibilities and applications of nuclear reactions and radio activity.* **CO5** - *Ability to apply gravimetric analysis and different separation/purification techniques effectively in laboratory scale.*			
Instructional Hours	**:**	*Monday : Period 1 (9:30 to 10:30 am)* *Tuesday: Period 5 (2:30 to 3:30 pm)*			

IGA	**No. of**	**Session Topic and Discussion Theme**	**Value additions**	**COs**

	Session			
UNIT 2 : Chemical Bonding -1 (9 hours)	1	Introduction – Type of bonds – Octet rule and its limitations.		**CO1**
	2	*Ionic Bond:* Factors favoring the formation of ionic bonds - Lattice energy of ionic compounds - Born-Lande equation (derivation not expected) Solvation enthalpy and solubility of ionic compounds		**CO1**
	3	Born-Haber cycle and its applications –Properties of ionic compounds - Polarisation of ions – Fajan'srules and its applications.	Assignment No: 1	**CO1**
	4	*Covalent Bond:* Lewis theory. Valence Bond Theory. Co ordinate bond		**CO1**
	5	Hybridization: Definition and characteristics VSEPR theory: Postulates		**CO1**
	6	Applications – Shapes of molecules- sp ($BeCl_2$, C_2H_2), sp^2 (BF_3, C_2H_4), sp^3 (CH_4, CCl_4, NH_3,H_2O, NH_4^+, H_3O^+ and SO_4^{2-})		**CO1, CO2**
	7	sp^3d (PCl_5), sp^3d^2 (SF_6) and sp^3d^3 (IF_7) and SF_4, ClF_3, XeF_2, IF_5, XeF_4, IF_7 and XeF_6	MOODLE- Assignment No:2	**CO1, CO2**
	8	Limitations of VBT. Properties of covalent compounds. Polarity of covalent bond – Percentage of ionic character –Dipole moment and molecular structure.		**CO1, CO2, C03**
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013. ❖ Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, NewDelhi, 2012. ❖ Manas Chanda, *Atomic Structure and Chemical Bonding*, 4th Edition, Tata McGraw Hill			
periodic properties	10	Modern periodic law – Long form periodic table. Periodicity in properties: Atomic and ionic radii	Assignment No.3	**CO1**
	11	Ionization enthalpy - Electron affinity (electron gain enthalpy) – Electronegativity. Electronegativity scales: Pauling and Mullikan scales		**CO1**

(4 hours)	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
	12	Effective nuclear charge – Slater rule and its applications		**CO1**
	13	Revision-Periodicity in properties and its consequences	Group Discussion	**CO1, C03**
		SECOND INTERNAL EXAMINATION		
Text Books	❖ B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013. ❖ Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, NewDelhi, 2012. ❖ Manas Chanda, *Atomic Structure and Chemical Bonding*, 4th Edition, Tata McGraw Hill			
UNIT 5 :* Analytical Chemistry II *(5 hours)	14	Gravimetric analysis: Systematic steps in gravimetric analysis. Illustrations using iron and barium estimation.		**CO1**
	15	Separation and purification techniques – Filtration, Crystallization and precipitation – Fractional distillation, Solvent extraction.		**CO1, CO5**
	16	Concept of solubility product as applied in group separation of cations – problems.	Demonstration	**CO1, CO5**
	17	Chromatography - Classification of methods elementary study of adsorption, paper, thin layer, column, ion exchange chromatography	PowerPoint presentation	**CO1, CO5**
	18	Gas chromatographic methods. HPLC	PowerPoint presentation	**CO1, CO5**
Text Books	❖ Vogel's Textbook of Quantitative Chemical Analysis 6th edn, Pearsons Education Ltd ❖ R. D. Day, A. L. Underwood, Quantitative analysis,6th Edn.,Prentice Hallof India Pvt. Ltd ❖ Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, NewDelhi, 2012.			

MD				
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Nuclear Chemistry	1	Introduction to nuclear chemistry Structure of nucleus ➢ Nuclear particles, nuclear forces, nuclear size, nuclear density		**CO1**
	2	Stability of nucleus ➢ binding energy ➢ magic numbers ➢ packing fraction ➢ n/p ratio. Nuclear Models	Individual Assignment: Nuclear models – liquid drop model and shell model.	**CO1, CO4**
	3	Natural Radioactivity ➢ modes of decay, decay constant ➢ half-life period, average life	Problems: Based on radioactive decay	**CO1**
	4	Radioactive Equilibrium Geiger-Nuttal rule, units of radioactivity, radiation dosage		**CO1**
	5	Nuclear Reactions ➢ induced by charged projectiles, neutrons and γ rays		**CO1, CO4**
	7	fission reactions fusion reactions		**CO1, CO4**
	1st Internal Examination			
	8	Preparation of transuranic elements		**CO1**
	9	Chain Reactions, Stellar energy	Power Point Presentation	**CO1**

Text Books	❖ H. J. Arnikar, Essentials of Nuclear Chemistry,New Age ❖ R. Gopalan, Elements of Nuclear Chemistry, Vikas Publ. House. ❖ B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition,Milestone Publishers and Distributors, New Delhi, 2013. ❖ Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, NewDelhi, 2012. ❖ ManasChanda, *Atomic Structure and Chemical Bonding*, 4th Edition, Tata McGraw HillPublishing Company, Noida, 2007.			
Unit III	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Chemical Bonding – II	10	MO Theory ➢ Linear combination of atomic orbitals ➢ Formation of molecular orbitals ➢ Bonding and antibonding molecular orbitals ➢ Stability of molecules based on bond order ➢ Relation between bond order and bond length		**CO1, CO2, C03**
	11	MO diagram of homo nuclear system ➢ H_2, He_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2 ➢ Magnetic behaviour of these homo nuclear systems	Power Point Presentation	**CO1, CO2, C03**
	12	MO diagram of heteronuclear system ➢ CO and NO ➢ Magnetic behaviour pf these homo nuclear systems ➢ Comparison of bond length, magnetic behaviour and bond energy of O_2, O_2^+, O_2^{2+}, O_2^- and O_2^{2-}	Power Point Presentation	**CO1, CO2, C03**
	13	Resonance structures of ➢ borate, carbonate and nitrate ions ➢ Comparison of bond energy.		**CO1**
	14	Comparison of VB and MO theories.	Group Discussion	**CO1**

	2nd Internal Examination			
	15	Metallic Bond ➢ Free electron theory ➢ valence bond theory		**CO1**
	16	Band theory Explanation of metallic properties based on these theories.		**CO1**
	17	Intermolecular Forces ➢ Induction forces and dispersion forces	Individual Assignment: Various intermolecular forces	**CO1**
	18	Hydrogen bond Intra and inter molecular hydrogen bonds , Effect on physical properties.		**CO1**
Text Books	❖ B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013. ❖ Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, NewDelhi, 2012. ❖ Manas Chanda, *Atomic Structure and Chemical Bonding*, 4th Edition, Tata McGraw Hill			

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA		
COURSE PLAN : ACADEMIC YEAR 2017 - 2018		
PROGRAMME : *B.Sc. Chemistry*		**SEMESTER** : *3*
LECTURE HOURS : *54*		**CREDITS** : *3*
SUBJECT TITLE : *Organic Chemistry - I*		**SUBJECT CODE** : *15U3CRCHE03*
COURSE TEACHERS	:	Dr. Joseph John (JJ), Dr. V. S. Sebastian (VSS) & Dr. Franklin J (FJ)
COURSE OUTCOMES (COs)	:	**CO1** - *Understand the classification and nomenclature of organic compounds.* **CO2** - *Describe aromaticity and stereochemistry of organic compounds.* **CO3** - *Understand the fundamentals of organic reaction mechanisms.* **CO4** - *Describe various emerging areas of organic chemistry and its applications.*
Instructional Hours	:	*Tuesday : Period 1 (9:30 to 10:30 am) - JJ* *Wednesday : Period 1 (9:30 to 10:30 am) - FJ* *Thursday : Period 5 (2:30 to 3:30 pm) - VSS*

FRANKLIN J			
Unit I : CLASSIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**COs**
1	Introduction to classification of organic compounds.		**CO1**
2	Rules of IUPAC system of nomenclature		**CO1**
3	Alkanes, alkenes, alkynes, cycloalkanes, bicycloalkanes, alkyl halides, alcohols and phenols.	Individual Assignment: *Nomenclature of Compounds*	**CO1**
4	Aldehydes, ketones, carboxylic acids and its derivatives, amines, nitro compounds. (*Both aliphatic and aromatic*)		**CO1**
Unit IV: AROMATICITY			
5	Concept of resonance: • Resonance energy in benzene. • Heat of hydrogenation and heat of combustion of Benzene • C-C bond lengths and orbital picture of Benzene	Power Point Presentation Structure and resonance of Benzene	**CO2**
6	Structure of naphthalene and anthracene (*Molecular Orbital picture and resonance*)		**CO2**
7	Concept of aromaticity – aromaticity (definition), *Huckel's rule*: Aapplication to Benzenoids : Benzene, Naphthalene, Anthracene, Phenanthrene.		**CO2**
8	Non–Benzenoid compounds – cyclopropenyl cation, cyclopentadienyl anion and tropylium cation.		**CO2**
9	General mechanism of electrophilic substitution-mechanism of halogenation, nitration,		**CO2**

1st Internal Examination			
10	Mechanism of Friedal Craft's alkylation and acylation, sulphonation.		**CO2**
11	Orientation of aromatic substitution – *ortho*, *para* and *meta* directing groups.		**CO2**
12	Ring activating and deactivating groups.	Power Point Presentation	**CO2**
13	Electronic interpretation of various groups like - NO_2 and –OH		**CO2**
14	Orientation (i). Amino, methoxy and methyl groups (ii). Carboxy, nitro, nitrile, carbonyl and sulfonic acid groups. (iii). Halogens.	Power Point Presentation: *Illustration of orientation effects*	**CO2**
15	Reactivity of naphthalene towards electrophilic substitution. Nitration and sulphonation		**CO2**
2nd Internal Examination			
16	Aromatic Nucleophilic substitutions - bimolecular displacement mechanism		**CO2**
17	Elimination –Addition mechanism : *Benzyne intermediate*	Power Point Presentation: *Benzyne intermediates*	**CO2**
18	Reactivity and orientation in Aromatic Nucleophilic substitutions.		**CO2**

References:

1. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India.
2. L. Finar, 'Organic Chemistry '- Vol.- 6th Edition I, Pearson Education (chapters-20,21)
3. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3rd Edn, Vishal Publishing Co.
4. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House,
5. Peter Sykes, A Guide book to Mechanism in Organic Chemistry :, 6thEdition, Pearson Education.

JOSEPH JOHN

Unit II : ORGANIC REACTION MECHANISMS

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	Introduction to Organic Reaction Mechanisms		**CO3**
2	Drawing electron movements with arrows: • Curved arrow notation. • Half headed and double headed arrows.	Individual Assignment: *Reactions with different kinds of arrow notations*	**CO3**
3	*Types of reagents*: Electrophiles and Nucleophiles *Types and sub-types organic reactions*: Substitution, Addition reactions, Elimination and Rearrangement.	Classification of 20 named reactions	**CO3**
4	Reactive intermediates with examples – carbocations, carbanions	Power Point Presentation: *Structure of intermediates*	**CO3**
5	Reactive intermediates with examples - carbenes, nitrenes and free radicals.		**CO3**
6	Electron displacement effects - Inductive, electrometric, mesomeric, resonance		**CO3**
7	Hyperconjugation and steric effects- steric inhibition of resonance.		**CO3**
8	• Aliphatic nucleophilic substitutions,		**CO3**

	• mechanism of S_N1 and S_N2 reactions.		
9	• Effects of structure, substrate, solvent, nucleophile and leaving groups • Stereochemistry- Walden inversion		**CO3**
1st Internal Examination			
10	*Elimination Reactions*:-Hoffmann and Saytzeff rules		**CO3**
11	*Cis*- and *trans*- eliminations		
12	• Mechanisms of E1 and E2 reactions • Elimination *versus* substitution.	Power Point Presentation	**CO3**
13	Addition reactions: • Mechanisms of addition of Bromine • Inductomeric effect		**CO3**
14	Mechanisms of addition of hydrogen halides to double bonds.		**CO3**
15	Markonikoff's rule and peroxide effect.		**CO3**
2nd Internal Examination			
16	Polymerisation reactions: Types of polymerization - free radical, cationic and anionic – polymerisations –including mechanism.		**CO4**
17	Pericylic Reactions: Classification- electrocyclic, sigmatropic, cycloaddition reactions-Examples	Power Point Presentation: *Illustration of different reactions*	**CO4**
18	Diels- Alder reaction- Stereochemical aspects- Effect of substituents.		**CO4**

References:

1. Peter Sykes, A Guide book to Mechanism in Organic Chemistry: 6th Edition, Pearson Education.
2. P. S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.
3. K.S. Tewari and N.K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House.
4. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co.
5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India,
6. I. L. Finar, Organic Chemistry, 6th Edition. Vol.- I, Pearson

V S SEBASTIAN

Unit III : STEREOCHEMISTRY OF ORGANIC COMPOUNDS

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	Stereoisomerism - definition - classification - optical and geometrical isomerism		**CO2**
2	Projection formulae - Fischer, flying wedge, Sawhorse and Newman projection formulae - notation of optical isomers -D-L notation-	Power point presentation	**CO2**
3	Cahn-Ingold-Prelog rules - R-S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations.		**CO2**
4	Optical isomerism - optical activity - optical and specific rotations - conditions for optical activity	Power Point Presentation: *Structure of intermediates*	**CO2**
5	Asymmetric centre: Chirality - achiral molecules - meaning of (+) and (-)		**CO2**
6	Elements of symmetry -. Prochirality		**CO2**

7	Racemization - methods of racemization (by substitution and tautomerism)		**CO2**
8	Resolution - methods of resolution -mechanical, seeding, biochemical and conversion to diastereoisomers		**CO2**
9	Asymmetric synthesis (partial and absolute synthesis).		**CO2**
1st Internal Examination			
10	Optical activity in compounds does not containing asymmetric carbon atoms-Biphenyls and allenes.		**CO2**
11	Geometrical isomerism - *cis*-trans *syn*-anti and E-Z notations - geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes		**CO2**
12	Methods of distinguishing geometrical isomers using melting point, dipole moment, dehydration and cyclisation.	Power Point Presentation	**CO2**
13	Conformational analysis - introduction of terms - conformers, configuration, dihedral angle, torsional strain	Power Point Presentation	**CO2**
14	Conformational analysis of ethane and *n*-butane using energy profile diagrams	Power Point Presentation	**CO2**
15	Conformers of cyclohexane (chair, boat and skew boat forms) - axial and equatorial- bonds-ring flipping showing axial equatorial interconversion,	Power Point Presentation	**CO2**
2nd Internal Examination			
16	Conformation of methyl cyclohexane.		
Unit V : SUPRAMOLECULAR CHEMISTRY			
17	Introduction to Supramolecular chemistry	Power Point Presentation:	**CO4**
18	Structure of supramolecular compunds		**CO4**

References:

1. P. Sykes, A Guide book to Mechanism in Organic Chemistry, 6th Edition, Orient Longman.
2. P.S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.
3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Co.
4. P. Y. Bruice, 'Organic Chemistry' - 3rd Edn. Pearson Education.

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA		
COURSE PLAN : ACADEMIC YEAR 2017 - 2018		
PROGRAMME : *B.Sc. Chemistry*		**SEMESTER** : *4*
LECTURE HOURS : *54*		**CREDITS** : *3*
SUBJECT TITLE : *Organic Chemistry - I*		**SUBJECT CODE** : *15U4CRCHE04*
COURSE TEACHERS	:	Dr. Joseph John (JJ), Dr. V. S. Sebastian (VSS) & Dr. Franklin J (FJ)
COURSE OUTCOMES (COs)	:	**CO1** - *Understand the chemistry of some selected functional groups with a view to develop proper aptitude towards the study of organic compounds and their reactions.* **CO2** - *Describe the chemistry of alcohols, phenols, carboxylic acids, derivatives of Carboxylic acids, Sulphonic acids, carbonyl compounds, poly nuclear hydrocarbons, active methylene compounds and Grignard reagents* **CO3** - *Understand and explain organic reaction mechanisms.*
Instructional Hours	:	*Tuesday : Period 1 (9:30 to 10:30 am) - JJ* *Wednesday : Period 1 (9:30 to 10:30 am) - VSS* *Thursday : Period 5 (2:30 to 3:30 pm) - FJ*

FRANKLIN J			
Unit I : HYDROXY COMPOUNDS			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**COs**
1	Introduction to Alcohols.		**CO1**
2	Monohydric alcohols: Classification Physical properties–hydrogen bonding		**CO1**
3	Distinction between primary, secondary and tertiary alcohols. Ascent and decent in alcohol series	Individual Assignment: *Nomenclature of Alcohols*	**CO1**
4	Dihydric alcohols		**CO1**
5	Oxidative cleavage – Lead tetra acetate, Periodic acid Pinacol - Pinacolone rearrangement: mechanism	Power Point Presentation	**CO3**
6	Phenols – Acidity of phenols- effects of substituents – comparison of acidity with alcohols		**CO2**
7	Preparation and uses of nitrophenols, picric acid, catechol, resorcinol and quinol		**CO2**
8	Mechanisms of Reimer –Tiemann reaction, Lederer- Mannase reaction, Fries rearrangement		**CO3**
Unit VI : GRIGNARD AND RELATED COMPOUNDS			
9	Grignard reagents-formation, structure and synthetic applications		**CO2**
1st Internal Examination			
10	Alkyl lithium, Reformatsky reaction		**CO2**

Unit VII : COMPOUNDS CONTAINING ACTIVE METHYLENE GROUPS			
11	Synthetic uses of malonic ester.	*Assignment* : Synthetic Applications of active methylene compounds	**CO2**
12	Synthetic uses of acetoacetic ester.		**CO2**
13	Synthetic uses of cyanoacetic ester.		**CO2**
14	Keto-enol tautomerism of ethyl acetoacetate.		**CO2**
15	Alkylation of carbonyl compounds *via* enamines		**CO2**
2nd Internal Examination			
Unit VIII : POLY NUCLEAR HYDROCARBONS AND THEIR DERIVATIVES			
16	Classification – reactions and structure of naphthalene	Power Point Presentation	**CO2**
17	Reactions and structure of anthracene and phenanthrene		**CO2**
18	Elementary idea of naphthyl amines, naphthols, naphthaquinone and anthraquinone.		**CO2**

References:

1. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India.
2. L. Finar, 'Organic Chemistry '- Vol.- 6th Edition I, Pearson Education (chapters-20,21)
3. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3rd Edn, Vishal Publishing Co.
4. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House,
5. Peter Sykes, A Guide book to Mechanism in Organic Chemistry :, 6thEdition, Pearson Education.

V S SEBASTIAN

Unit II : ETHERS AND EPOXIDES

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	Synthesis and Reactions of Epoxides		**CO2**
2	Cleavage of ether linkages by HI- Ziesels method of estimation of alkoxy groups	Power point presentation	**CO2**
3	Claisen rearrangement –mechanism.		**CO2**
Unit III : ALDEHYDES AND KETONES			
4	Structure and reactivity of the carbonyl group - acidity of alpha hydrogen. Comparative studies of -aldehydes and ketones -	Power Point Presentation:	**CO2**
5	aliphatic and aromatic aldehydes - formaldehyde and acetaldehyde-		**CO2**
6	Mechanism of nucleophilic additions to carbonyl groups : Claisen and Claisen-Schmidt condensations.		**CO2**
7	Mechanism of nucleophilic additions to carbonyl groups : Benzoin condensations and Aldol condensations.	Assignment: Mechanism of Named reactions	**CO2**
8	Mechanism of nucleophilic additions to carbonyl groups : Perkin and Knoevenagel condensations.		**CO2**
9	Condensation with ammonia and its derivatives.		**CO2**
1st Internal Examination			
10	Wittig reaction and Mannich reaction, Addition of Grignard reagents.		**CO3**
11	Oxidation and reduction of aldehydes and ketones: Baeyer-Villiger oxidation		**CO3**

12	Oxidation and reduction of aldehydes and ketones: Cannizzaro's reaction		**CO3**
13	Oxidation and reduction of aldehydes and ketones: Meerwein-Pondorof -Verley, and Clemmensen, reductions		**CO3**
14	Oxidation and reduction of aldehydes and ketones: Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.		**CO3**
15	Use of acetal as protecting group.	Power Point Presentation	**CO2**
2nd Internal Examination			
Unit V : CARBONIC ACID DERIVATIVES			
16	Preparation, reactions, structure and uses: Urea and thiourea		**CO2**
17	Preparation, reactions, structure and uses: semicarbazide		**CO2**
18	Preparation and basicity of guanidine.		**CO2**

References:

1. P. Sykes, A Guide book to Mechanism in Organic Chemistry, 6th Edition, Orient Longman.
2. P.S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.
3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Co.
4. P. Y. Bruice, 'Organic Chemistry' - 3rd Edn. Pearson Education.

JOSEPH JOHN

Unit IV : CARBOXYLIC AND SULPHONIC ACIDS

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	Structure of carboxylate ion- effects of substituents on acid strength of aliphatic and aromatic carboxylic acids	Power Point Presentation	**CO2**
2	Ascent and descent in fatty acid series		**CO2**
3	Hell-Volhard-Zelinsky reaction -Mechanism of decarboxylation		**CO3**
4	Preparation of functional derivatives of carboxylic acids : acid chlorides		**CO2**
5	Preparation of functional derivatives of carboxylic acids : esters and anhydrides		**CO2**
6	Preparation of functional derivatives of carboxylic acids: amides		**CO2**
7	Methods of formation and chemical reactions : anthranilic acid, cnnamic acid		**CO2**
8	Methods of formation and chemical reactions : acrylic acid		**CO2**
9	Methods of formation and chemical reactions : oxalic acid	Assignment	**CO2**
1st Internal Examination			
10	Methods of formation and chemical reactions : malonic acid		**CO2**
11	Methods of formation and chemical reactions : citric acid		**CO2**

12	Methods of formation and chemical reactions: adipic acid		**CO2**
13	Methods of formation and chemical reactions: maleic acid,		**CO2**
14	Methods of formation and chemical reactions: fumaric acid		**CO2**
15	Methods of formation and chemical reactions: coumarin.		**CO2**
2nd Internal Examination			
16	Preparation, reactions and uses: benzene sulphonic acid		**CO2**
17	Preparation, reactions and uses: benzene sulphonyl chloride		**CO2**
18	Preparation, reactions and uses: *otho* and *para* toluene sulphonyl chlorides		**CO2**

References:

1. Peter Sykes, A Guide book to Mechanism in Organic Chemistry: 6th Edition, Pearson Education.
2. P. S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.
3. K.S. Tewari and N.K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House.
4. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co.
5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India,
6. I. L. Finar, Organic Chemistry, 6th Edition. Vol.- I, Pearson

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*5*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Inorganic Chemistry - I*	**SUBJECT CODE**	**:**	*15U5CRCHE05*
COURSE TEACHERS	**:**	*Dr. Joseph John (JJ), Mr. Midhun Dominic C D (MD), Ms. June Cyriac (JUC)*			
Objectives	**:**	➢ To understand the general characteristics of the d and f block elements ➢ To study the physical and chemical properties of d and f block elements ➢ To study the various theories of coordination compounds ➢ To study isomerism exhibited by metal complexes ➢ To understand the classification, properties and applications of organometallic compounds. ➢ To study the concepts of acids and bases. ➢ To understand the importance and various functions of metals in biological systems.			
Instructional Hours	**:**	*3 hours per week*			

JJ	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	**Remarks**
UNIT 2 : Co-	1	Ligands, classification based on the number of donor atoms, chelating ligands, bridging ligands		
	2	Isomerism in complexes-Structural isomerism only, IUPAC nomenclature		

ordination Chemistry (18 hours)				
	3	Coordination number and possible geometries of complexes from C. N 3 to 12	Assignment No: 1	
	4	Stereo isomerism- geometrical and optical isomerism of complexes with 4 and 6 coordination numbers.		
	5	Stability of complexes - stepwise stability constant and overall stability constant, factors affecting the stability of metal complexes. EAN, Chelates and chelate effect.	Group Discussion	
	6	Magnetic behavior of complexes- Diamagnetic and paramagnetic complexes, explanation, effective magnetic moment, spins only magnetic moments, calculation of spin only magnetic moment. Quenching of magnetic moment.		
	7	Theories of bonding in coordination compounds– Werner's theory of coordination, primary and secondary valences of metal ions.	MOODLE- Assignment No:2	
	8	Valence bond theory- of octahedral, tetrahedral and square planar complexes, high spin and low spin complexes- inner and outer orbital complexes, explanation of magnetic properties		
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 2 : Co-	10	Limitations of valence bond theory.	Assignment No.3	
	11	Crystal filed theory- splitting of d-orbitals in octahedral, tetrahedral complexes, strong and weak field ligands, pairing energy		

ordination Chemistry (18 hours)				
	12	Explanation of colour and magnetic properties of complexes, limitation of CF theory.		
	13	Jahn-Teller distortion and splitting of d orbitals in tetragonal and square planar fields,		
	14	Jahn-Teller distortion in Cu (II) complexes. MO theory- evidence for metal ligand covalency		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 2 : Co-ordination Chemistry (18 hours)	15	MOE diagram of complexes of octahedral symmetry (sigma bonding only).		
	16	Explanation of Δ in the Oh and Td complexes using MOE diagram.		
	17	Substitution reactions in metal complexes- Labile and inert complexes, ligand substitution reactions in octahedral complexes	Demonstration	
	18	S_N1 and S_N2 substitution reactions. Substitution reactions of square planar complexes – Trans effect and applications of trans effect.	PowerPoint presentation	
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			

MD	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 4 : Acids and Bases (8 hours)	1	Definition- Bronsted-Lowry, Lux-Flood, Solvent system, Usanovich and Lewis definitions. Self-study.		
	2	Strength of lewis acids and bases: Factors affecting strength of acids and bases: Solvent effect		
	3	Factors affecting strength of acids and bases: Leveling and differentiating solvents.	Assignment No: 1	
	4	Effect of substituent, steric factor, charge on the species, Electronegativity		
	5	Hydration, oxidation number of the central atom, resonance effect	Group Discussion	
	6	Hard and Soft acids and bases. HSAB Theory, basis of HSAB theory		
	7	Symbiosis, Applications of HSAB Concept	MOODLE- Assignment No:2	
	8	Stability of complexes, mode of coordination, predicting feasibility of reactions		

		FIRST INTERNAL EXAMINATION		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Edn. Milestone Publishers, New Delhi 2010. ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006. ❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ M. Clyde Day,and J. Selbin Theoretical inorganic chemistry 2nd Edn. Reinhold Book Corp. 2008. ❖ 6. B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. 2006.		
UNIT 5 : Bioinorganic Chemistry (10 hours)	9	Essential and trace elements in biological systems, Myoglobin and Hemoglobin, role of myoglobin and hemoglobin in biological systems	Assignment No.3	
	10	Mechanism of oxygen transport, cooperativity, Bohr effect, Phosphate effect		
	11	Cytochromes- Structure and function.		
	12	Metalloenzymes: Inhibition and poisoning of enzymes. A brief study of the following metalloenzymes and their functions. Carbonic anhydrase and Carbonic peptidase.		
	13	Cytochrome oxidase, cytochrome P450, Peroxidase, catalases, superoxide dismutase and Nitrogenase.		
	14	Role of alkali and alkaline earth metals in biological systems, Na/K pump.		

		SECOND INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
U NI T	15	Metal deficiency: Deficiency of Iron, Copper and Zinc		
	16	Metal toxicity. Toxicity of Copper, Iron, Calcium, Plutonium, Mercury and Cadmium.		
	17	Metals as carcinogens. Treatment of metal toxicity. Chelation therapy.	Demonstration	
	18	Anti-cancer drugs – cisplatin and carboplatin.	PowerPoint presentation	
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi, 2010. ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry,5th Ed. Pearson 2009. ❖ F.A.Cotton, G.Wilkinson, P. L. Gaus, Basic Inorganic Chemistry,3rd Edn,John –Wiley,1995 ❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. ❖ Ivano Bertini, Harry B Gray, Stephen J. Lippard, Joan Selvertone Valentine,Bioinorganic Chemistry.Viva Books Pvt Ltd. 2007.			

JUC	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 1 : Chemistry of d and f block elements (9 hours)	1	**Module 1 : Chemistry of d and f Block Elements** Different properties of d block elements		
	2	electronic configuration, oxidation state.		
	3	Valency, metallic character, colour.	Assignment No: 1	
	4	Magnetic properties, catalytic properties and ability to form complexes.		
	5	Comparison with second and third transition series.	Group Discussion	
	6	Chemistry of Lanthanides		
	7	Their properties	MOODLE- Assignment No:2	
		FIRST INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
U NI	8	Discussion on CIA	Assignment No.3	

T 1 : Chemistry of d and f block	9	Lanthanide contraction, separation of lanthanides. Actinides, properties. Comparison of lanthanides and actinides		
	SECOND INTERNAL EXAMINATION			
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 3 : Organometallic Compounds (9 hours)	10	Definition, Classification of organometallic compounds,		
	11	Ylides, Classification on the basis of hapticity,		
	12	Naming of organometallic compounds.	Demonstration	
	13	catalytic properties, alkene hydrogenation, shift reaction,	PowerPoint presentation	
	14	Zeigler-Natta polymerization, 18 e rule,		
	15	Metal-alkene complexes, metal-alkyne complexes,		
	16	Metallocenes-Ferrocene. Zeise salt.		
	17	Preparation and structure.		
	18	Revision		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Edn. Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education,2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ R. C. Mehrothra and A. Singh, Organometallic chemistry, New age publishers. ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 3rd edn., John Wiley, New York.1995. ❖ A. G. Sharpe, Inorganic Chemistry, 3rd Edn. Pearson.			

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*5*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	**Organic Chemistry - III**	**SUBJECT CODE**	**:**	**15U5CRCHE06**
COURSE TEACHERS	**:**	*Dr. V.S . Sebastian, Dr. Joseph T Moolayil, Dr.Grace Thomas, Dr. M. George*			
COURSE OUTCOMES (COs)	**:**	**CO1** - To learn the chemistry of nitro compounds, amines, dyes, organic polymers, soaps, detergents and organic reagents. **CO2** - To understand and study mechanism of reactions of nitro compounds and amines **CO3** - To have an elementary idea of chemotherapy, organic spectroscopy and photochemistry **CO4** - *Ability to explore and reflect about the wide range of possibilities and applications of nuclear reactions and radio activity.* **CO5** - To identify organic compound using UV, IR and PMR spectroscopic techniques			

	No. of Session	Session Topic and Discussion Theme	Value additions	COs
C Orga	1	Introduction Nitro compounds- nitromethane- tautomerism reduction products of nitrobenzene in acidic, neutral and alkaline media-		**CO1**
	2	reduction products of nitrobenzene in acidic, neutral		**CO1**

nic com pou nds cont aini ng Nitr ogen *(10 hour s)*				
	3	reduction products of nitrobenzene in alkaline media-	Assignment No: 1	**CO1**
	4	Electrolytic reduction and selective reduction of poly nitro compounds- formation of charge transfer complexes		**CO1**
	5	Amines- isomerism- stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines -		**CO1**
	6	Structural features affecting basicity of aliphatic and aromatic amines. Quaternary amine salts as phase-transfer catalysts		**CO1, CO2**
	7	Comparative study of aliphatic and aromatic amines.	Assignment No:2	**CO1, CO2**
	8	Preparation of alkyl and arylamines (reduction of nitro compounds, nitriles),		**CO1, CO2, CO3**
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	1. I. L. Finar, Organic Chemistry -, 6th Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24). 2. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 22,23). 3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22). 4. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter- 22,23,24). 5. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.			
	10	Reductive amination of aldehydes and ketones Gabriel-Phthalimide reaction, Hoffmann bromamide reaction.	Assignment No.3	**CO1**
	11	Diazonium salts-preparation, synthetic transformations of aryldiazonium salts		**CO1**
	No. of Session	**Session Topic and Discussion Theme**	**Value additions**	**COs**
	12			**CO1**

	13	Azo Coupling - Mechanisms of Sandmeyer's and Gatterman reactions	Group Discussion	**CO1, C03**
		SECOND INTERNAL EXAMINATION		
Text Books	**1.** I. L. Finar, Organic Chemistry -, 6th Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24). **2.** R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 22,23). **3.** M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22). **4.** K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter- 22,23,24). **5.** B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.			
Organic compounds containing Nitrogen *(5 hours)*	14	Schiemann and Gomberg reactions		**CO1**
	15	Preparation and uses of Phenyl hydrazine		**CO1, CO5**
	16	Diazomethane - preparation, structure and synthetic uses	Demonstration	**CO1, CO5**
	17	Diazoacetic ester - preparation, structure and synthetic uses	PowerPoint presentation	**CO1, CO5**
	18	Arndt- Eistert synthesis- mechanism	PowerPoint presentation	**CO1, CO5**
	19	Wolff rearrangement –mechanism		
	20	Curtius rearrangement and its mechanism.		
Text Books	**6.** I. L. Finar, Organic Chemistry -, 6th Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24). **7.** R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 22,23). **8.** M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22). **9.** K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter- 22,23,24). **10.** B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.			

Unit II & III , IV & V	No. of Sessions	Session Topic and Discussion Theme	Value additions	COs
Dyes (3 hours)	1	Theory of colour and constitution. Classification - according to structure and method of application.		**CO1**
	2	Preparation and uses of Azo dye-methyl orange and Bismark brown,		**CO1, CO4**
	3	Preparation and uses of Triphenyl methane dye -Malachite green,		**CO1**
	4	Preparation and uses of Phthalein dye - phenolphthalein and fluroescein,		**CO1**
	5	Preparation and uses of Vat dye – indigo,		**CO1, CO4**
	7	Preparation and uses of Anthraquinone dye - alizarin		**CO1, CO4**
	1st Internal Examination			
Text Books		o I. L. Finar, Organic Chemistry, 6th Edition. Vol - I, Pearson. (Chapter-31) o M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) o K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-38). o B. S. Bahl, 'Advanced Organic Chemistry', S. Chand		
Unit V, VI & VII	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Photoch	10	Introduction- Photochemical versus Thermal reactions. Reactions		**CO1, CO2, C03**

emical Reactions (3 hours), **Organic Polymers (4hours), Soaps and Detergents (3) hours)**	11	Norrish reactions of acyclic Ketones.	Power Point Presentation	**CO1, CO2, C03**
	12	Patterno-Buchi, Photo-Fries reactions.	Power Point Presentation	**CO1, CO2, C03**
	13	Synthesis and applications of the following polymers- Polyesters- terephthalates,		**CO1**
	14	Nylon 6 and Nylon 6,6, phenol formaldehyde resins, urea formaldehyde resins .	Group Discussion	**CO1**
	2nd Internal Examination			
	15	Epoxy resins and polyurethanes, PVC and Teflon.		**CO1**
	16	Synthetic rubbers –SBR and Nitrile rubber- structure and applications		**CO1**
	17	Composition of soaps- detergent action of soap	Individual Assignment:	**CO1**
	18	Synthetic detergents- - their functions – comparison between soaps and detergents-		**CO1**
	19	Environmental aspects. LAS and ABS detergents		
Text Books	1. I. L. Finar, Organic Chemistry, 6th Edition. Vol- I, Pearson. (p.-323) 2. M. K. Jain and S. C. Sharma, 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) 3. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-36). 4. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 31) 5. Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. 6. Gowariker V.R., Viswanathan N.V. and JayaderSreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.			
VSS				
***Unit VIII* & IX**	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**

Aliphatic hydrocarbons (2 hours), Chemotherapy (5))hours) Chemotherapy	1	Cycloalkanes- relative stabilities..		**CO1**
	2	Butadiene – structure and stability, 1,4 addition and its mechanism		**CO1, CO4**
	3	Drugs- introduction –classification –mode of action		**CO1**
	4	Elementary idea of the structure and mode of action of drugs Sulphanilamides,		**CO1**
	5	Elementary idea of the structure and mode of action of drugs Amphicillin and Chloramphenicol		**CO1, CO4**
	7	Elementary idea of the structure and application of Chloroquine, Paracetamol, Analgin and Aspirin.		**CO1, CO4**
	1st Internal Examination			
Text Books	o I. L. Finar, Organic Chemistry, 6th Edition. Vol - I, Pearson. (Chapter-31) o M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) o K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-38). o B. S. Bahl, 'Advanced Organic Chemistry', S. Chand			
Unit IV & V	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Chemistry of Organic	10	Drugs in cancer therapy- Chlorambucil		**CO1, CO2, C03**
	11	Analytical reagents – Tollens reagent, Fehling solution	Power Point Presentation	**CO1, CO2, C03**
	12	Schiff's reagents, Borsche's reagent, Benedict solution-(Procedure not required.	Power Point Presentation	**CO1, CO2, C03**

Reagents (4 hours), Structure elucidation (8)	13	Applications of Synthetic reagents –NBS, Lead tetra acetate, Periodic acid, OsO_4		**CO1**
	14	Ozone, LDA, Raney Nickel, Selenium dioxide, DCC (elementary idea.	Group Discussion	**CO1**
	2nd Internal Examination			
	15	Introduction to UV, IR and NMR spectroscopy.		**CO1**
	16	UV, IR and NMR spectral characteristics of simple molecules such as ethylene, butadiene, benzene, acetaldehyde, acetone acetophenone, crotonaldehyde, ethanol		**CO1**
	17	Problems pertaining to the structure elucidation of simple organic compounds using IR and PMR spectroscopic techniques	Individual Assignment:	**CO1**
	18	Mass spectrometry- Introduction-EI ionisation- Determination Molecular mass by MS (Elementary idea- fragmentation study not required)		**CO1**
Text Books	I. L. Finar, Organic Chemistry, 6th Edition. Vol- I, Pearson. (p.-323) M. K. Jain and S. C. Sharma, 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-36). R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 31)			

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA					
COURSE PLAN : ACADEMIC YEAR 2017 - 2018					
PROGRAMME	**:**	*B.Sc. Chemistry*	**SEMESTER**	**:**	*5*
LECTURE HOURS	**:**	*54*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Physical Chemistry - I*	**SUBJECT CODE**	**:**	*CH5B03*
COURSE TEACHERS	**:**	Dr. K. B. Jose (KBJ), Dr. Thommachan Xavier (TX), Dr. Jorphin Joseph (JRJ) & Dr. Ignatious Abraham (IGA)			
COURSE OUTCOMES (COs)	**:**	**CO1** - *Understand the intermolecular forces and dynamics of molecules in gases and liquids* **CO2 -** *Describe the structure of solids and defects in crystals.* **CO3** - *Understand and explain surface phenomena.* **CO4** - *Understand the chemistry of solutions.*			
Instructional Hours	**:**	*Monday : Period 1 (9:30 to 10:30 am) - JRJ* *Tuesday : Period 1 (9:30 to 10:30 am) - KBJ* *Wednesday : Period 2 (10:30 to 11:30 am) - IGA* *Thursday : Period 2 (10:30 to 11:30 pm) - TX*			

IGNATIOUS ABRAHAM			
Unit I : GASES			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**COs**
1	Kinetic molecular model of gases		**CO1**
2	Pressure of an ideal gas, derivation of gas laws		**CO1**
3	Maxwell's distribution of velocities – molecular velocities (average, root mean square and most probable velocities)		**CO1**
4	Collision diameter, mean free path		**CO1**
5	Viscosity of gases – temperature and pressure dependence. Relation between mean free path and coefficient of viscosity.	Power Point Presentation	**CO1**
6	Barometric distribution law		**CO1**
7	Law of equipartition of energy		**CO1**
8	Degrees of freedom and molecular basis of heat capacities.		**CO1**
9	Real gases: compressibility factor z		**CO1**
1st Internal Examination			
10	van der Waals equation of state – derivation and application in explaining real gas behaviour.		**CO1**
11	Virial equation of state	*Assignment* : Synthetic Applications of active methylene compounds	**CO1**
12	Van der Waals equation expressed in virial form – calculation of Boyle temperature		**CO1**
13	Isotherms of real gases		**CO1**

14	Continuity of states. Critical phenomena.		**CO1**
15	Liquefaction of gases		**CO1**
2nd Internal Examination			
Unit III : SYMMETRY			
16	Symmetry of molecules-symmetry elements and symmetry operations – centre of symmetry, plane of symmetry, proper and improper axes of symmetry,	Power Point Presentation	**CO2**
17	Combination of symmetry elements, molecular point groups, Schoenflies symbol,	*Assignment*	**CO2**
18	Crystallographic point groups		**CO2**

References:

1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandhar, Chapters 1,2
2. K. L. Kapoor, A Textbook of Physical chemistry, Volumes 1, Macmillan India Ltd Chaper 1
3. P.Atkins and J Paula, The elements of Physical chemistry, 7th edn., Oxford University Press, Chapter 1
4. F. A. Alberty and R J Silby, Physical Chemistry, 3rd Edn, John Wiley, Chapter 17

THOMMACHAN XAVIER

Unit III : LIQUIDS

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	Liquid State - introduction		**CO1**
2	Intermolecular forces in liquids	Power point presentation	**CO1**
3	Viscosity – Factors affecting viscosity		**CO1**
4	the viscometer method	Power Point Presentation:	**CO1**
5	surface tension		**CO1**
6	Determination of surface tension		**CO1**
7	Structure of liquids.		**CO1**
8	Unusual behaviour of water		**CO1**
Unit III : LIQUID CRYSTALS AND ADSORPTION			
9	Classification of liquid crystals	*Assignment*	**CO2**
1st Internal Examination			
10	Structure of nematic phases		**CO2**
11	Structure of cholestric phases		**CO2**
12	Adsorption – types		**CO3**
13	Adsorption of gases by solids		**CO3**
14	Factors influencing adsorption		**CO3**
15	Freundlich adsorption isotherm	Power Point Presentation	**CO3**
2nd Internal Examination			
16	Langmuir adsorption isotherm		**CO3**
17	The BET theory		**CO3**
18	Use of BET equation for the determination of surface area.		**CO3**

References:

1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 1, Macmillan India Ltd Chapers 2,3
2. P. Atkins and J. Paula, The elements of Physical chemistry, 7th edn., Oxford University Press, Chapter 23

3. A. McQuarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd, Chapter 29
4. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, Vishal Publishing Co, Chapter 5

K B JOSE			
Unit III : SOLID STATE			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**COs**
1	The nature of the solid state	Power Point Presentation	**CO2**
2	Anisotropy- the law of constancy of interfacial angles		**CO2**
3	Law of rational indices - Miller indices.		**CO3**
4	Seven crystal systems and fourteen Bravais lattices.	*Assignment*	**CO2**
5	X-ray diffraction, Bragg's law		**CO2**
6	Detailed study of simple, face centred and body centred cubic systems	Models	**CO2**
7	Bragg's x-ray diffractometer method	Power Point	**CO2**
8	Powder pattern method.		**CO2**
9	Analysis of powder diffraction patterns of NaCl and KCl	Assignment	**CO2**
1st Internal Examination			
10	Density of cubic crystals, identification of cubic crystal from crystallographic data.	*Assignment*	**CO2**
11	Close packing of spheres, ccp and hcp arrangements.		**CO2**
12	Structure of ionic compounds of the type AX - NaCl	Power Point	**CO2**
13	Structure of ionic compounds of the type AX - CsCl, ZnS	Power Point	**CO2**
14	Structure of ionic compounds of the type AX2- (CaF_2, Na_2O)	Power Point	**CO2**
15	Defects in crystals – stoichiometric and non-stoichiometric defects	*Assignment*	**CO2**
2nd Internal Examination			
16	Extrinsic and intrinsic defects.		**CO2**
17	Electrical conductivity, semiconductors, n-type, p-type		**CO2**
18	Superconductivity – an introduction	Power Point	**CO2**

References:

1. Peter Sykes, A Guide book to Mechanism in Organic Chemistry: 6th Edition, Pearson Education.
2. P. S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.
3. K.S. Tewari and N.K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House.
4. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co.

5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India,
6. I. L. Finar, Organic Chemistry, 6th Edition. Vol.- I, Pearson

JORPHIN JOSEPH			
Unit III : SOLUTIONS			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**COs**
1	Introduction - Binary liquid solutions	Power Point Presentation	**CO4**
2	Raoult's law- ideal and non-ideal solutions		**CO4**
3	G_{mix}, V_{mix}, and S_{mix} for ideal solutions.		**CO4**
4	Vapour pressure-composition and boiling point-composition curves of ideal and non-ideal binary liquid solutions.	*Assignment*	**CO4**
5	Fractional distillation of binary liquid-liquid solutions		**CO4**
6	Distillation of immiscible liquids, partially miscible liquid-liquid systems.	Models	**CO4**
7	Critical solution temperature (CST) – the lever rule	Power Point	**CO4**
8	Introduction to ternary liquid solutions.		**CO4**
9	Solubility of gases in liquids – Henry's law.	Assignment	**CO4**
1st Internal Examination			
10	Distribution of a solute between two solvents – Nernst distribution law.	*Assignment*	**CO4**
11	Colligative properties of dilute solutions – vapour pressure lowering		**CO4**
12	Colligative properties of dilute solutions – Boiling point elevation	Power Point	**CO4**
13	Colligative properties of dilute solutions – freezing point depression (thermodynamic derivation).	Power Point	**CO4**
14	Molar mass determination-related problems-	Power Point	**CO4**
15	Osmotic pressure –laws of osmotic pressure -	*Assignment*	**CO4**
2nd Internal Examination			
16	Reverse osmosis – purification of sea water.		**CO4**
17	Abnormal molecular masses – van't Hoff factor		**CO4**
18	degree of association and degree of dissociation	Power Point	**CO4**

References:

1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandhar, Chapters 15, 24, 25
2. K. L. Kapoor, A Textbook of Physical chemistry, Volume 4, Macmillan India Ltd,
3. *"Physical Chemistry",* K. J. Laidler and J. M. Meiser, 3rd Edition, Houghton Mifflin Comp., New York, International Edition (1999).

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*36*
SEMESTER	**:**	*5*	**CREDITS**	**:**	*2*
SUBJECT TITLE	**:**	**Physical Chemistry - II**	**SUBJECT CODE**	**:**	**-**
COURSE TEACHERS	**:**	*Dr.Jinu George, Senju Devassykutty*			
COURSE OBJECTIVES	**:**	• **Understand the basics of spectroscopy.** • **Explain the fundamental principles of rotational, vibrational, Raman, electronic, NMR and mass spectroscopic techniques.** • **Describe the fundamentals of photochemistry and optical properties.**			
Instructional Hours	**:**	*2 hours per week*			

	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
4. Raman spectroscopy	1	➢ ***Electronic Spectroscopy:*** Introduction		
	2	Electronic spectrum: concept of potential energy curves for bonding and anti-bonding molecular orbitals		https://youtu.be/MW4PwJxxyt0
	3	➢ electronic transition, the Frank-Condon principle,	ICT	
	4	dissociation energy. Polyatomic molecules – qualitative description of σ, π and n- molecular orbitals		
	5	➢ Polyatomic molecules- energy levels and the respective transitions		

5. Electronic spectroscopy	7	***NMR Spectroscopy*** **:** NMR spectroscopy: basic principles of NMR spectroscopy	ICT	
	1st Internal Examination			
	8	Nuclear spin, Larmor precession. Proton magnetic resonance (^{1}H NMR or PMR)		https://youtu.be/t5stvnKNXbg
	9	Nuclear shielding and deshielding, chemical shift and molecular structure. Spin-spin splitting and coupling constant.		
Text Books	**References** 1. R. Puri, L. R. Sharma, M. S. Pathania, '*Elements of Physical Chemistry*', Vishal Pub. Co., 2. K. J. Laidler, John H. Meiser, '*Physical Chemistry'*, 2nd edn..			
	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
6. NMR Spectroscopy 7. Mass Spectroscopy	10	➢ First order spectra – interpretation of PMR spectra of simple organic molecules		
	11	➢ First order spectra examples- ethyl bromide, ethanol, acetaldehyde, ethyl acetate, toluene, acetophenone.	Power Point Presentation	
	12	➢ ***Mass Spectroscopy*****:** Mass spectrometry: Basic principle-ionization	Power Point Presentation	
	13	➢ Fragmentation, separation of ions and representation of the spectrum		
	14	Application in molecular mass determination.	Group Discussion	
	2nd Internal Examination			
	15	➢ ***Photochemistry:*** Interaction of radiation with matter: Laws of photochemistry – Grothus-Draper law, Stark-Einstein law, examples of photochemical reactions.		

	16	Beer law and Beer-Lambert's law. Jablonsky diagram, qualitative description of fluorescence		
	17	Quantum yield, primary and secondary processes. Basic concepts of photosensitized reactions – photosynthesis, dissociation of hydrogen molecule, isomerization of 2-butene, and chemiluminescence.		
	18	Optical properties - optical activity, molar refraction.		
Text Books	**References** • K. K. Sharma, L R Sharma, '*A Text Book of Physical Chemistry'*, Vikas Publishing house. • S. Negi, S. C. Anand, '*A Textbook of Physical Chemistry*', Second Edition, New Age International (P) limited, publishers.			

	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	**Courses/ Text book/Web URL**
Unit .1. Introduction to spectroscopy and	1	**1. Introduction to spectroscopy** Introduction: electromagnetic radiation, regions of the spectrum,		Presentation on: Molecules and Molecular Spectroscopy - UAF 12/17/2017
	2	interaction of electromagnetic radiation with molecules, various types of molecular spectroscopic techniques,		
	3	Born-Oppenheimer approximation.		

3. Vibrational spectroscopy	4	**2. Rotational spectroscopy** Introduction to Rotational spectrum:	ICT	
	5	diatomic molecules, energy levels of a rigid rotator, selection rules, determination of bond length.		
	7	**3. Vibrational spectroscopy**		
	1st Internal Examination			
	8	Vibrational spectrum: the simple harmonic oscillator		
	9	– energy levels, force constant, selection rules.		
Text Books	**References** 1. R. Puri, L. R. Sharma, M. S. Pathania, '*Elements of Physical Chemistry*', Vishal Pub. Co., 2. K. J. Laidler, John H. Meiser, '*Physical Chemistry'*, 2nd edn..			
2. Rotational spectroscopy	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
4. Rotational spectroscopy Raman	10	Anharmonic oscillator		
	11	– pure vibrational spectra of diatomic molecules,	Power Point Presentation	
	12	selection rules, fundamental frequencies, overtones,	Power Point Presentation	
	13	hot bands. Degrees of freedom for polyatomic molecules,		
	14	revision	Group Discussion	

spectroscopy	**2nd Internal Examination**			
	15	concept of group frequencies –		Classical Mechanics with a Bang! - URL is "https://modphys.hosted.uark.edu/markup/CMwBang_UnitsDetail_2017.html"
	16	– pure vibrational spectra of diatomic molecules,		
	17	frequencies of common functional groups in organic compounds.		
	18	Raman spectrum: quantum theory of Raman Effect (elementary idea), concept of polarizability, qualitative treatment of pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, rule of mutual exclusion.		
Text Books	**References** • K. K. Sharma, L R Sharma, '*A Text Book of Physical Chemistry'*, Vikas Publishing house. • S. Negi, S. C. Anand, '*A Textbook of Physical Chemistry*', Second Edition, New Age International (P) limited, publishers.			

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	Open course	**SEMESTER**	5
COURSE CODE AND TITLE	15U5OCCHE1 - Chemistry in Everyday life	**CREDIT**	3
HOURS/SEM	72		
FACULTY NAME	Dr. Joseph T Moolayil (JTM), Dr. Grace Thomas (GT), Dr. Ramakrishnan S (RKS), Dr. Abi T G (ATG)		

COURSE OBJECTIVES	
1	Understand chemistry of Food additives and Flavours
2	Understand chemistry of Soaps
3	Understand chemistry of synthetic detergent
4	Understand chemistry of Cosmetics
5	Understand chemistry of Plastics, Paper Dyes
6	Understand chemistry of Drugs
7	Understand chemistry of Chemistry and Agriculture

Dr. Abi T. G.

Plastics, Paper Dyes **(14 Hrs)**

Sl.No	**Session**	**Topic**	**Method of Teaching**	**Remarks**
1	1	Plastics in everyday life	Chalk & Board	
2	2	Brief idea of polymerization-	Chalk & Board	
3	3	Thermoplastic and thermosetting polymers.	Chalk & Board	
4	4	Use of PET, HDPE, PVC, LDPE, PP, ABS.	Chalk & Board	
5	5	Use of PET, HDPE, PVC, LDPE, PP, ABS.	Chalk & Board	
First Internal Examination				
6	6	Biodegradable plastics	Chalk & Board	
7	7	Environmental hazards of plastics	Chalk & Board	
8	8	News print paper, writing paper, paper	Chalk & Board	

		boards, cardboards.		
9	9	Organic materials, wood, cotton, jute and coir.	Chalk & Board	
10	10	International recycling codes, and symbols for identification.	Chalk & Board	
11	11	Natural and synthetic dyes (basic idea only).	Chalk & Board	
12	12	Recycling of plastics.	Chalk & Board	
Second internal Examination				
13	13	Revision	Chalk & Board	
14	14	Revision	Chalk & Board	
Synthetic Detergents				**(3 Hrs)**
15	15	Enzymes used in commercial detergents	Chalk & Board	
16	16	Environmental hazards.	Chalk & Board	
17	17	Revision	Chalk & Board	

Dr. Joseph T Moolayil				
Cosmetics		**(12 Hrs)**		
1	1	Cosmetics- Introduction,	Chalk & Board	
2	2	classification	Chalk & Board	
3	3	bathing oils	Chalk & Board	
4	4	toilet powder,	Chalk & Board	
5	5	dental cosmetics	Chalk & Board	
6	6	shaving cream	Chalk & Board	
First Internal Examination				
7	7	shampoo, hair dyes	Chalk & Board	
8	8	face creams	Chalk & Board	
9	9	skin products	Chalk & Board	
10	10	General formulation of each type.	Chalk & Board	
11	11	Toxicology of cosmetics	Chalk & Board	
12	12	revision	Chalk & Board	
Soaps			**(7 Hrs)**	

13	13	Soaps – Introduction	Chalk & Board	
Second Internal Examination				
14	14	Detergent action of soap.	Chalk & Board	
15	15	Toilet soap, bathing bars	Chalk & Board	
16	16	Washing soaps, liquid soap manufacture-. Significance of acidity and alkalinity.	Chalk & Board	
17	17	Additives, fillers and flavours	Chalk & Board	
18	18	Significance of acidity and alkalinity	Chalk & Board	
19	19	Revision	Chalk & Board	

Dr. Ramakrishnan S				
Food additives and Flavours				**(12 Hrs)**
1	1	Functional food additives	Chalk & Board	
2	2	adulteration	Chalk & Board	
3	3	food laws	Chalk & Board	
4	4	food laws	Chalk & Board	
5	5	Food colours - permitted and non – permitted-	Chalk & Board	
6	6	Food colours: Toxicology.	Chalk & Board	
First Internal Examination				
7	7	Flavours – natural and synthetic-	Chalk & Board	
8	8	Flavours – Toxicology	Chalk & Board	
9	9	Other functional additives	Chalk & Board	
10	10	Soft drinks- formulation	Chalk & Board	
11	11	Health drinks	Chalk & Board	
12	12	Revision	Chalk & Board	
Synthetic Detergents				**(6 Hrs)**
13	13	Detergents- Introduction,	Chalk & Board	
Second Internal Examination				
14	14	detergent action	Chalk & Board	
15	15	types of detergents-cationic, anionic, amphiphilic detergents.	Chalk & Board	
16	16	Common detergent chemicals.	Chalk & Board	

17	17	Additives, excipients colours and flavours.	Chalk & Board	
18	18	Revision	Chalk & Board	

Dr. Grace Thomas				
Drugs				**(6 Hrs)**
1	1	Chemotherapy	Chalk & Board	
2	2	- types of drugs- analgesics,	Chalk & Board	
3	3	- types of drugs- antipyretics, antihistamines	Chalk & Board	
4	4	- types of drugs- antacids tranquilizers, sedatives	Chalk & Board	
5	5	- types of drugs: antibiotics	Chalk & Board	
6	6	- types of drugs- antifertility drugs.	Chalk & Board	
First Internal Examination				
Chemistry and Agriculture				**(12 Hrs)**
7	7	Fertilizers- natural, synthetic, mixed	Chalk & Board	
8	8	NPK fertilizers.	Chalk & Board	
9	9	Excessive use of fertilizers and its impact on the environment.	Chalk & Board	
10	10	Bio fertilizers. Plant growth hormones.	Chalk & Board	
11	11	Pesticides- Classification-insecticides, herbicides, fungicides.	Chalk & Board	
12	12	Excessive use of pesticides – environmental hazards.	Chalk & Board	
13	13	Excessive use of pesticides – environmental hazards.	Chalk & Board	
Second Internal Examination				
14	14	Bio pesticides.	Chalk & Board	
15	15	Antiseptics and Disinfectants	Chalk & Board	
16	16	Disinfectants-Oils - vegetable oils, mineral oil	Chalk & Board	
17	17	essential oil-Sugars, artificial sugars	Chalk & Board	
18	18	Revision	Chalk & Board	

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Remarks**
1	1	Excessive use of pesticides – environmental hazards.	Case studies in short	
2	2	Ingredients of any 2 cosmetics	written	

Reference books	
1	P. Coultate, Food- The Chemistry of its components. Royal Society of Chemistry, London(Paper back)
2	Shashi Chowls,Engineering Chemistry, Danpat Rai Publication.
3	B.K. Sharma. Industrial Chemistry
4	CNR Rao- Understanding chemistry, Universities Press.
5	Puri and Sharma. Advanced Organic Chemistry.
6	Brown, Insect control by chemicals
7	A. K. De, Environmental Chemistry, New age International Ltd.
8	S. S. Dara, A Textbook of Environmental chemistry and pollution control, S.Chand & Company Ltd
9	Tisdale, S.L., Nelson, W.L. and Beaton, J. D. Soil Fertility and Fertilizers, Macmillian Publishing Company, New York, 1990.
10	Buchel, K.H. Chemistry of Pesticides, John Wiley & Sons, New York, 1983
11	P.C Pall, K. Goel, R.K Gupta, Insecticides,pesticides and agrobased industries.
12	Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.
13	I.I Singh, V.K Kapoor, Organic Pharmaceutical Chemistry

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Inorganic Chemistry II*	**SUBJECT CODE**	**:**	*15U6CRCHE09*
COURSE TEACHERS	**:**	*Dr. Joseph John (JJ), Mr. Midhun Dominic C D (MD), Ms. June Cyriac (JUC)*			
Objectives	**:**	To understand the principle of metallurgical processes, the preparation and uses of inorganic polymers, importance of non-aqueous chemistry, metal carbonyls, the structure of solids and the general characteristics of p-block elements. To understand the importance of our environment and its protection.			
Instructional Hours	**:**	*3 hours per week*			

JJ	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	**Remarks**
UNIT 1 : Metallurgy	1	Methods of concentration of ores- Gravity, magnetic and electrostatic separations, Froth flotation and leaching		
	2	Calcination and Roasting. Reduction to free metal- smelting and electrometallurgy,		
	3	Hydrometallurgy. Goldschmidt Thermite Process.	Assignment No: 1	
	4	Refining of metals- electrolytic, ion exchange, zone refining, vapour		

(9 hours)		phase refining and oxidative refining.		
	5	Thermodynamics of the oxidation of metals to metal oxides - Ellingham diagrams.	Group Discussion	
	6	Extractive metallurgy of U, Ti		
	7	Extractive metallurgy of Th and Ni.	MOODLE- Assignment No:2	
	8	Revision		
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Ed.Milestone Publishers, New Delhi 2010. ❖ S. Prakash, G. D. Tuli, S. K. Basu and R. D. Madan, Advanced Inorganic Chemistry, 5th edn, 2012, Volume I, S Chand. ❖ A. Cottrel, An introduction to metallurgy, 2nd edn., University press. 1990.			
UNIT 6: Structure of Inorganic Solids (9 hours)	10	Close packing of spheres, ccp and hcp arrangements.	Assignment No.3	
	11	Interstitial sites in close packing, Tetrahedral, Octahedral sites. Radius ratio, Limiting radius ratio for trigonal, tetrahedral and octahedral sites. (only values).		
	12	Use of limiting radius ratio in the structural determination of ionic crystals. Structure of ionic crystals of NaCl		
	13	Structure of ionic crystals of CsCl, ZnS		
	14	Defects in crystals – stoichiometric and non-stoichiometric defects		
		SECOND INTERNAL EXAMINATION		

Text Books	❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010. ❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006 ❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, , 3rd edn., Oxford University Press. ❖ G.L. Meissler, D.A Tarr, Inorganic Chemistry, Pearson Education ❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. ❖ A. R. West, Solid State Chemistry and its applications, John Wiley.			
UNIT 6: Structure of Inorganic Solids (9 hours)	15	Consequences of defects. extrinsic and intrinsic defects		
	16	Impurity defects.	Demonstration	
	17	Semiconductors, n-type, p-type, Superconductivity – an introduction.	PowerPoint presentation	
	18	Revision		
Text Books	❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010. ❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006 ❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, , 3rd edn., Oxford University Press. ❖ G.L. Meissler, D.A Tarr, Inorganic Chemistry, Pearson Education ❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. ❖ A. R. West, Solid State Chemistry and its applications, John Wiley.			

MD	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 2 : Metal Carbonyls and Metal Clusters (9 hours)	1	Introduction to metal carbonyls and metal clusters		
	2	Preparation and properties of mononuclear carbonyls.		
	3	Structures of $Mo(CO)_6$, $Fe(CO)_5$ and $Ni(CO)_4$.	Assignment No: 1	
	4	Polynuclear carbonyls, bridged carbonyls and bonding in carbonyls.		
	5	Metal clusters - carbonyl and halide clusters	Group Discussion	
	6	Low nuclearity carbonyl clusters and high nuclearity carbonyl clusters,		
	7	Electron counting schemes for $Rh_6(CO)_{16}$ and $[Os_6(CO)_{18}]^{2-}$	MOODLE- Assignment No:2	
	8	Metal only clusters (Zintl ions). Quadruple bond – structure of $Re_2Cl_8^{2-}$.		
	9	Revision		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Edn. Milestone Publishers, New Delhi 2010. ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006. ❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ M. Clyde Day,and J. Selbin Theoretical inorganic chemistry 2nd Edn. Reinhold Book Corp. 2008. ❖ 6. B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. 2006.			

UNIT 5 Compounds of s and p block elements	10	Introduction to s and p block elements		
	11	Macrocyclic ligands:- crown ethers and cryptands, Macrocyclic effect	Assignment No.3	
	12	Alkali metal complexes with crown ethers and cryptands, their applications.		
	13	Boron hydrides – diborane (preparation, properties and bonding)		
	14	B_5H_9, B_4H_{10} (structure only). Closo carboranes, boron nitride		
	15	Borazine, boric acid and Peroxy acids of sulphur.		
	16	Oxides and oxy acids of halogens (structure only), superacids,		
	17	Interhalogen compounds, pseudohalogens, electropositive iodine, (structure only).		
	18	Fluorocarbons. Fluorides, oxides and oxy fluorides of xenon (structure only).		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008. ❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006. ❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd edn., Oxford University Press, 2006. ❖ M. N. Greenwood and A. Earnshaw, Chemistry of the elements 2nd edn, Butterworth, 1997.			

JUC	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	**Remarks**
UNIT 3 : Inorganic Polymers (6 hours)	1	Inorganic polymers – general properties, comparison with organic polymers		
	2	Glass transition temperature. Sulphur based polymers – polymeric sulphur nitride and chalcogenic glasses (preparation)		
	3	Sulphur based polymers – polymeric sulphur nitride and chalcogenic glasses (properties and uses).	Assignment No: 1	
	4	Phosphorus based polymers – polyphosphazenes and polyphosphates.		
	5	Silicon based polymers – silicones and silicone rubber (preparation)	Group Discussion	
	6	Silicon based polymers – silicones and silicone rubber (properties and uses).		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Edn. Milestone Publishers, New Delhi,2010. ❖ S. Prakash, G. D. Tuli, S. K. Basu and R. D. Madan, Advanced Inorganic Chemistry,Volume I, S Chand. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006			
UNIT 4 : Non-Aqueous Solvents (4	7	Classification of solvents, characteristics of solvents	Assignment No.3	
	8	Reactions in liquid ammonia, Alkali metal solution in liquid ammonia, their important properties.		
	9	Liquid sulphur dioxide (acid base, amphoteric, solvation, oxidation – reduction, complex formation)		

hours)	10	Liquid HF (acid base, amphoteric, solvation, oxidation – reduction, complex formation)		
	SECOND INTERNAL EXAMINATION			
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Milestone Publishers, New Delhi,2010 ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006. ❖ M. Clyde Day, and J. Selbin, Theoretical Inorganic Chemistry, 2nd Edn. Reinhold Book Corp. 2008.			
UNIT 7 : Water Quality Parameters (7 hours)	11	Introduction to water quality parameters		
	12	Standards for drinking water-Determination of turbidity (nephelometric method)		
	13	Determination of pH-determination of total dissolved solids	Demonstration	
	14	Total hardness-total alkalinity-acidity - chloride	PowerPoint presentation	
	15	Determination of dissolved oxygen (DO), BOD		
	16	Determination of COD. Estimation of coliform count.		
	17	Revision		
Text Books	❖ B.K Sharma Environmental Chemistry, 12th Edn., Goel Publishing House,2011. ❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi, 2010. ❖ A.K Dee, Environmental Chemistry, 3rd Edn., New Age International Pvt. Ltd.,1996. ❖ Sodhi. G.S., Concepts of Environmental Chemistry, Narsa Publication House, 2009. ❖ Sindhu. P. S., Environmental Chemistry, New Age International Pvt. Ltd., 2011. ❖ Balaram Pani, Environment Chemistry, I. K. International Publishing House Ltd.,2007. ❖ Thomas G Spiro, Chemistry of Environment, Prentice Hall of India., 2006. ❖ Raghavan Nambiar., Environmental Studies, Scitech Publications (India) Pvt. Ltd.,2008.			

COURSE PLAN					
ACADEMIC YEAR 2016-17					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Organic Chemistry-IV*	**SUBJECT CODE**	**:**	**19U6CRCHE10**
COURSE TEACHERS	**:**	*V.S. Sebastian (VSS), Franklin J (FJ), Joseph T Moolayil (JTM), M. George (MG)*			

FJ	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	
UNIT 1 : Natural Products (12 hours)	1	Natural Products - Terpenoids		
	2	Isoprene rule. Structure elucidation of citral and geraniol		
	3	Structure elucidation of geraniol	Assignment No: 1	
	4	Alkaloids - general methods of isolation .		
	5	Alkaloids-classification – structure elucidation		
	6	Synthesis of coniine		
	7	Synthesis of pipperine	Assignment No:2	
	8	Synthesis of nicotine.		
	9	Vitamins – classification- structure (elementary idea) of vitamin A, C and B1, B2, B6		

		FIRST INTERNAL EXAMINATION		
	Text Books	❖ I. L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma '*Modern Organic Chemistry'*, 3rd Edition, Vishal Publishing Company Co . ❖ K.S. Tewari and N.K. Vishnoi,'*Organic Chemistry'*, 3rd Edition, Vikas Publishing House.		
	10	Lipids – biological functions – oils and fats – common fatty acids		
	11	Extraction and refining- hydrogenation –		
	12	Rancidity- identification of oils and fats		
	13	Revision-Natural products, alkaloids		
	SECOND INTERNAL EXAMINATION			
Text Books	❖ L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma '*Modern Organic Chemistry'*, 3rd Edition, Vishal Publishing Company Co. ❖ K.S. Tewari and N.K. Vishnoi,'*Organic Chemistry'*, 3rd Edition, Vikas Publishing House.			

JTM

Unit II	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Carbohydrates (14 Hours)	1	Classification - constitution of glucose and fructose.		
	2	Reactions of glucose-osazone formation		
	3	Reactions of fructose - osazone formation.		
	4	Reactions of glucose and fructose - Mutarotation and its mechanism.		
	5	Epimerisation		
	6	Configuration of monosaccharides		
	I st Internal Examination			
	7	Cyclic structure. Pyranose and furanose forms		
	8	Determination of ring size.	Power Point Presentation	
	9	Determination of ring size. Haworth projection formula.		

	10	Chain lengthening and chain shortening of aldoses.		
	11	Inter conversion of aldoses and ketoses.		
	12	Disaccharides - reactions and structure of sucrose and maltose. Ring structure		
	2nd Internal Examination			
	13	Structure and properties of starch and cellulose (elementary idea).		
	14	Industrial applications of cellulose.		
Text Books	❖ I. L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma '*Modern Organic Chemistry'*, 3rd Edition, Vishal Publishing Company Co. ❖ K.S. Tewari and N.K. Vishnoi,'*Organic Chemistry'*, 3rd Edition, Vikas Publishing House. ❖ R. T. Morrison and R.N. Boyd, '*Organic Chemistry'*, 6th Edition - Prentice Hall of India			
MG				
Unit III	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Heterocyclic Compounds (10 Hours)	1	Aromaticity of heterocyclic compounds.		
	2	Preparation, properties and uses of furan	Power Point Presentation	
	3	Preparation, properties and uses of pyrrole	Power Point Presentation	
	4	Preparation, properties and uses of thiophene.		
	5	Synthesis and reactions of pyridine	Group Discussion	
	6	Synthesis and reactions of piperidine -		

	7	comparative study of basicity of pyrrole, pyridine and piperidine with amines.		
	8	Synthesis and reactions of quinoline, isoquinoline and indole with special reference to Skraup synthesis		
	9	Bischler, Napieralskii and Fisher indole synthesis		
	Ist Internal Examination			
	10			
Unit VI	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Steroids (3 Hours)	1	Introduction – Diels hydrocarbon-	Individual Assignment:	
	2	Structure and functions of cholesterol.		
	2nd Internal Examination			
	3	Elementary idea of HDL, LDL, Vitamin D		
Text Books	❖ I. L. Finar, Organic Chemistry - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. ❖ K.S. Tewari and N.K. Vishnoi,'Organic Chemistry', 3rd Edition, Vikas Publishing House. ❖ R. T. Morrison and R.N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India			

VSS				
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Amino acids and Proteins	1	Amino acids- classification,		
	2	Zwitter ion. Peptide-		
	3	Solution phase peptide synthesis.	Power Point Presentation	
	4	Classification of proteins based on physical and chemical		

Compounds (10 Hours)		properties and on physiological functions.		
	5	Primary secondary tertiary and quaternary structure of proteins	Group Discussion	
	6	Helical and sheet structures (*elementary treatment only*). Nucleic acids. Types of nucleic acids		
	7	Nucleic acids. Types of nucleic acids,		
	8	RNA and DNA,		
	9	polynucleotide chain components		
	Ist Internal Examination			
	10	Green Fluorescent Proteins (*elementary idea*)		
Unit V	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Enzymes (3 Hours)	1	Nomenclature and classification of enzymes (*based on substrate*).	Individual Assignment:	
	2	Chemical nature of enzymes. Mechanism of enzyme action.		
	2nd Internal Examination			
	3	Substrate specificity of enzymes. Enzyme inhibition.		

Text Books	❖ I. L. Finar, Organic Chemistry - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. ❖ K.S. Tewari and N.K. Vishnoi,'Organic Chemistry', 3rd Edition, Vikas Publishing House. ❖ R. T. Morrison and R.N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India ❖ *en.wikipedia.org/wiki/Green_fluorescent_protein* ❖ *www.scholarpedia.org/article/fluorescent_protein* ❖ *www.conncoll.edu/ccacad/zimmer/GFP-ww/timeline.html* ❖ *www.gonda.ucla.edu/bri_core/gfp.htm*

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA			
COURSE PLAN : ACADEMIC YEAR 2017 - 2018			
PROGRAMME	**:** *B.Sc. Chemistry*	**SEMESTER**	**:** *6*
LECTURE HOURS	**:** *54*	**CREDITS**	**:** *3*
SUBJECT TITLE	**:** *Physical Chemistry - III*	**SUBJECT CODE**	**:** *15U6CRCHE11*
COURSE TEACHERS	**:**	Dr. Ignatious Abraham (IGA), Dr. K. B. Jose (KBJ) & Senju Devassykutty (SD)	
COURSE OUTCOMES (COs)	**:**	**CO1** - *Understand the basics of thermodynamics.* **CO2** - *Understand the applicability of the laws of thermodynamics to various physical and chemical processes.* **CO3** - *Describe the phase diagrams of one- and two-component systems* **CO4** - *Understand the basic principles of chemical kinetics.*	
Instructional Hours	**:**	*Monday : Period 3 (9:30 to 10:30 am) - SD* *Tuesday : Period 1 (9:30 to 10:30 am) - KBJ* *Friday : Period 2 (10:30 to 11:30 am) - IGA*	

IGNATIOUS ABRAHAM			
Unit I : CLASSICAL THERMODYNAMICS			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**COs**
1	**Introduction to Thermodynamics:** Definition of thermodynamic terms, intensive and extensive properties		**CO1**
2	Path and state functions, exact and inexact differentials		**CO1**
3	Reversible and irreversible processes,		**CO1**
4	Spontaneous and non-spontaneous processes, internal energy, work and heat		**CO1**
5	Zeroth law of thermodynamics	Power Point Presentation	**CO1**
6	**First law of thermodynamics:** Statement and mathematical expression		**CO1**
7	Enthalpy, heat capacity, Cp and Cv relation in ideal gas systems,		**CO1**
8	Change in thermodynamic properties of an ideal gas during isothermal reversible / irreversible processes.		**CO2**
9	Change in thermodynamic properties of an ideal gas during adiabatic, reversible / irreversible processes.		**CO2**
1st Internal Examination			
10	Joule-Thomson experiment,		**CO2**
11	Joule-Thomson coefficient μ_{JT}, inversion temperature	*Assignment* : Synthetic Applications of active methylene compounds	**CO2**
12	**Second law of Thermodynamics:** Limitations of first law – statements of second law,		**CO1**

13	Carnot's cycle – efficiency of heat engines, Carnot theorem.		**CO1**
14	Entropy – entropy change for various reversible/irreversible processes,		**CO1**
15	Change in entropy of an ideal gas with pressure, volume and temperature.		**CO1**
2nd Internal Examination			
Unit III : SYMMETRY			
16	Third law of thermodynamics-statement and significance.	Power Point Presentation	**CO2**
17	Helmholtz energy and Gibbs energy	*Assignment*	**CO1**
18	Variation of Gibbs energy with T and P		**CO1**

References:

1. R. P. Rastogi, R. R. Misra, An Introduction to Chemical Thermodynamics, 6th edn., Vikas Pub. Pvt. Ltd.
2. K. L. Kapoor, A Textbook of Physical chemistry, Volumes 3, Macmillan India Ltd. Chapters 3, 5, 6.
3. P. Atkins and J Paula, The elements of Physical chemistry, 7th edn., Oxford University Press, Chapter 8.
4. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandher.
5. J. Rajaram and J. C. Kuriakose, Thermodynamics, ShobanLal Nagin Chand & Co (1986).
6. H. Kuhn and H. D. Fosterling, Principles of Physical chemistry, John Wiley.
7. W. J. Moore, Basic Physical Chemistry, Orient Longman.

SENJU DEVASSYKUTTY

Unit II : PHASE EQUILIBRIA

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	The phase rule, equilibrium between phases – conditions.		**CO3**
2	One component system – water system	Power point presentation	**CO3**
3	One component system - sulphur system		**CO3**
4	Two component systems – solid-liquid equilibrium – simple eutectic,	Power Point Presentation:	**CO3**
5	Lead- silver system		**CO3**
6	Formation of compounds with congruent melting point ferric chloride- water system,		**CO3**
7	Formation of compounds with incongruent melting point sodium sulphate- water system.		**CO3**
Unit I : THERMOCHEMISTRY			
8	Enthalpies of formation and combustion		**CO1**
9	Enthalpies of neutralization, solution and hydration	*Assignment*	**CO1**
1st Internal Examination			
10	Relation between heats of reactions at constant volume and constant pressure.		**CO2**
11	Variation of heats of reaction with temperature – Kirchoff's equation		**CO2**
12	Hess's law and its application.		**CO1**
13	Criteria for reversible and irreversible processes.		**CO1**
14	Gibbs-Helmholtz equation.		**CO1**
15	Clausius - Clapeyron equation, applications.	Power Point Presentation	**CO1**

2nd Internal Examination			
16	Partial molar properties – chemical potential,		**CO2**
17	Gibbs-Duhem equation		**CO2**
18	Chemical potential in a system of ideal gases, concept of activity.		**CO2**

References:

1. R. P. Rastogi, R. R. Misra, An Introduction to Chemical Thermodynamics, 6th edn., Vikas Pub. Pvt. Ltd.
2. K. L. Kapoor, A Textbook of Physical chemistry, Volumes 3, Macmillan India Ltd. Chapters 3, 5, 6.
3. P. Atkins and J Paula, The elements of Physical chemistry, 7th edn., Oxford University Press, Chapter 8.
4. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandher.
5. J. Rajaram and J. C. Kuriakose, Thermodynamics, ShobanLal Nagin Chand & Co (1986).
6. H. Kuhn and H. D. Fosterling, Principles of Physical chemistry, John Wiley.
7. W. J. Moore, Basic Physical Chemistry, Orient Longman.

K B JOSE

Unit III : SOLID STATE

Sessions	Session Topic and Discussion Theme	Value additions	COs
1	Rate of reaction, rate equation, order and molecularity of reactions	Power Point Presentation	**CO4**
2	Integrated rate expressions for first and second order reactions.		**CO4**
3	Zero order reactions, pseudo-order reactions, half-life.		**CO4**
4	**Theories of chemical kinetics:** effect of temperature on the rate of reaction	*Assignment*	**CO4**
5	Arrhenius equation, concept of activation energy		**CO4**
6	Collision theory, transition state theory.	Models	**CO4**
7	Thermodynamic parameters for activation – Eyring equation (no derivation needed),	Power Point	**CO4**
8	Enthalpy and entropy of activation.		**CO4**
9	Theory of unimolecular reactions – Lindemann theory.	Assignment	**CO4**
1st Internal Examination			
10	Kinetics of complex (composite) reactions: Opposing reactions, consecutive reactions, and parallel (simultaneous) reactions.	*Assignment*	**CO4**
11	Chain reactions – steady state treatment, hydrogen bromine reaction.		**CO4**
12	Catalysis: Homogeneous catalysis,	Power Point	**CO4**
13	Enzyme catalysis – Michaelis-Menten equation (no derivation needed).	Power Point	**CO4**
14	Heterogeneous catalysis – surface catalysis, uni and bi molecular reactions on surface.	Power Point	**CO4**
15	Elementary idea about autocatalysis.	*Assignment*	**CO4**
2nd Internal Examination			
Unit I : Chemical Equilibrium			
16	Chemical equilibrium: conditions for chemical equilibrium.		**CO2**

17	van't Hoff reaction isotherm, relation between Kc and Kx – Kp		**CO2**
18	Temperature dependence of Kp – van't Hoff equation	Power Point	**CO2**

References:

1. J. Rajaram and J. C. Kuriakose, Thermodynamics, ShobanLal Nagin Chand & Co (1986).
2. H. Kuhn and H. D. Fosterling, Principles of Physical chemistry, John Wiley.
3. W. J. Moore, Basic Physical Chemistry, Orient Longman.
4. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, Vishal Pub. Co. Jalandhar.
5. D. A. McQuarrie, J. D. Simon, Physical Chemistry – A molecular Approach Viva Books Pvt. Ltd.
6. K. L. Kapoor, A Textbook of Physical Chemistry, Volumes 4, Macmillan India Ltd.
7. K. K. Sharma, L. K. Sharma, A Textbook of Physical Chemistry, 4th edn,Vikas publishing House.

	No. of Session	Session Topic and Discussion Theme	Value additions	WEB url/ADDITIONAL RESOURCES
UNIT 1 : Ionic equilibrium	1	Introduction-concepts of acids and bases	Power point	
	2	relative strength of acid-base pairs, influence of solvents	Chalk & Board	
	3	Classification of acids and bases as hard and soft acids and bases. Pearson's HSAB concept, applications,.	Chalk & Board	
	4	Dissociation constants – acids, bases, and polyprotic acids.	Chalk & Board	
	5	Ostwald's dilution law. Ionic product of water – pH.	Chalk & Board	
	6	Buffer solutions – mechanism of buffer action,	Assignment No:1	
	7	Henderson equation. Hydrolysis of salts – hydrolysis constant, degree of hydrolysis, pH of salt solutions.(contd derivation)	Chalk & Board	
	8	Acid-base indicators, theories, determination of pH by indicators, solubility product principle – applications.	Power point	
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ K. L. Kapoor, '*A Textbook of Physical Chemistry*', Volumes 1, Macmillan India Ltd. ❖ B. R. Puri, L. R. Sharma, M. S. Pathania, '*Elements of Physical Chemistry*', Vishal Pub. Co. Jalandhar. ❖ I. N. Levine, *Physical Chemistry*, Tata Mc Graw Hill.			
UNIT 4:	10	Introduction, optical activity	Power point	

Electrical and Magnetic properties	11	molar refraction, dielectric constant,	Chalk & Board	
(10 hours)	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	
	12	dipole moment, magnetic properties of molecules,	Power point	
	13	nuclear paramagnetism,	Group Discussion	
		SECOND INTERNAL EXAMINATION		
Text Books	❖ K. J. Laidler and J. M. Meiser, *'Physical Chemistry',* 3rd Edition, Houghton Mifflin Comp., New York, International Edition (1999). ❖ Barrow, G.M. *Physical Chemistry*, Tata McGraw-Hill (2007). ❖ Castellan, G.W. *Physical Chemistry*, 4th Ed. Narosa (2004).			
UNIT 4: Electrical and Magnetic properties	14	NMR spectrometer	Assignment No:2	
	15	the chemical shift	Power point	
	16	electron spin resonance (ESR).	Demonstration	
	17	numericals	PowerPoint presentation	
	18	revision	PowerPoint presentation	
Text Books	❖ F A Alberty and R J Silby, *Physical Chemistry*, John Wiley. ❖ P. W. Atkins, *The elements of Physical chemistry*, 8thedn, Oxford University Press. ❖ S. H. Marron and J. B. Lando, *Fundamentals of Physical Chemistry*, Macmillan Ltd.			

COURSE PLAN

ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Physical Chemistry-IV*	**SUBJECT CODE**	**:**	**16U6CRCHE12**
COURSE TEACHERS	**:**	*Dr Jinu George (JG), Dr.Thommachan Xavier, Dr. K B Jose*			
COURSE OBJECTIVES	**:**	*- Ability to understand the concept of acids, bases and pH of solutions.* *- Ability to find out pH of various solutions using appropriate equations.* *- Ability to understand the electrical and magnetic properties of subtances.* *- Ability to understand the conductance properties of electrolytes and their applications.* *- Ability to understand electrochemical equivalent and types of cells and its working so that student can work in an electrochemical laboratory*			
Instructional Hours	**:**	*3* ***hours per week***			

	No. of Session	**Session Topic and Discussion Theme**	**Value additions**	
U NI	1	Introduction - Faraday's laws of electrolysis	Demonstration	

T 2 and UNIT 2 : Electrical Conductance	2	electrochemical equivalent, and chemical equivalent	Demonstration	
	3	Electrolytic conductivity, molar conductivity - Variation of molar conductivity with concentration.	Assignment No: 3	
	4	Kohlrausch's law – applications.	Group discussion	
	5	Ionic mobility – relation with ion conductivity, influence of temperature on ion conductivity,	Chalk & board	
	6	ion conductivity and viscosity – Walden's rule	Chalk & board	
	7	Influence of dielectric constant of solvent on ion conductivity. Abnormal ion conductivity of hydrogen and hydroxyl ions.	Chalk & board	
	8	Discharge of ions during electrolysis – Hittorf's theoretical device.	Discussion	
		FIRST INTERNAL EXAMINATION		
Text Books	❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998). ❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.			
	9	Transport Numbers – determination by Hittorf's method and moving boundary method.	Assignment No.3	
	10	Debye-Hückel theory of strong electrolytes	Chalk & board	
	11	The concept of ionic atmosphere, Asymmetry and electrophoretic effect.	Chalk & board	
	12	Debye- Hückel-Onsager equation (*no derivation*)	Group Discussion	
		SECOND INTERNAL EXAMINATION		

Text Books	❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998). ❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.			
Electrical Conductance	13	Activity, mean ionic activity and mean ionic activity coefficients of electrolytes.	PowerPoint presentation	
	14	Ionic strength of a solution, Debye-Hückel limiting law (*no derivation*)	PowerPoint presentation	
	15	Applications of conductance measurements	Demonstration	
	16	Determinations of degree of dissociation of weak electrolytes, ionic product of water	PowerPoint presentation	
	17	Solubility of sparingly soluble salts .	PowerPoint presentation	
	18	conductometric titrations.	PowerPoint presentation	
Text Books	❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998). ❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.			
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
UNIT 3 : Elect	1	Introduction – Electrochemical Cells and Electrolytic cells, Galvanic cells	PowerPoint presentation	
	2	Characteristics of reversible cells. Reversible electrodes – different	PowerPoint presentation	

romotiv e Force		types		
	3	Reference electrodes – Standard Hydrogen Electrode, Calomel electrode, electrode potential – electrochemical series.	Group discussions	
	4	Representation of cells – e.m.f of cell, electrode reactions and cell reactions.	Group discussions	
	5	Thermodynamics of reversible cells and reversible electrodes – Determination of ΔG, ΔH and ΔS of cell reaction.	PowerPoint presentation	
	7	E.M.F and equilibrium constant of cell reaction	PowerPoint presentation	
	1st Internal Examination			
	8	Effect of electrolyte concentration on electrode potential and e.m.f - Derivation of Nernst equation.	Chalk & board	
	9	Concentration cells – electrode concentration cell and electrolyte concentration cells	Power Point Presentation	
Text Books	❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house. ❖ F A Alberty and R J Silby, Physical Chemistry, John Wiley. ❖ P. W. Atkins, The elements of Physical chemistry, 8thedn, Oxford University Press.			
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
	10	Types of electrolyte concentration cells – with transference and without transference	Power Point Presentation	
	11	Liquid junction potential. Fuel cells – the hydrogen-oxygen fuel cell.	Power Point Presentation	
	12	Applications of e.m.f measurements – determination of solubility product	Power Point Presentation	
	13	determination of pH using hydrogen electrode	Chalk & board	

	14	quinhydrone electrode and glass electrode	Group Discussion	
	2nd Internal Examination			
	15	Potentiometric titrations - Redox indicators.	Power Point Presentation	
	16	Irreversible electrode processes – overvoltage.	Power Point Presentation	
	17	Corrosion of metals – forms of corrosion	Individual Assignment	
	18	Corrosion monitoring and prevention methods.	Group discussions	
Text Books	❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house. ❖ F A Alberty and R J Silby, Physical Chemistry, John Wiley. ❖ P. W. Atkins, The elements of Physical chemistry, 8thedn, Oxford University Press.			

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*72*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*4*
SUBJECT TITLE	**:**	**Advances in Chemistry**	**SUBJECT CODE**	**:**	**15U6ELCHE1**
COURSE TEACHERS	**:**	**Dr. Abi T G (ATG), Dr. Grace Thomas (GT) & Dr Ramakrishnan S (RKS), Dr Joseph John (JJ)**			
Course Objectives	**:**	***1.*** *Knowing the advance topics in organic, physical, inorganic and theoretical chemistry* ***2.*** *Understanding the chemistry of nanomaterials, Industrially important materials and learn about its applications in the current scenario* ***3.*** *Understand, the basic principles of Modern Analytical Techniques in Chemistry* ***4.*** *Understanding the basics principles of Green Chemistry, Supramolecular Chemistry and explore the different schemes in retrosynthetic analysis* ***5.*** *Understanding the basics of biophysical chemistry and knowing the applications of biopolymers* ***6.*** *Understanding the different computational chemistry methods and its scope in modern chemistry.*			

Teacher I – ATG **Module Taken : Unit 1.1: Advanced Topics in Inorganic Chemistry – Nanomaterials (Total – 9 Hrs)**
Instructional Hours : ***One Hour Per Week***

No. of Session	Session Topic and Discussion Theme	Method of Teaching	Remarks/Student Assignmets
1	Nanomaterials	Conventional Lecture	
2	Synthesis of nanomaterials – chemical precipitation,	Lecture with ICT- PPTs	**Seminar** **Assignment to Students on the Topic Applications of Carbon nanotubes**
3	Mechano-chemical method and micro emulsion method,		
4	Reduction technique, chemical vapour deposition and sol-gel method (brief study).		
5	Properties and applications of fullerenes,		
6	Quantum dots.		
7	Carbon nanotubes.		
8	Applications of nano materials - nano composites –		
9	Nano medicines		

References

1. V. S. Muraleedharan and A. Subramanian, Nano science and nanotechnology, Ane Books Pvt. Ltd. New Delhi, 2009
2. T. Pradeep, Nano; The Essentials, Mc Graw-Hill education, New Delhi, 2006.

	First Internal Test		

Teacher I – ATG **Module Taken : Unit 3.2 Advanced Topics in Physical Chemistry-Introduction to Computational Chemistry**

Instructional Hours : ***One Hour Per Week***

10	Scope of Computational chemistry. Building of 3D molecular structures using computer	Lecture with ICT- PPTs	

	softwares. Coordinate formats		
11	Z-matrix, Cartesian coordinate and PDB format. Z-matrix of simple molecules H_2O, CO_2 & NH_3.		
12	Introduction to Common computational and visualization softwares.		
13	Brief introduction to Hartree Fock, ab initio, semi empirical methods.		
14	DFT and molecular mechanics methods.		
15	. Basis sets, STO & GTO basis sets.		
	Second Internal Test		
16	Potential energy surface. Local and Global minima. Single point energy calculations and Geometry optimizations	Lecture with ICT- PPTs Problem Solving ICT- Computational Chemistry Softares	**Give Assignments on Computational Chemistry Calculations Using Gaussian Software**
17	Format of input and output files in Computational Chemistry Calculations.		
18	(Single point and Optimization Calculations in simple molecules such as molecules H_2O, CO_2 & NH_3 using suitable software package.		

Reference Text Books

1. T Clark , Hand book of Computational Chemistry, Wiley, New York.
2. W J Hehre, A J Shusterman, W W Huang, A laboratory book of computational organic chemistry, Wave function Inc.
3. A. R. Leach, Molecular Modeling, Longman.
4. D. C. Young, Computational Chemistry, A practical guide to applying techniques to real world problems, John Wiley
5. F. Jensen, Introduction to Computational Chemistry, John Wiley.

6. Guy H. Grant and W. Graham Richards, “Computational Chemistry”, OCP(29)
7. Christopher J. Cramer, John Wiley, “Essentials of Computational Chemistry”.

Teacher 2 – JJ Module Taken : Unit 1.2: Advanced Topics in Inorganic Chemistry – Industrially important materials
(Total – 8 Hrs) Instructional Hours : *One Hour Per Week*

No. of Session	Session Topic and Discussion Theme	Method of Teaching	Remarks/Student Assignmets
1	Refractory materials.	1. Conventional Lecture -Chalk & Board, 2. Seminar Presentation from Students	**Assignment for Class Note Preparation**
2	Carbides, nitrides, borides.		
3	Graphite and graphite oxide,		
4	Intercalation compounds of alkali metals,		
5	Carbon monofluoride,		
6	Intercalation compounds of graphite with metal Halides, glass,		
7	Silicates, zeolites,		
8	Ultramarines and ceramics.		
	First Internal Test		

Teacher 2 – JJ Module Taken : Unit 1.3 Advanced Topics in Inorganic Chemistry – Modern Analytical Techniques
Instructional Hours : *One Hour Per Week*

9	Thermo analytical methods:	1. Conventional Lecture -Chalk	
10	Principle of Thermo gravimetry,		
11	TGA of calcium oxalate monohydrate and Differential thermal analysis		

12	Differential scanning calorimetry. Applications.	& Board, 2. Seminar Presentation from Students	
13	Colorimetry: Principle, Beer's law, Lambert's law		
14	Absorption coefficient, transmittance, opacity.		
15	Absorbance, optical density, molar absorption coefficient.		
16	Principle of estimation of iron, chromium and ammonia.		
	Second Internal Test		
Reference Text Books			
1. H.H Willard, L.L. Merritt, J.A. Dean, F.A Settle, Instrumental methods of Analysis, CBS Publishers And Distributors, Delhi, 1996. 2. G.H Jeffery, J. Basset, J. Mendham, R.C Denny, Vogel's Textbook of Quantitative Chemical Analysis, ELBS 5th edn. 1996.			

Teacher III – GT Module Taken : Unit 2.1 Advanced topics in Organic Chemistry- Supramolecular Chemistry **(Total – 6 Hrs) Instructional Hours : *One Hour Per Week***			
No. of Session	**Session Topic and Discussion Theme**	**Method of Teaching**	**Remarks/Student Assignmets**
1	Introduction to Supramolecular Chemistry	Conventional Lecture	
2	Molecular Recognition	Lecture with ICT- PPTs	
3	Host-guest interactions.		
4	Types of non-covalent interactions.		
5	Importance of molecular recognition in DNA		
6	Importance of molecular recognition in protein structure		
	First Internal Test		
References 1. Helena Dodzuik, Introduction to Supramolecular Chemistry Springer (chapter 1,2**)** 2. J. M. Lehn, Supramolecular Chemistry, VCH 3. H. Vogtle, Supramolecular Chemistry, Wiley 4. En.wikipedia.org/wiki/Supramolecular Chemistry			
	First Internal Test		
Teacher III – GT Module Taken : Unit 2.2 Advanced topics in Organic Chemistry- Retrosynthetic analysis **(Total – 6 Hrs) Instructional Hours : *One Hour Per Week***			
7	Retrosynthetic analysis and disconnection approach.	Conventional Lecture and Power Point Presentation	**Seminar Presentation by**
8	Basic principles and terminology.		

9	Retrosynthetic analysis of simple cyclic and acyclic alkenes,	Lecture with ICT- PPTs	**Students**
10	Retrosynthetic analysis of alcohols		
11	Retrosynthetic analysis of carbonyl compounds.		
12	Simple problems of retro synthesis of the above compounds		

References

1. J. Clayden, N. Greeves, S. Warren and P. Wothers, Organic Chemistry, Oxford University Press, 2001.(Chapter 30)
2. Paula Yurkanis Bruice, Organic Chemistry, 2002, (3rd Edition) (chapter 29)
3. S. Warren, Organic Synthesis, The disconnection Approach, John Wiley & Sons, 2004.
4. E. J. Corey, X-M. Cheng (1995). *The Logic of Chemical Synthesis*. New York: Wiley. ISBN 0-471-11594-0.
5. W. Carruthers, 'Modern Methods in Organic Synthesis', Cambridge University Press., 1986.

	Second Internal Test		
13	Introduction to Green Chemistry	Lecture with ICT- PPTs	**Seminar Presentation by Students**
14	Need for green chemistry		
15	Twelve principles of green chemistry		
16	Examples of Green Chemistry Processes		
17	Green polymer.		
18	Polylactic acid (PLA)		

Reference Text Books

1. V. K. Ahluwalia, Green Chemistry, *Ane Books* India.
2. Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice Oxford University Press: New York, 1998, p.30. By permission

of Oxford University Press.
3. Arends I., R. Sheldon, U. Hanefeld, Green Chemistry and Catalysis, 2007 WILEY-VCH, Verlag GmbH & Co. KGaA, Weinheim.

Teacher IV – RKS Module Taken : Unit 2.4: Advanced Topics in Organic Chemistry – Advances in Polymers (Total – 9 Hrs)
Instructional Hours : ***One Hour Per Week***

No. of Session	Session Topic and Discussion Theme	Method of Teaching	Remarks/Student Assignmets
1	Biopolymers -	Conventional Lecture	
2	biomaterials	1. Conventional Lecture -Chalk & Board,	
3	Polymers in medical field.		
4	High temperature ploymers		
5	Fire-resistant polymers.		
6	Silicones,		
7	Conducting polymers-		
8	Carbon fibers.		
9	General discussion about the biopolymers		
	First Internal Test		

Teacher IV – RKS Module Taken : Unit 3.1 Advanced Topics in Physical Chemistry-Biophysical Chemistry
(Total – 10 Hrs) Instructional Hours : ***One Hour Per Week***

10	Protein structure; Amino acids.		
11	Primary, secondary and tertiary structure;		

12	Protein folding. Significance of Van der Waals force, hydrogen bond and hydrophobic interactions.	Lecture with ICT- PPTs	Assignment as Problems Related to Henderson and Hasselbalch equation
13	Acid-Base equilibrium: .Protonation and deprotonation reactions.		
14	Biological significance of pH; Properties of proteins with emphasis on isoelectric pH..		
15	Henderson and Hasselbalch equation. Titration curves of amino acids & pK values,		
	Second Internal Test		
16	Buffers & Stability of their pH	Lecture with ICT- PPTs	
17	Thermodynamics and Kinetics. Standard free energy change in biochemical reactions, exergonic,.		
18	Hydrolysis of ATP. Chemical potential. Oxidation/reduction reactions and bioenergetics.		
19	Enzyme catalysis. Michael Menton kinetics		

Reference Text Books

1. Principles of Biochemistry- Albert L. Lehninger CBS Publishers & Distributors.
2. Biochemistry – Lubert Stryer Freeman International Edition.
3. Biochemistry - Voet and Voet, John Wiley and Sons.
4. Physical Chemistry for Life Sciences, Peter Atkins and Julio de Paula, 2006, Oxford Press
5. Narayanan, P (2000) Essentials of Biophysics, New Age Int. Pub. New Delhi.
6. Roy R.N. (1999) A Text Book of Biophysics New Central Book Agency.
7. Introduction to Biophysical chemistry, R. Bruce Martin, McGraw-Hill, NY, 1964.
8. Physical Chemistry with applications to Biological systems, Ramond Chnag, Mc Millan publishing Co.inc, New York 1977.
9. Principles of Physical Biochemistry 2nd Edition, K.E. van Holde, W.C. Johnson, P.S. Ho,

Pearson Prentice Hall, ISBN 0-13-046427-9.

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	BSc PHYSICS	**SEMESTER**	1
COURSE CODE AND TITLE	**15U1CPCHE1**, GENERAL CHEMISTRY	**CREDIT**	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Ramakrishnan S, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	Describe different models of atomic structure.
2	Define acids and bases and explain the concept of equilibrium.
3	Explain the fundamentals of nuclear chemistry and analytical chemistry.
4	Understand basics of thermodynamics

Dr. Ramakrishnan S

MODULE I : Atomic Structure : 9 hrs

Sl.No	Session	Topic	Method of Teaching	COs
1	1	Introduction: Atoms, Planck's quantum Theory, Photoelectric effect	Chalk & Board	1
2	2	Postulates of bohr's theory, Energy levels in atom	Chalk & Board	1
3	3	origin of hydrogen spectrum	Chalk & Board	1
4	4	Sommerfeld's extension of Bohr's Theory	Chalk & Board	1
5	5	Shortcomings of Bohr Theory	Chalk & Board	1
First Internal Examination				
6	6	Dual nature of matter and radiation. Derivation of de Broglie equation	Chalk & Board	1
7	7	Wave nature of electron and quantisation of angular momentum, Heisenberg's uncertainty principle	Chalk & Board	1
8	8	Concept of orbital, Quantum numbers,	Chalk & Board	1

		shapes of orbitals		
9	9	Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle	Chalk & Board	1
MODULE II: Concept of Equilibrium:				
10	10	Acids and bases	Chalk & Board	2
11	11	theories of acids and bases	Chalk & Board	2
12	12	ionic product of water, introductory idea of pH, pOH.	Chalk & Board	2
13	13	Strengths of acids and bases, Ka and Kb, pKa and pKb	Chalk & Board	2
14	14	buffer solution, Henderson equation	Chalk & Board	2
15	15	hydrolysis of salt, solubility	Chalk & Board	2
First Internal Examination				
16	16	solubility product, application	Chalk & Board	2
17	17	Common ion effect, application.	Chalk & Board	2
Mr.Senju Devassykutty				
MODULE III: Nuclear Chemistry : (6 hrs)				
1	1	Stability of Nucleus	Chalk & Board	3
2	2	natural radioactivity, induced radioactivity	Chalk & Board	3
3	3	fertile and fissile isotopes, units of radioactivity.	Chalk & Board	3
4	4	Nuclear Reactions: fission and fusion, chain reactions	Chalk & Board	3
5	5	disposal of nuclear wastes	Chalk & Board	3
6	6	applications of radioactivity	Chalk & Board	3
MODULE IV: Analytical Chemistry- (5 hrs)				
7	7	Concentration terms- molality, molarity, normality, weight percentage, ppm, and millimoles.	Chalk & Board	3
Second Internal Examination				
8	8	Titrimetric method of analysis: General principle, types of titrations, requirements for titrimeric analysis.	Chalk & Board	3
9	9	Primary and secondary standards, criteria	Chalk & Board	3

		for primary standards, preparation of standard solutions, standardization of solutions		
10	10	Errors	Chalk & Board	3
11	11	Minimizatiion of errors	Chalk & Board	3
MODULE V: Laws of Thermodynamics : (8 hrs)				
12	12	System and Surrounding	Chalk & Board	4
13	13	First law of Thermodynamics: Internal energy, Significance of internal energy change, enthalpy	Chalk & Board	4
14	14	Second law of Thermodynamics: free energy, Entropy and Spontaneity,	Chalk & Board	4
Second internal Examination				
15	15	Statement of second law based on entropy	Chalk & Board	4
16	16	Entropy change in Phase transitions	Chalk & Board	4
17	17	entropy of fusion, entropy of vaporization, entropy of sublimation	Chalk & Board	4
18	18	The concept of Gibbs's free energy- Physical significance of free energy, conditions for equilibrium & spontaneity based on ΔG values.	Chalk & Board	4
19	19	Effect of temperature on spontaneity of Reaction. Third law of thermodynamics	Chalk & Board	4

TEXTBOOKS AND REFERENCES	
1	P. L. Soni, Inorganic Chemistry.
2	C. N. R. Rao, University General Chemistry, Macmillan.
3	R. A. Day Junior, A.L. Underwood, Quantitative Analysis, 5th edn. Prentice Hall of India Pvt. Ltd. New Delhi, 1988.
4	R. Gopalan, Analytical Chemistry, S. Chand and Co., New Delhi.
5	B. R. Puri, L. R. Sharma, M.S. Pathania, Elements of Physical Chemistry, 3rd edn. Vishal Pub. CO., 2008.
6	B. R. Puri, L. R. Sharma, Kalia, Principles of Inorganic Chemistry, 31st edn. Milstone (2010).
7	Manas Chanda, Atomic Structure and Molecular Spectroscopy.
8	Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas, 6th edn. Pearson Education (2003).

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Alignment with POs, PSOs and COs**
1	1	atomic structure	Numerical problems	CO1
2	2	concepts of chemical equilibrium	Numerical problems	CO2

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	BSc BOTANY	**SEMESTER**	1
COURSE CODE AND TITLE	**15U1CPCHE1**, GENERAL CHEMISTRY	**CREDIT**	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Ramakrishnan S, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	Describe different models of atomic structure.
2	Define acids and bases and explain the concept of equilibrium.
3	Explain the fundamentals of nuclear chemistry and analytical chemistry.
4	Understand basics of thermodynamics

MODULE I : Atomic Structure : Dr. Ramakrishnan S				
Sl.No	**Session**	**Topic**	**Method of Teaching**	**COs**
1	1	Introduction: Atoms, Planck's quantum Theory, Photoelectric effect	Chalk & Board	1
2	2	Postulates of bohr's theory, Energy levels in atom	Chalk & Board	1
3	3	origin of hydrogen spectrum	Chalk & Board	1
4	4	Sommerfeld's extension of Bohr's Theory	Chalk & Board	1
5	5	Shortcomings of Bohr Theory	Chalk & Board	1
First Internal Examination				
6	6	Dual nature of matter and radiation. Derivation of de Broglie equation	Chalk & Board	1
7	7	Wave nature of electron and quantisation of angular momentum, Heisenberg's uncertainty principle	Chalk & Board	1
8	8	Concept of orbital, Quantum numbers, shapes of orbitals	Chalk & Board	1

9	9	Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle	Chalk & Board	1
MODULE II: Concept of Equilibrium: Dr. Ramakrishnan S				
1	1	Acids and bases	Chalk & Board	2
2	2	theories of acids and bases	Chalk & Board	2
3	3	ionic product of water, introductory idea of pH, pOH.	Chalk & Board	2
4	4	Strengths of acids and bases, Ka and Kb, pKa and pKb	Chalk & Board	2
5	5	buffer solution, Henderson equation	Chalk & Board	2
6	6	hydrolysis of salt, solubility	Chalk & Board	2
First Internal Examination				
7	7	solubility product, application	Chalk & Board	2
8	8	Common ion effect, application.	Chalk & Board	2
MODULE III: Nuclear Chemistry : Mr.Senju Devassykutty				
1	1	Stability of Nucleus	Chalk & Board	3
2	2	natural radioactivity, induced radioactivity	Chalk & Board	3
3	3	fertile and fissile isotopes, units of radioactivity.	Chalk & Board	3
4	4	Nuclear Reactions: fission and fusion, chain reactions	Chalk & Board	3
5	5	disposal of nuclear wastes	Chalk & Board	3
6	6	applications of radioactivity	Chalk & Board	3
MODULE IV: Analytical Chemistry- Basic principles: Mr.Senju Devassykutty				
1	1	Concentration terms- molality, molarity, normality, weight percentage, ppm, and millimoles.	Chalk & Board	3
Second Internal Examination				
2	2	Titrimetric method of analysis: General principle, types of titrations, requirements for titrimeric analysis.	Chalk & Board	3
3	3	Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of	Chalk & Board	3

		solutions		
MODULE V: Laws of Thermodynamics : Mr.Senju Devassykutty				
1	1	System and Surrounding	Chalk & Board	4
2	2	First law of Thermodynamics: Internal energy, Significance of internal energy change, enthalpy	Chalk & Board	4
3	3	Second law of Thermodynamics: free energy, Entropy and Spontaneity,	Chalk & Board	4
Second internal Examination				
4	4	Statement of second law based on entropy	Chalk & Board	4
5	5	Entropy change in Phase transitions	Chalk & Board	4
6	6	entropy of fusion, entropy of vaporization, entropy of sublimation	Chalk & Board	4
7	7	The concept of Gibbs's free energy- Physical significance of free energy, conditions for equilibrium & spontaneity based on ΔG values.	Chalk & Board	4
8	8	Effect of temperature on spontaneity of Reaction.	Chalk & Board	4
9	9	Third law of thermodynamics	Chalk & Board	4

TEXTBOOKS AND REFERENCES	
1	P. L. Soni, Inorganic Chemistry.
2	C. N. R. Rao, University General Chemistry, Macmillan.
3	R. A. Day Junior, A.L. Underwood, Quantitative Analysis, 5th edn. Prentice Hall of India Pvt. Ltd. New Delhi, 1988.
4	R. Gopalan, Analytical Chemistry, S. Chand and Co., New Delhi.
5	B. R. Puri, L. R. Sharma, M.S. Pathania, Elements of Physical Chemistry, 3rd edn. Vishal Pub. CO., 2008.
6	B. R. Puri, L. R. Sharma, Kalia, Principles of Inorganic Chemistry, 31st edn. Milstone (2010).
7	.Manas Chanda, Atomic Structure and Molecular Spectroscopy.
8	Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas, 6th edn. Pearson Education (2003).

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Alignment with POs, PSOs and COs**
1	1	atomic structure	Numerical problems	CO1
2	2	concepts of chemical equilibrium	Numerical problems	CO2

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	BSc Zoology	**SEMESTER**	1
COURSE CODE AND TITLE	**15U1CPCHE1**, GENERAL CHEMISTRY	**CREDIT**	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Ramakrishnan S, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	Describe different models of atomic structure.
2	Define acids and bases and explain the concept of equilibrium.
3	Explain the fundamentals of nuclear chemistry and analytical chemistry.
4	Understand basics of thermodynamics

Dr. Ramakrishnan S

MODULE I : Atomic Structure : 9 hrs

Sl.No	Session	Topic	Method of Teaching	COs
1	1	Introduction: Atoms, Planck's quantum Theory, Photoelectric effect	Chalk & Board	1
2	2	Postulates of bohr's theory, Energy levels in atom	Chalk & Board	1
3	3	origin of hydrogen spectrum	Chalk & Board	1
4	4	Sommerfeld's extension of Bohr's Theory	Chalk & Board	1
5	5	Shortcomings of Bohr Theory	Chalk & Board	1
First Internal Examination				
6	6	Dual nature of matter and radiation. Derivation of de Broglie equation	Chalk & Board	1
7	7	Wave nature of electron and quantisation of angular momentum, Heisenberg's uncertainty principle	Chalk & Board	1
8	8	Concept of orbital, Quantum numbers,	Chalk & Board	1

		shapes of orbitals		
9	9	Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle	Chalk & Board	1
MODULE II: Concept of Equilibrium:				
10	10	Acids and bases	Chalk & Board	2
11	11	theories of acids and bases	Chalk & Board	2
12	12	ionic product of water, introductory idea of pH, pOH.	Chalk & Board	2
13	13	Strengths of acids and bases, Ka and Kb, pKa and pKb	Chalk & Board	2
14	14	buffer solution, Henderson equation	Chalk & Board	2
15	15	hydrolysis of salt, solubility	Chalk & Board	2
First Internal Examination				
16	16	solubility product, application	Chalk & Board	2
17	17	Common ion effect, application.	Chalk & Board	2
Mr.Senju Devassykutty				
MODULE III: Nuclear Chemistry : (6 hrs)				
1	1	Stability of Nucleus	Chalk & Board	3
2	2	natural radioactivity, induced radioactivity	Chalk & Board	3
3	3	fertile and fissile isotopes, units of radioactivity.	Chalk & Board	3
4	4	Nuclear Reactions: fission and fusion, chain reactions	Chalk & Board	3
5	5	disposal of nuclear wastes	Chalk & Board	3
6	6	applications of radioactivity	Chalk & Board	3
MODULE IV: Analytical Chemistry- (5 hrs)				
7	7	Concentration terms- molality, molarity, normality, weight percentage, ppm, and millimoles.	Chalk & Board	3
Second Internal Examination				
8	8	Titrimetric method of analysis: General principle, types of titrations, requirements for titrimeric analysis.	Chalk & Board	3
9	9	Primary and secondary standards, criteria	Chalk & Board	3

		for primary standards, preparation of standard solutions, standardization of solutions		
10	10	Errors	Chalk & Board	3
11	11	Minimizatiion of errors	Chalk & Board	3
MODULE V: Laws of Thermodynamics : (8 hrs)				
12	12	System and Surrounding	Chalk & Board	4
13	13	First law of Thermodynamics: Internal energy, Significance of internal energy change, enthalpy	Chalk & Board	4
14	14	Second law of Thermodynamics: free energy, Entropy and Spontaneity,	Chalk & Board	4
Second internal Examination				
15	15	Statement of second law based on entropy	Chalk & Board	4
16	16	Entropy change in Phase transitions	Chalk & Board	4
17	17	entropy of fusion, entropy of vaporization, entropy of sublimation	Chalk & Board	4
18	18	The concept of Gibbs's free energy- Physical significance of free energy, conditions for equilibrium & spontaneity based on ΔG values.	Chalk & Board	4
19	19	Effect of temperature on spontaneity of Reaction. Third law of thermodynamics	Chalk & Board	4

TEXTBOOKS AND REFERENCES	
1	P. L. Soni, Inorganic Chemistry.
2	C. N. R. Rao, University General Chemistry, Macmillan.
3	R. A. Day Junior, A.L. Underwood, Quantitative Analysis, 5th edn. Prentice Hall of India Pvt. Ltd. New Delhi, 1988.
4	R. Gopalan, Analytical Chemistry, S. Chand and Co., New Delhi.
5	B. R. Puri, L. R. Sharma, M.S. Pathania, Elements of Physical Chemistry, 3rd edn. Vishal Pub. CO., 2008.
6	B. R. Puri, L. R. Sharma, Kalia, Principles of Inorganic Chemistry, 31st edn. Milstone (2010).
7	Manas Chanda, Atomic Structure and Molecular Spectroscopy.
8	Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas, 6th edn. Pearson Education (2003).

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Alignment with POs, PSOs and COs**
1	1	atomic structure	Numerical problems	CO1
2	2	concepts of chemical equilibrium	Numerical problems	CO2

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	BSc PHYSICS	**SEMESTER**	2
COURSE CODE AND TITLE	**15U2CPCHE2**, BASIC ORGANIC CHEMISTRY	**CREDIT**	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Ramakrishnan S, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	Understand the basics of organic chemistry.
2	Understand various purification techniques like solvent extraction, distillation and crystallization. .
3	Explain the basics of organic reaction mechanism.
4	Discuss the classification and synthesis of polymers

Dr. Ramakrishnan S.

MODULE I: Purification of Organic Compounds:

Sl.No	**Session**	**Topic**	**Method of Teaching**	**Value Additions**	**CO**
1	1	Purification techniques: Recrystallisation, sublimation.	Chalk & Board		
2	2	General principles of distillation, fractional distillation, distillation under reduced pressure	Chalk & Board		
3	3	Solvent extraction	Chalk & Board		

MODULE III: Mechanisms of Organic Reactions :

4	4	Hybridization and shape of molecules - sp^3, sp^2 and sp, (ethane, ethene, ethyne)	Chalk & Board		

5	5	Types of reagents - electrophiles, nucleophiles.	Chalk & Board		
6	6	Types of electron displacement in organic molecules	Chalk & Board		
7	7	Explanation of the strength of carboxylic and halogen substituted acids,	Chalk & Board		
8	8	base strength of primary, secondary and tertiary amines.	Chalk & Board		
9	9	Types of bond fission- homolytic and heterolytic fission.	Chalk & Board		
First Internal Examination					
10	10	Reactive intermediates- carbocations-Their formation and stability.	Chalk & Board		
11	11	Substitution reactions: Nucleophilic substitution of alkyl halides- S_N1 and S_N2 mechanisms. Factors affecting rate of Substitution reaction of alkyl halide. Nature of alkyl halide, Effect of solvent. Stereochemistry of S_N1 and S_N2 reactions.	Chalk & Board		
12	12	Electrophilic substitution in benzene-reaction mechanism. Halogenation, Nitration and Sulphonation	Chalk & Board		
13	13	Addition reactions: electrophilic addition. Addition of Bromine and Hydrogen halides to ethane, propene and ethyne-the Markwonikoff's rule, Peroxide effect.	Chalk & Board		
Second Internal Examination					
14	14	Reactive intermediates- free radicals. Their formation and stability.	Chalk & Board		
15	15	Substitution reactions: Nucleophilic substitution of alkyl halides- SN1 and SN2 mechanisms. Factors affecting rate of Substitution reaction of alkyl halide. Nature of alkyl halide, Effect of solvent. Stereochemistry of SN1 and SN2 reactions.	Chalk & Board		
16	16	Electrophilic substitution in benzene-reaction mechanism. Halogenation, Nitration and Sulphonation	Chalk & Board		
17	17	Addition reactions: electrophilic addition. Addition of Bromine and Hydrogen halides to ethane, propene and ethyne-the Markwonikoff's rule, Peroxide effect.	Chalk & Board		
18	18	Elimination reactions: E1 and E2 mechanisms. Saytzeff and Hofmann elimination	Chalk & Board		

Mr. Senju Devassykutty					
MODULE II: Stereochemistry of Organic Compounds:					
1	1	Geometrical isomerism- *cis* and *trans* configuration, 2-butene, maleic and fumaric acid,	Chalk & Board		
2	2	determination of configuration of cis-trans isomers, E and Z configuration.	Chalk & Board		
3	3	Optical isomerism- D and L configuration. Optical activity,	Chalk & Board		
4	4	Chirality, Stereogenic Centre	Chalk & Board		
5	5	Enantiomers and diastereomers	Chalk & Board		
6	6	optical isomerism in lactic acid and tartaric acid, .	Chalk & Board		
First Internal Examination					
7	7	Racemisation	Chalk & Board		
8	8	Conformation- Newman projection, Saw-horse projection	Chalk & Board		
9	9	Conformations of Ethane	Chalk & Board		
10	10	n - butane	Chalk & Board		
11	11	Cyclohexane.	Chalk & Board		

MODULE V: Natural and Synthetic Polymers:					
12	12	Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres; homopolymers and copolymers.	Chalk & Board		
13	13	Polymerization reactions, Addition Polymerization,	Chalk & Board		
Second Internal examination					
14	14	Condensation polymerization,	Chalk & Board		
15	15	polyethene, polypropylene, PVC, phenol-formaldehyde resins, polyamides (nylons) and polyester.	Chalk & Board		

16	16	Natural rubber: structure, vulcanization.	Chalk & Board		
17	17	Synthetic rubbers- SBR, nitrile rubber, neoprene.	Chalk & Board		
18	18	Biodegradable polymers, environmental hazards caused by polymers, Health problem due to burning plastics.	Chalk & Board		

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Alignment with POs, PSOs and COs**
1	1	Stereochemistry of Organic Compounds : some organic compounds	written	CO1
2	2	Natural rubber- structure, sources, processes, applications	written	CO4

TEXTBOOKS AND REFERENCES	
1	I. L. Finar, Organic Chemistry, Vol. I, 6th edn. Pearson.
2	S. M. Mukherji, S. P Singh, R. P Kapoor, Organic Chemistry, Vol.1, New Age International (P) Ltd, 2006
3	P.S Kalsi, Stereochemistry Conformation and Mechanism, New Age International Publishers, 2004
4	Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, 6th edn. Orient Longman, 1988
5	S. M. Mukherji, S.P Singh, Reaction Mechanism in Organic Chemistry, Macmillan, 3rd Edn., 2003
6	V. R. Gowariker, Polymer Science, Wiley Eastern.
7	K.S Tewari,N K Vishnoi, Text book of Organic Chemistry, Vikas Publishing House Pvt. Ltd.2007.

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	BSc BOTANY	**SEMESTER**	2
COURSE CODE AND TITLE	**15U2CPCHE2**, BASIC ORGANIC CHEMISTRY	**CREDIT**	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Ramakrishnan S, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	Understand the basics of organic chemistry.
2	Understand various purification techniques like solvent extraction, distillation and crystallization. .
3	Explain the basics of organic reaction mechanism.
4	Discuss the classification and synthesis of polymers

MODULE I: Purification of Organic Compounds: Dr. Ramakrishnan S					
Sl.No	**Session**	**Topic**	**Method of Teaching**	**Value Additions**	**CO**
1	1	Purification techniques: Recrystallisation, sublimation.	Chalk & Board		
2	2	General principles of distillation, fractional distillation, distillation under reduced pressure	Chalk & Board		
3	3	Solvent extraction	Chalk & Board		

MODULE III: Mechanisms of Organic Reactions : Dr. Ramakrishnan S.					
4	4	Hybridization and shape of molecules - sp^3, sp^2 and sp, (ethane, ethene, ethyne)			

5	5	Types of reagents - electrophiles, nucleophiles.	Chalk & Board		
6	6	Types of electron displacement in organic molecules	Chalk & Board		
7	7	Explanation of the strength of carboxylic and halogen substituted acids,	Chalk & Board		
8	8	base strength of primary, secondary and tertiary amines.	Chalk & Board		
9	9	Types of bond fission- homolytic and heterolytic fission.	Chalk & Board		
First Internal Examination					
10		Reactive intermediates- carbocations-Their formation and stability.	Chalk & Board		
11		Substitution reactions: Nucleophilic substitution of alkyl halides- S_N1 and S_N2 mechanisms. Factors affecting rate of Substitution reaction of alkyl halide. Nature of alkyl halide, Effect of solvent. Stereochemistry of S_N1 and S_N2 reactions.	Chalk & Board		
12		Electrophilic substitution in benzene-reaction mechanism. Halogenation, Nitration and Sulphonation	Chalk & Board		
13		Addition reactions: electrophilic addition. Addition of Bromine and Hydrogen halides to ethane, propene and ethyne-the Markwonikoff's rule, Peroxide effect.	Chalk & Board		
Second Internal Examination					
14		Reactive intermediates- free radicals. Their formation and stability.	Chalk & Board		
15		Substitution reactions: Nucleophilic substitution of alkyl halides- SN1 and SN2 mechanisms. Factors affecting rate of Substitution reaction of alkyl halide. Nature of alkyl halide, Effect of solvent. Stereochemistry of SN1 and SN2 reactions.	Chalk & Board		
16		Electrophilic substitution in benzene-reaction mechanism. Halogenation, Nitration and Sulphonation	Chalk & Board		
17		Addition reactions: electrophilic addition. Addition of Bromine and Hydrogen halides to ethane, propene and ethyne-the Markwonikoff's rule, Peroxide effect.	Chalk & Board		
18		Elimination reactions: E1 and E2 mechanisms. Saytzeff and Hofmann elimination	Chalk & Board		

MODULE II: Stereochemistry of Organic Compounds: Mr. Senju Devassykutty					
1	1	Geometrical isomerism- *cis* and *trans* configuration, 2-butene, maleic and fumaric acid,	Chalk & Board		
2	2	determination of configuration of cis-trans isomers, E and Z configuration.	Chalk & Board		
3	3	Optical isomerism- D and L configuration. Optical activity,	Chalk & Board		
4	4	Chirality, Stereogenic Centre	Chalk & Board		
5	5	Enantiomers and diastereomers	Chalk & Board		
6	6	optical isomerism in lactic acid and tartaric acid, .	Chalk & Board		
First Internal Examination					
7	7	Racemisation	Chalk & Board		
8	8	Conformation- Newman projection, Saw-horse projection	Chalk & Board		
9	9	Conformations of Ethane	Chalk & Board		
10	10	n - butane	Chalk & Board		
11	11	Cyclohexane.	Chalk & Board		

MODULE V: Natural and Synthetic Polymers: Mr. Senju Devassykutty					
12	12	Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres; homopolymers and copolymers.	Chalk & Board		
13	13	Polymerization reactions, Addition Polymerization,	Chalk & Board		
Second Internal examination					
14	14	Condensation polymerization,	Chalk & Board		
15	15	polyethene, polypropylene, PVC, phenol-formaldehyde resins, polyamides (nylons) and polyester.	Chalk & Board		
16	16	Natural rubber: structure, vulcanization.	Chalk & Board		
17	17	Synthetic rubbers- SBR, nitrile rubber,	Chalk &		

		neoprene.	Board		
18	18	Biodegradable polymers, environmental hazards caused by polymers, Health problem due to burning plastics.	Chalk & Board		

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Alignment with POs, PSOs and COs**
1	1	Stereochemistry of Organic Compounds : some organic compounds	written	CO1
2	2	Natural rubber- structure, sources, processes, applications	written	CO4

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4	Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, 6th edn. Orient Longman, 1988
5	S. M. Mukherji, S.P Singh, Reaction Mechanism in Organic Chemistry, Macmillan, 3rd Edn., 2003
6	V. R. Gowariker, Polymer Science, Wiley Eastern.
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SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN
ACADEMIC YEAR 2017-2018

PROGRAMME	BSc Zoology	**SEMESTER**	2
COURSE CODE AND TITLE	**15U2CPCHE2**, BASIC ORGANIC CHEMISTRY	**CREDIT**	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Ramakrishnan S, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	Understand the basics of organic chemistry.
2	Understand various purification techniques like solvent extraction, distillation and crystallization. .
3	Explain the basics of organic reaction mechanism.
4	Discuss the classification and synthesis of polymers

Dr. Ramakrishnan S.

MODULE I: Purification of Organic Compounds:

Sl.No	**Session**	**Topic**	**Method of Teaching**	**Value Additions**	**CO**
1	1	Purification techniques: Recrystallisation, sublimation.	Chalk & Board		
2	2	General principles of distillation, fractional distillation, distillation under reduced pressure	Chalk & Board		
3	3	Solvent extraction	Chalk & Board		

MODULE III: Mechanisms of Organic Reactions :

4	4	Hybridization and shape of molecules - sp^3, sp^2 and sp, (ethane, ethene, ethyne)	Chalk & Board		

5	5	Types of reagents - electrophiles, nucleophiles.	Chalk & Board		
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7	7	Explanation of the strength of carboxylic and halogen substituted acids,	Chalk & Board		
8	8	base strength of primary, secondary and tertiary amines.	Chalk & Board		
9	9	Types of bond fission- homolytic and heterolytic fission.	Chalk & Board		
First Internal Examination					
10	10	Reactive intermediates- carbocations-Their formation and stability.	Chalk & Board		
11	11	Substitution reactions: Nucleophilic substitution of alkyl halides- S_N1 and S_N2 mechanisms. Factors affecting rate of Substitution reaction of alkyl halide. Nature of alkyl halide, Effect of solvent. Stereochemistry of S_N1 and S_N2 reactions.	Chalk & Board		
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14	14	Reactive intermediates- free radicals. Their formation and stability.	Chalk & Board		
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18	18	Elimination reactions: E1 and E2 mechanisms. Saytzeff and Hofmann elimination	Chalk & Board		

Mr. Senju Devassykutty					
MODULE II: Stereochemistry of Organic Compounds:					
1	1	Geometrical isomerism- *cis* and *trans* configuration, 2-butene, maleic and fumaric acid,	Chalk & Board		
2	2	determination of configuration of cis-trans isomers, E and Z configuration.	Chalk & Board		
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7	7	Racemisation	Chalk & Board		
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9	9	Conformations of Ethane	Chalk & Board		
10	10	n - butane	Chalk & Board		
11	11	Cyclohexane.	Chalk & Board		

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12	12	Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres; homopolymers and copolymers.	Chalk & Board		
13	13	Polymerization reactions, Addition Polymerization,	Chalk & Board		
Second Internal examination					
14	14	Condensation polymerization,	Chalk & Board		
15	15	polyethene, polypropylene, PVC, phenol-formaldehyde resins, polyamides (nylons) and polyester.	Chalk & Board		

16	16	Natural rubber: structure, vulcanization.	Chalk & Board		
17	17	Synthetic rubbers- SBR, nitrile rubber, neoprene.	Chalk & Board		
18	18	Biodegradable polymers, environmental hazards caused by polymers, Health problem due to burning plastics.	Chalk & Board		

ASSIGNMENTS AND SEMINARS				
Sl No	**Module**	**Topic**	**Nature of Assignment**	**Alignment with POs, PSOs and COs**
1	1	Stereochemistry of Organic Compounds : some organic compounds	written	CO1
2	2	Natural rubber- structure, sources, processes, applications	written	CO4

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2	S. M. Mukherji, S. P Singh, R. P Kapoor, Organic Chemistry, Vol.1, New Age International (P) Ltd, 2006
3	P.S Kalsi, Stereochemistry Conformation and Mechanism, New Age International Publishers, 2004
4	Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, 6th edn. Orient Longman, 1988
5	S. M. Mukherji, S.P Singh, Reaction Mechanism in Organic Chemistry, Macmillan, 3rd Edn., 2003
6	V. R. Gowariker, Polymer Science, Wiley Eastern.
7	K.S Tewari,N K Vishnoi, Text book of Organic Chemistry, Vikas Publishing House Pvt. Ltd.2007.

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Physics*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*3*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	ADVANCED PHYSICAL CHEMISTRY – I	**SUBJECT CODE**	**:**	*15U3CPCHE3.1*
COURSE TEACHERS	**:**	*Dr. MIDHUN DOMINIC C.D, Dr. THOMMACHAN XAVIER, Dr. K.B.JOSE*			
COURSE OUTCOMES (COs)	**:**	**CO1** - *To have idea about Nanochemistry and nanotechnology* **CO2** - *Determination of symmetry of molecules* **CO3** - *Study of phase equilibria of different systems* **CO4** - *An idea of solid state ad crystal systems* **CO5** - *An idea on properties of liquid state* **CO6** - *To study the basic concepts of surface chemistry* **CO7** - *To have an idea about colloids*			

Dr. MIDHUN DOMINIC C D				
Unit	**No. of Sessions**	**Session Topic and Discussion Theme**	**Mode of teaching**	**COs**
Nanomaterials and Nanotechnology (8 hrs)	1	Introduction to nanoscience-Moore's law	Lecture	**CO1**
	2	properties of nanomaterials	Lecture	**CO1**
	3	Synthesis of nanomaterials-reduction method-precipitation method-sol gel method	Lecture	**CO1**
	4	Green synthesis of nanosilver and nanogold-	Lecture	**CO1 CO5**
		First Internal examination		
Liquid State(5 hrs)	5	Properties and applications of nanomaterials	Lecture	**CO1 CO5**
	6	nanocomposites-nanomedicine.	Lecture	**CO5**
	7	Intermolecular forces liquids compared with gases and solids	Lecture	**CO5**

	8	viscosity, surface tension	Lecture	
	9	Liquid crystals – the intermediate phase between solid and normal liquid phases,	Lecture	
	Second Internal examination			**CO5**
	10	thermographic behavior, classification	Lecture	**CO5**
	11	structure of nematic and cholesteric phases.	Lecture	**CO6**
	12	Adsorption – types of adsorption of gases by solids	Lecture	**CO6** **CO6**
	13	Factors influencing adsorption	Lecture	
	14	Freundlich adsorption isotherm – Langmuir adsorption isotherm	Lecture	**CO7** **CO7**
	15	Colloids: preparation, properties – optical and electrical	Lecture	**CO7**
	16	Electric double layer, coagulation, electrophoresis, electro osmosis	Lecture	
	17	Surfactants, micelle, applications of colloids	Seminar	
	References: 1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, 40th edn. Vishal Pub. Co. Jalandhar (2003) 2. Ashcroft / Mermin, Solid State Physics, Thomson Publishers 3. J. Tareen and T. Kutty, A basic course in Crystallography, University Press.			
Dr. THOMMACHAN XAVIER				
Symmetry and Molecular Structure (9 hrs)	1	Symmetry elements and symmetry operation	Lecture	**CO2** **CO2**
	2	Centre of symmetry, plane of symmetry,	Lecture	**CO2**
	3	proper and improper axes of symmetry,	Lecture	**CO2**
	4	identity, molecular point groups,	Lecture	**CO2**
	5	Schoeniflies symbol and determination of point groups of simple molecule- H_2O	Lecture	**CO2**
	6	point groups of simple molecule NH_3, BF_3,	Lecture	
	First Internal examination			**CO2**
	7	point groups of simple molecule CO, HCl,	Lecture	**CO2**
	8	point groups of simple molecule C_2H_2, CO_2,	Lecture	
	9	point groups of simple molecule Benzene, NO_3^-, PCl_5.	Lecture	
	10	Revision	Discussion	
Phase Equilib	11	The phase rule, definition,	Lecture	**CO3**
	12	equilibrium between phases, one component system – water system	Lecture	**CO3** **CO3**

rium **(9 hrs)**	13	Sulphur system.	Lecture	**CO3**
	14	Distribution law, partition coefficient,	Lecture	
		Second Internal examination		
	15	applications- Study of association or dissociation	Lecture	**CO3**
	16	Principle of extraction. Distribution indicators.	Lecture	**CO3** **CO3**
	17	Revision	Discussion	

References:

1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, 40th edn. Vishal Pub. Co. Jalandhar (2003)
2. Ashcroft / Mermin, Solid State Physics, Thomson Publishers
3. J. Tareen and T. Kutty, A basic course in Crystallography, University Press.

Dr. K B JOSE

	1	Classification: amorphous, crystalline – differences.	Lecture	**CO4**
	2	Lattice ,lattice energy (general idea)	Lecture	**CO4** **CO4** **CO4**
	3	unit cell, examples of simple cubic	Lecture	
	4	bcc and fcc lattices	Lecture	
	5	Calculation of number of molecules in a unit cell.	Lecture	**CO4** **CO4**
	6	Weiss and Miller indices, crystal systems	Lecture	**CO4**
		First Internal examination		**CO4**
	7	Bravais lattices, X-ray diffraction – Bragg's equation,	Lecture	**CO4** **CO4**
	8	structure determination of NaCl by X-ray diffraction.	Lecture	**CO4** **CO4**
	9	Theories of Solid: metallic bond	Lecture	**CO4** **CO4**
	10	band theory, conductors,	Lecture	
	11	semiconductors and insulators,	Lecture	
	12	mention of super conductors.	Lecture	
	13	Defects in solids-stoichiometric	Lecture	
	14	Non-stoichiometric defects and	Lecture	

		consequences		
	Second Internal examination			
	15	Magnetic Properties: classification	Lecture	**CO4**
	16	Diamagnetic, paramagnetic,	Lecture	**CO4**
	17	Antiferromagnetic, ferro and ferrimagnetic,	Lecture	**CO4**
	18	permanent and temporary magnets.	Lecture	**CO4**
	19	Revision	Discussion	

Head of the Department

Thevara

Date 2/11/2018

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Botany*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*3*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	INORGANIC AND BIO-INORGANIC CHEMISTRY	**SUBJECT CODE**	**:**	*15U3CPCHE3.2 :*
COURSE TEACHERS	**:**	*Dr. Ramakrishnan S., Dr. Jorphin Joseph and Dr. Midhun Dominic*			
COURSE OUTCOMES (COs)	**:**	**CO1** - *To have idea about Chemistry in Agriculture* **CO2** - *Understand basic chemistry involved in biological processes* **CO3** - *To have basic knowledge on some important enzymes and nucleic acids* **CO4** - *To have idea about Chemistry in medicine*			

Dr. Ramakrishnan S.				
Unit	**No. of Sessions**	**Session Topic and Discussion Theme**	**Mode of teaching**	**COs**
Chemistry and Agriculture (12hrs)	1	Mineral nutrients-Macro nutrients- Primary and Secondary macro nutrients.	Lecture	**CO1**
	2	Micronutrients. Their role in plant growth.	Lecture	
	3	Pesticides-classifications simple examples,	Lecture	
	4	NPK value superphosphates, triple super phosphate	Lecture	
	5	uses of mixed fertilizers,	Lecture	
	6	Bio-fertilizers.	Lecture	
	First Internal examination			
	7	Plant growth hormones.	Lecture	

	8	bio pesticides	Lecture	
	9	Insecticides – stomach poisons,	Lecture	
	10	contact insecticides, Examples	Lecture	
	11	fumigants. Examples	Lecture	
	12	Method of preparation of DDT, BHC, pyrethrin.	Lecture	
	Reference: 1. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi, 2010. 2. http://en.wikipedia.org/wiki/Plant_nutrition.			
Chemistry in medicine (6 hrs)	13	antibiotics	Lecture	**CO4**
	14	sulpha drugs	Lecture	
	15	antipyretics	Lecture	
	Second Internal examination			
	16	analgesics	Lecture	
	17	tranquillizers, and antidepressants	Lecture	
	18	Drug addiction abuse and prevention.	Lecture	
	Reference: 1. I. L. Finar, Organic Chemistry, Vol. 1 & 2, 6th Edition, Pearson. 2. C. N. R. Rao, University General Chemistry, Macmillion. 3. G. T. Austin, Shreve's Chemical process Industries, 5th edition, McGraw Hill, 1984. 4. Rastogi, Biochemistry, Tata McGraw. Hill Publication, 1996.			
Dr. Jorphin Joseph				
Oxygen carriers in	1	Oxygen transport in biological system- Hemoglobin and myoglobin	Lecture	**CO2**
	2	Structure and function of Hemoglobin and myoglobin	Lecture	
	3	Oxygen transport mechanism	Lecture	
	4	cooperativity of hemoglobin	Lecture	
	5	Perutz mechanism	Lecture	
	6	Bohr effect.	Lecture	
	First Internal examination			
	7	Hemocyanin, Hemerythrin	Lecture	
	8	Photosynthetic pigments, Chlorophyll,	Lecture	

biological system hrs)		Structure		
	9	Different types of chlorophyll		
	10	Photosystem-I, photosystem-II		
	11	Z- Scheme	Lecture	
	12	photophosphorylation	Discussion	
Chemistry in medicine (6 hrs)	13	Essential and trace elements in biological system.	Lecture	**CO4**
	14	Metal deficiency and disease- Iron, Zinc Copper	Lecture	
	15	Metal toxicity- Toxicity due to Copper overload	Lecture	
	16	Metal toxicity- Toxicity due Plutonium	Lecture	
		Second Internal examination		
	17	Metal toxicity- Toxicity due mercury	Lecture	
	18	Metal toxicity- Toxicity due Iron	Discussion	

Reference

J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.

2. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Milestone Publishers, New Delhi, 2010.

1. G.L. Meissler, D.A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004.
2. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, Inorganic Chemistry, Pearson 2006.

Dr. Midhun Dominic

Chemistry in medicine (3 hrs)	1	Treatment for excess iron, copper, mercury and plutonium.	Lecture	**CO4**
	2	Anti-cancer drugs- Cisplatin.	Lecture	
	3	Anti-Arthritis drugs- Gold compounds	Lecture	
Enzymes and	4	Thermodynamics of Living cell- Exergonic and endergonic reactions	Lecture	**CO3**
	5	coupled reactions, biological oxidation reactions	Lecture	
		Second Internal examination		
	6	Enzymes: classification, Metalloenzymes,	Lecture	

Nucleic acids (15 hrs)	7	prosthetic group, coenzyme, cofactors	Lecture	
	8	characteristics of enzyme action	Lecture	
	9	mechanism of enzyme action	Lecture	
	10	Structure and function of some important enzymes	Lecture	
	11	Structure and function of some important enzymes	Lecture	
	12	Structure and function of some important enzymes	Lecture	
	13	Structure and function of some important enzymes	Lecture	
	14	Energy rich molecules: elementary structure of ATP and ADP.	Lecture	
	15	Na+/K+ ATPase-Sodium Potassium pump	Lecture	
	16	**Nucleic acids-** Chemical composition,	Lecture	
	Second Internal examination			
	17	Structure of DNA & RNA.	Lecture	
	18	Biological Functions.	Lecture	
	Reference 1. I. L. Finar, Organic Chemistry, Vol. 1 & 2, 6th Edition, Pearson. 2. C. N. R. Rao, University General Chemistry, Macmillion. 3. G. T. Austin, Shreve's Chemical process Industries, 5th edition, McGraw Hill, 1984. 4. Rastogi, Biochemistry, Tata McGraw. Hill Publication, 1996.			

Head of the Department

Thevara

Date 1/09/2019

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Zoology*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*3*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	INORGANIC AND BIO-INORGANIC CHEMISTRY	**SUBJECT CODE**	**:**	*15U3CPCHE3.2 :*
COURSE TEACHERS	**:**	*Dr. Ramakrishnan S., Dr. Franklin John and Dr. Midhun Dominic C.D*			
COURSE OUTCOMES (COs)	**:**	**CO1** - *To have idea about Chemistry in Agriculture* **CO2** - *Understand basic chemistry involved in biological processes* **CO3** - *To have basic knowledge on some important enzymes and nucleic acids* **CO4** - *To have idea about Chemistry in medicine*			

Dr. Ramakrishnan S.				
Unit	**No. of Sessions**	**Session Topic and Discussion Theme**	**Mode of teaching**	**COs**
Chemistry and Agriculture (12hrs)	1	Mineral nutrients-Macro nutrients- Primary and Secondary macro nutrients.	Lecture	**CO1**
	2	Micronutrients. Their role in plant growth.	Lecture	
	3	Pesticides-classifications simple examples,	Lecture	
	4	NPK value superphosphates, triple super phosphate	Lecture	
	5	uses of mixed fertilizers,	Lecture	
	6	Bio-fertilizers.	Lecture	
	First Internal examination			
	7	Plant growth hormones.	Lecture	

	8	bio pesticides	Lecture	
	9	Insecticides – stomach poisons,	Lecture	
	10	contact insecticides, Examples	Lecture	
	11	fumigants. Examples	Lecture	
	12	Method of preparation of DDT, BHC, pyrethrin.	Lecture	
	Reference: 1. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi, 2010. 2. http://en.wikipedia.org/wiki/Plant_nutrition.			
Chemistry in medicine (6 hrs)	13	antibiotics	Lecture	**CO4**
	14	sulpha drugs	Lecture	
	15	antipyretics	Lecture	
	Second Internal examination			
	16	analgesics	Lecture	
	17	tranquillizers, and antidepressants	Lecture	
	18	Drug addiction abuse and prevention.	Lecture	
	Reference: 1. I. L. Finar, Organic Chemistry, Vol. 1 & 2, 6th Edition, Pearson. 2. C. N. R. Rao, University General Chemistry, Macmillion. 3. G. T. Austin, Shreve's Chemical process Industries, 5th edition, McGraw Hill, 1984. 4. Rastogi, Biochemistry, Tata McGraw. Hill Publication, 1996.			
Dr. Franklin John				
Oxygen carriers in	1	Oxygen transport in biological system- Hemoglobin and myoglobin	Lecture	**CO2**
	2	Structure and function of Hemoglobin and myoglobin	Lecture	
	3	Oxygen transport mechanism	Lecture	
	4	cooperativity of hemoglobin	Lecture	
	5	Perutz mechanism	Lecture	
	6	Bohr effect.	Lecture	
	First Internal examination			
	7	Hemocyanin, Hemerythrin	Lecture	
	8	Photosynthetic pigments, Chlorophyll,	Lecture	

biological system hrs)		Structure		
	9	Different types of chlorophyll		
	10	Photosystem-I, photosystem-II		
	11	Z- Scheme	Lecture	
	12	photophosphorylation	Discussion	
Chemistry in medicine (6 hrs)	13	Essential and trace elements in biological system.	Lecture	**CO4**
	14	Metal deficiency and disease- Iron, Zinc Copper	Lecture	
	15	Metal toxicity- Toxicity due to Copper overload	Lecture	
	16	Metal toxicity- Toxicity due Plutonium	Lecture	
		Second Internal examination		
	17	Metal toxicity- Toxicity due mercury	Lecture	
	18	Metal toxicity- Toxicity due Iron	Discussion	

Reference

J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.

2. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Milestone Publishers, New Delhi, 2010.

1. G.L. Meissler, D.A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004.
2. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, Inorganic Chemistry, Pearson 2006.

Dr. Midhun Dominic C.D

Chemistry in medicine (3 hrs)	1	Treatment for excess iron, copper, mercury and plutonium.	Lecture	**CO4**
	2	Anti-cancer drugs- Cisplatin.	Lecture	
	3	Anti-Arthritis drugs- Gold compounds	Lecture	
Enzymes and	4	Thermodynamics of Living cell- Exergonic and endergonic reactions	Lecture	**CO3**
	5	coupled reactions, biological oxidation reactions	Lecture	
		Second Internal examination		
	6	Enzymes: classification, Metalloenzymes,	Lecture	

Nucleic acids (15 hrs)	7	prosthetic group, coenzyme, cofactors	Lecture	
	8	characteristics of enzyme action	Lecture	
	9	mechanism of enzyme action	Lecture	
	10	Structure and function of some important enzymes	Lecture	
	11	Structure and function of some important enzymes	Lecture	
	12	Structure and function of some important enzymes	Lecture	
	13	Structure and function of some important enzymes	Lecture	
	14	Energy rich molecules: elementary structure of ATP and ADP.	Lecture	
	15	Na+/K+ ATPase-Sodium Potassium pump	Lecture	
	16	**Nucleic acids-** Chemical composition,	Lecture	
	Second Internal examination			
	17	Structure of DNA & RNA.	Lecture	
	18	Biological Functions.	Lecture	
	Reference 1. I. L. Finar, Organic Chemistry, Vol. 1 & 2, 6th Edition, Pearson. 2. C. N. R. Rao, University General Chemistry, Macmillion. 3. G. T. Austin, Shreve's Chemical process Industries, 5th edition, McGraw Hill, 1984. 4. Rastogi, Biochemistry, Tata McGraw. Hill Publication, 1996.			

Head of the Department

Thevara

Date 1/09/2019

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Physics*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*4*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	ADVANCED PHYSICAL CHEMISTRY – II	**SUBJECT CODE**	**:**	*15U4CPCHE4.1*
COURSE TEACHERS	**:**	*Dr. MIDHUN DOMINIC C.D, Dr. THOMMACHAN XAVIER, Dr K B JOSE*			
COURSE OUTCOMES (COs)	**:**	**CO1** -*To understand the basics of spectroscopy* **CO2** - *To know the fundamental factors of chemical kinetics* **CO3** - *To have an idea about photochemistry* **CO4** - *basic understanding of electrochemistry* **CO5** - *To understand the fundamental aspects of redox reactions*			

Dr. MIDHUN DOMINIC C D				
Unit	**No. of Sessions**	**Session Topic and Discussion Theme**	**Mode of teaching**	**COs**
Introduction to Spectroscopy (12 hrs)	1	Interaction of electromagnetic radiation with matter, electromagnetic spectrum	Lecture	**CO1** **CO1**
	2	Quantization of energy, electronic, vibrational and rotational energy levels	Lecture	**CO1**
	3	Boltzmann distribution of energy (formula only), population of levels	Lecture	**CO1**
	4	UV- Visible Spectroscopy: Beer Lambert's law	Lecture	**CO1** **CO1**
	5	molar extinction coefficient and its importance	Lecture	**CO1** **CO1**
	6	UV spectrum, max, chromophore, auxochrome	Lecture	**CO1** **CO1**
	7	Red shift, blue shift, types of transition	Lecture	**CO1**
	8	Infra-red spectroscopy: vibrational degrees of freedom	Lecture	**CO1** **CO1**
	9	Types of vibrations – symmetric and asymmetric stretching and bending	Lecture	**CO2**
	First Internal examination			

Chemical Kinetics (8hrs)	10	Concept of group frequencies-frequencies of common functional groups in organic compounds.	Lecture	**CO2**
	11	Rotational Spectroscopy: diatomic molecules	Lecture	**CO2**
	12	Determination of bond length	Lecture	**CO2**
	13	Rate of reaction, rate law	Lecture	**CO2**
	14	Order of reaction, molecularity of reaction	Lecture	**CO2**
	15	Integrated rate expression for first order reaction	Lecture	**CO2**
	16	Half life, determination of order of reactions	Lecture	
		Second Internal examination		
	17	Influence of temperature on reaction rate – Arrhenius equation	Lecture	
	18	Concept of activation energy	Lecture	
	19	Importance of activated complex	Lecture	
	20	Catalysis, examples	Lecture	
Dr. THOMMACHAN XAVIER				
Photochemistry (5 hrs)	1	Laws of Photochemistry	Lecture	**CO3**
	2	Photochemical process – primary and secondary, quantum yield	Lecture	**CO3**
	3	Basic Concepts of Photosensitized reactions	Lecture	**CO3**
	4	Flash photolysis and chemiluminescence	Lecture	**CO3**
	5	Frank-Condon principle – fluorescence and phosphorescence	Lecture	**CO3**
Electrochemistry (12 hrs)	6	Conductance of electrolytic solution, electrolytic conductivity (K)		**CO4**
	7	Molar conductivity of solutions of electrolytes	Lecture	**CO4**
		First Internal examination		**CO4**
	8	Variation of conductivity and molar conductivity with concentration	Lecture	**CO4**
	9	Kohlrausch's law – application	Lecture	**CO4**
	10	Faraday's laws of electrolysis	Lecture	**CO4**
	11	Electrochemical equivalent and chemical equivalent	Lecture	**CO4**
	12	Transport number-determination by Hittorf's method	Lecture	**CO4**
	13	Applications of conductance	Lecture	**CO4**

		measurements		**CO4**
	Second Internal examination			
	14	Kw, Ksp, Conductometric titrations	Lecture	**CO4**
	15	Strong and weak electrolytes.	Lecture	
	16	Ostwald's dilution law	Lecture	
	17	Hydrolysis of salts	Lecture	
Dr. K B JOSE				
Electromotive force (11 hrs)	1	Galvanic cells, characteristics of reversible cells	Lecture	**CO4** **CO4**
	2	Reversible electrodes – different types	Lecture	**CO4**
	3	Electrode potential – effect of electrolyte concentration on electrode potential and emf (Nernst equation)	Lecture	
	4	Electrochemical series, representation of cell	Discussion	
	First Internal examination			
	5	EMF of cell	Lecture	**CO4** **CO4**
	6	EMF and equilibrium constant of cell reaction	Lecture	**CO4** **CO4**
	7	Concentration cells	Lecture	**CO4**
	8	General discussion of electrode – concentration cell and electrolyte concentration cells	Lecture	**CO4**
	9	Liquid junction potential, fuel cells – the hydrogen – oxygen fuel cell.	Lecture	**CO4**
	10	Application of emf measurement – determination of pH using hydrogen electrode, quinhydrone electrode, glass electrode	Lecture	
	11	Potentiometric titrations	Lecture	
Redox reactions	12	Oxidation Reduction reactions: explanation with examples	Lecture	**CO5** **CO5**
	13	oxidation states	Lecture	
	Second Internal examination			**CO5**
	14	Rules to assign oxidation states in	Lecture	

CO5

CO5

(6 hrs)		polyatomic molecules		
	15	Determination of oxidation states	Lecture	
	16	Oxidation reduction titrations	Lecture	
	17	Experimental method, example	Lecture	

Head of the Department

Thevara

Date 2/11/2018

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Botany*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*4*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	Advanced Bio-organic Chemistry	**SUBJECT CODE**	**:**	*15U4CPCHE4.2*
COURSE TEACHERS	**:**	*Dr. Ramakrishnan S., Dr. Jorphin Joseph and Dr. Midhun Dominic*			
COURSE OUTCOMES (COs)	**:**	**CO1** - *To study the classification and properties of amino acids* **CO2** - *To study structure and functions of proteins* **CO3** - *To study classification, properties and structure of carbohydrates* **CO4** - *To study fundamentals of vitamins, hormones, steroids and lipids* **CO5** - *To study basics of natural products* **CO6** - *To study about heterocyclic compounds* **CO7** - *To study the fundamentals of chromatographic techniques*			

Dr. Ramakrishnan S				
Unit	**No. of Sessions**	**Session Topic and Discussion Theme**	**Mode of teaching**	**COs**
Amino acids and protein (12hrs)	1	Amino acids, Classification of amino acids	Lecture	**CO1 CO2**
	2	Chemical properties of amino acid	Lecture	
	3	Separation of amino acids	Lecture	
	4	Synthesis amino acids (glycine and alanine)	Lecture	
	5	Synthesis amino acids (phenyl alanine)	Lecture	
	6	Peptides, peptide bonds, polypeptides	Lecture	
		First Internal examination		
	7	Proteins, Classification of proteins	Lecture	

	8	Prosthetic group, properties of proteins	Lecture	
	9	Denaturation of proteins	Lecture	
	10	Structure of proteins	Lecture	
	11	Structure of proteins	Lecture	
	12	Revision	Discussion	
	Reference: 1. I. L. Finar, Organic Chemistry Vol 1 & 2, 6th edition, Pearson 2. K. S. Tewari, N. K. Vishnoi, A Text Book of Organic chemistry, 3rd edition, Vikas publishing House Pvt. Ltd ,2006. 3. Rastogi, Biochemistry, Tata McGraw –Hill Publication, 1996. 4. Dr. A.C. Deb, Fundamentals of Biochemistry.			
Chromatographic Techniques (6 hrs)	13	Chromatographic Techniques, classifications	Lecture	**CO7**
	14	**principle and uses:** R_f values Column chromatography, Thin layer chromatography (TLC), Paper chromatography (PC):	Lecture	
	15	Gas chromatography(GC)	Lecture	
		Second Internal examination		
	16	High Performance Liquid chromatography (HPLC)	Lecture	
	17	Ion Exchange chromatography (IEC)	Lecture	
	18	Revision	Discussion	
	Reference: 1. R. A. Day Junior, A.L. Underwood, Quantitative Analysis, 5th edn. Prentice Hall of India Pvt. Ltd. New Delhi, 1988(Chapters 17, 18). **1.** Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J.D. **2.** Barnes, M. Thomas, 6th edn. Pearson Education (2003). **3.** R. Gopalan, Analytical Chemistry, S. Chand and Co., New Delhi.			
Dr. Jorphin Joseph				
Carbohydrates (10 hrs)	1	Carbohydrates, classification	Lecture	**CO3**
	2	preparation and properties of glucose	Lecture	
	3	preparation and properties of fructose	Lecture	
	4	preparation and properties of sucrose	Lecture	
	5	Haworth configuration of α-D glucose and β-D glucose, α-D fructose, β-D fructose, maltose and cellobiose	Lecture	
	6	Mutarotation	Lecture	
		First Internal examination		

	7	Conversion of glucose to fructose and vice-versa	Lecture	
	8	Structure of starch and cellulose	Lecture	
	9	Industrial applications of cellulose	Lecture	
	10	Revision	Discussion	
Vitamins, Steroids, Hormones and lipids (8hrs)	11	Vitamins, Structure and biological activity of Vitamin A, B and C	Lecture	**CO4**
	12	Steroids	Lecture	
	13	Cholesterol	Lecture	
	14	Bile acids	Lecture	
	15	Lipids, simple and complex lipids	Lecture	
		Second Internal examination		
	16	Analysis of oils and fats – acid value, saponification value, iodine value	Lecture	
	17	Role MUFA and PUFA in preventing heart disease	Lecture	
	18	Revision	Discussion	

Reference

1. I. L. Finar, Organic Chemistry Vol 1 & 2, 6th edition, Pearson
2. K. S. Tewari, N. K. Vishnoi, A Text Book of Organic chemistry, 3rd edition, Vikas publishing House Pvt. Ltd ,2006.
3. Rastogi, Biochemistry, Tata McGraw –Hill Publication, 1996.
4. Dr. A.C. Deb, Fundamentals of Biochemistry.

Dr. Midhun Dominic

Vitamins, Steroids, Hormones and lipids	1	Hormones	Lecture	**CO4**
	2	Steroid hormones, Peptide hormones	Lecture	
	3	Amine hormones, Artificial hormones	Lecture	
	4	Revision	Discussion	
Natural Products (5hrs)	5	Terpinoids Essential oils: isolation	Lecture	**CO5**
	6	isoprene rule Citral, geraniol, natural rubber	Lecture	
		Second Internal examination		
	7	Alkaloids: isolation, properties	Lecture	
	8	Structure of coniine, nicotine, piperine	Lecture	

	9	Revision	Discussion	
	References 1. I. L. Finar, Organic Chemistry Vol 1 & 2, 6th edition, Pearson 2. K. S. Tewari, N. K. Vishnoi, A Text Book of Organic chemistry, 3rd edition, Vikas publishing House Pvt. Ltd, 2006			
Heterocyclic Compounds (9 hrs)	10	Aromaticity	Lecture	**CO6**
	11	Huckel rule	Lecture	
	12	Structure of furan, indole, pyridine, pyrimidine, purine	Lecture	
	13	Aromaticity of furan, indole, pyridine	Lecture	
	14	Aromaticity of pyrimidine, purine	Lecture	
	15	Preparation, properties :furan, pyridine	Lecture	
	Second Internal examination			
	16	Preparation , properties : indole	Lecture	
	17	Preparation , properties : purine and pyrimidine	Lecture	
	18	Revision	Discussion	
	Revision 1. I. L Finar, Organic Chemistry Vol 1 & 2, 6th Edition, Pearson. 2. K. S. Tewari, N. K. Vishnoi, A Text Book of Organic chemistry, 3rd edition , Vikas publishing House Pvt. Ltd, 2006.			

Head of the Department

Thevara

Date 01/09/2019

COURSE PLAN					
ACADEMIC YEAR 2017-18					
PROGRAMME	**:**	*B.Sc. Zoology*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*4*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	Advanced Bio-organic Chemistry	**SUBJECT CODE**	**:**	*15U4CPCHE4.2*
COURSE TEACHERS	**:**	*Dr. Ramakrishnan S., Dr. Franklin John and Dr. Midhun Dominic*			
COURSE OUTCOMES (COs)	**:**	**CO1** - *To study the classification and properties of amino acids* **CO2** - *To study structure and functions of proteins* **CO3** - *To study classification, properties and structure of carbohydrates* **CO4** - *To study fundamentals of vitamins, hormones, steroids and lipids* **CO5** - *To study basics of natural products* **CO6** - *To study about heterocyclic compounds* **CO7** - *To study the fundamentals of chromatographic techniques*			

Dr. Ramakrishnan S				
Unit	**No. of Sessions**	**Session Topic and Discussion Theme**	**Mode of teaching**	**COs**
Amino acids and protein (12hrs)	1	Amino acids, Classification of amino acids	Lecture	**CO1 CO2**
	2	Chemical properties of amino acid	Lecture	
	3	Separation of amino acids	Lecture	
	4	Synthesis amino acids (glycine and alanine)	Lecture	
	5	Synthesis amino acids (phenyl alanine)	Lecture	
	6	Peptides, peptide bonds, polypeptides	Lecture	
		First Internal examination		
	7	Proteins, Classification of proteins	Lecture	

	8	Prosthetic group, properties of proteins	Lecture	
	9	Denaturation of proteins	Lecture	
	10	Structure of proteins	Lecture	
	11	Structure of proteins	Lecture	
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	Reference: 1. I. L. Finar, Organic Chemistry Vol 1 & 2, 6th edition, Pearson 2. K. S. Tewari, N. K. Vishnoi, A Text Book of Organic chemistry, 3rd edition, Vikas publishing House Pvt. Ltd ,2006. 3. Rastogi, Biochemistry, Tata McGraw –Hill Publication, 1996. 4. Dr. A.C. Deb, Fundamentals of Biochemistry.			
Chromatographic Techniques (6 hrs)	13	Chromatographic Techniques, classifications	Lecture	**CO7**
	14	**principle and uses:** R_f values Column chromatography, Thin layer chromatography (TLC), Paper chromatography (PC):	Lecture	
	15	Gas chromatography(GC)	Lecture	
	Second Internal examination			
	16	High Performance Liquid chromatography (HPLC)	Lecture	
	17	Ion Exchange chromatography (IEC)	Lecture	
	18	Revision	Discussion	
	Reference: 1. R. A. Day Junior, A.L. Underwood, Quantitative Analysis, 5th edn. Prentice Hall of India Pvt. Ltd. New Delhi, 1988(Chapters 17, 18). **1.** Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J.D. **2.** Barnes, M. Thomas, 6th edn. Pearson Education (2003). **3.** R. Gopalan, Analytical Chemistry, S. Chand and Co., New Delhi.			
Dr. Franklin John				
Carbohydrates (10 hrs)	1	Carbohydrates, classification	Lecture	**CO3**
	2	preparation and properties of glucose	Lecture	
	3	preparation and properties of fructose	Lecture	
	4	preparation and properties of sucrose	Lecture	
	5	Haworth configuration of α-D glucose and β-D glucose, α-D fructose, β-D fructose, maltose and cellobiose	Lecture	
	6	Mutarotation	Lecture	
	First Internal examination			

	7	Conversion of glucose to fructose and vice-versa	Lecture	
	8	Structure of starch and cellulose	Lecture	
	9	Industrial applications of cellulose	Lecture	
	10	Revision	Discussion	
Vitamins, Steroids, Hormones and lipids (8hrs)	11	Vitamins, Structure and biological activity of Vitamin A, B and C	Lecture	**CO4**
	12	Steroids	Lecture	
	13	Cholesterol	Lecture	
	14	Bile acids	Lecture	
	15	Lipids, simple and complex lipids	Lecture	
		Second Internal examination		
	16	Analysis of oils and fats – acid value, saponification value, iodine value	Lecture	
	17	Role MUFA and PUFA in preventing heart disease	Lecture	
	18	Revision	Discussion	

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Dr. Midhun Dominic

Vitamins, Steroids, Hormones and lipids	1	Hormones	Lecture	**CO4**
	2	Steroid hormones, Peptide hormones	Lecture	
	3	Amine hormones, Artificial hormones	Lecture	
	4	Revision	Discussion	
Natural Products (5hrs)	5	Terpinoids Essential oils: isolation	Lecture	**CO5**
	6	isoprene rule Citral, geraniol, natural rubber	Lecture	
		Second Internal examination		
	7	Alkaloids: isolation, properties	Lecture	
	8	Structure of coniine, nicotine, piperine	Lecture	

	9	Revision	Discussion	
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Heterocyclic Compounds (9 hrs)	10	Aromaticity	Lecture	**CO6**
	11	Huckel rule	Lecture	
	12	Structure of furan, indole, pyridine, pyrimidine, purine	Lecture	
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	15	Preparation, properties :furan, pyridine	Lecture	
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	16	Preparation , properties : indole	Lecture	
	17	Preparation , properties : purine and pyrimidine	Lecture	
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Head of the Department

Thevara

Date 01/09/2019