

<b>COURSE PLAN</b>					
<b>ACADEMIC YEAR 2015-16</b>					
<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	:	<i>36</i>
<b>SEMESTER</b>	:	<i>1</i>	<b>CREDITS</b>	:	<i>2</i>
<b>SUBJECT TITLE</b>	:	<b>Theoretical and Inorganic Chemistry-I</b>	<b>SUBJECT CODE</b>	:	<b>15U1CRCHE01</b>
<b>COURSE TEACHERS</b>	:	<i>Dr. Grace Thomas, Dr. Ignatious Abraham(IGA)</i>			
<b>Instructional Hours</b>	:	<i>Two Hours per week</i>			

Sessions	Topic/Module	Method of teaching *
1	<b>Module 1-(Chemistry as a discipline of science): 3 h</b> 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	<b>Module II Basic Concepts in Chemistry (3h)</b>  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	<b>Module 3: Analytical Chemistry I (9 hrs) Quantitative Analysis.</b> 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 $\text{KMnO}_4$ and $\text{K}_2\text{Cr}_2\text{O}_7$ - Redox indicators.	Conventional Teaching ASSIGNMENT I
13	Complexometric titrations – EDTA titrations - titration curves – metal ion indicators and characteristics.	Conventional Teaching
14	<b>Errors in Chemical Analysis.</b> 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	<b>Module IV:Atomic Structure(9h)</b> 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	<p><b>Module (V)</b>  <b>Quantum Mechanical Model of Atom</b>  <b>(12 hrs)</b></p> <p>Operator algebra – Linear and Hermitian operators –</p>	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 maximum multiplicity - Aufbau principle – Electronic configuration of atoms	Conventional Teaching

## References

1. Jeffrey A. Lee, *The Scientific Endeavor: A Primer on Scientific Principles and Practice*, Pearson Education, 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, New Delhi, 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*, 5<sup>th</sup>edn., Blackwell Science, London (Chapter 1)
1. D. F. Shriver and P. W. Atkins, *Inorganic Chemistry*, 3<sup>rd</sup>edn., 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*, 8<sup>th</sup> 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 2015-16				
<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	: 36
<b>SEMESTER</b>	:	2	<b>CREDITS</b>	: 2
<b>SUBJECT TITLE</b>	:	<i>Theoretical and Inorganic Chemistry-II</i>	<b>SUBJECT CODE</b>	: 15U2CRCHE02
<b>COURSE TEACHERS</b>	:	<i>Dr. Grace Thomas(GT), Dr. Ignatious Abraham(IGA)</i>		
<b>COURSE OUTCOMES (COs)</b>	:	<p><b>CO1</b> - Ability to understand the basics of periodicity in the properties of the elements, chemical bonding, nuclear chemistry and different analytical techniques</p> <p><b>CO2</b> - Ability to apply valence bond and molecular orbital theories to explain the bonding characteristics of different chemical systems.</p> <p><b>CO3</b> - 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.</p> <p><b>CO4</b> - Ability to explore and reflect about the wide range of possibilities and applications of nuclear reactions and radio activity.</p> <p><b>CO5</b> - Ability to apply gravimetric analysis and different separation/purification techniques effectively in laboratory scale.</p>		
<b>Instructional Hours</b>	:	<p><i>Monday : Period 1 (9:30 to 10:30 am)</i></p> <p><i>Tuesday: Period 5 (2:30 to 3:30 pm)</i></p>		
<b>IGA</b>	<b>No. of</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>

	Session			
<b>UNIT 2 : Chemical Bonding -1</b> (9 hours)	1	Introduction – Type of bonds – Octet rule and its limitations.		<b>CO1</b>
	2	<i>Ionic Bond</i> : 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		<b>CO1</b>
	3	Born-Haber cycle and its applications – Properties of ionic compounds - Polarisation of ions – Fajan's rules and its applications.	Assignment No: 1	<b>CO1</b>
	4	<i>Covalent Bond</i> : Lewis theory. Valence Bond Theory. Coordinate bond		<b>CO1</b>
	5	Hybridization: Definition and characteristics VSEPR theory: Postulates		<b>CO1</b>
	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 $SO_4^{2-}$ )		<b>CO1, CO2</b>
	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	<b>CO1, CO2</b>
	8	Limitations of VBT. Properties of covalent compounds. Polarity of covalent bond – Percentage of ionic character – Dipole moment and molecular structure.		<b>CO1, CO2, CO3</b>
	9	<b>FIRST INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i>, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.</li> <li>❖ Satya Prakash, <i>Advanced Inorganic Chemistry, Volume 1</i>, 5th Edition, S. Chand and Sons, New Delhi, 2012.</li> <li>❖ Manas Chanda, <i>Atomic Structure and Chemical Bonding</i>, 4th Edition, Tata McGraw Hill</li> </ul>			
<b>periodic properties</b>	10	Modern periodic law – Long form periodic table. Periodicity in properties: Atomic and ionic radii	Assignment No.3	<b>CO1</b>
	11	Ionization enthalpy - Electron affinity (electron gain enthalpy) – Electronegativity. Electronegativity scales: Pauling and Mullikan scales		<b>CO1</b>



(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, CO3
<b>SECOND INTERNAL EXAMINATION</b>				
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i>, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.</li> <li>❖ Satya Prakash, <i>Advanced Inorganic Chemistry, Volume 1</i>, 5th Edition, S. Chand and Sons, NewDelhi, 2012.</li> <li>❖ Manas Chanda, <i>Atomic Structure and Chemical Bonding</i>, 4th Edition, Tata McGraw Hill</li> </ul>			
<b>UNIT 5 : Analytical Chemistry II (5 hours)</b>	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
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ Vogel’s Textbook of Quantitative Chemical Analysis 6th edn, Pearsons Education Ltd</li> <li>❖ R. D. Day, A. L. Underwood, Quantitative analysis, 6th Edn., Prentice Hall of India Pvt. Ltd</li> <li>❖ Satya Prakash, <i>Advanced Inorganic Chemistry, Volume 1</i>, 5th Edition, S. Chand and Sons, NewDelhi, 2012.</li> </ul>			

<b>GT</b>					
<i>Unit IV</i>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>	
<b>Nuclear Chemistry</b>	1	Introduction to nuclear chemistry Structure of nucleus ➤ Nuclear particles, nuclear forces, nuclear size, nuclear density		<b>CO1</b>	
	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.	<b>CO1, CO4</b>	
	3	Natural Radioactivity ➤ modes of decay, decay constant ➤ half-life period, average life	Problems: Based on radioactive decay	<b>CO1</b>	
	4	Radioactive Equilibrium Geiger-Nuttal rule, units of radioactivity, radiation dosage		<b>CO1</b>	
	5	Nuclear Reactions ➤ induced by charged projectiles, neutrons and $\gamma$ rays		<b>CO1, CO4</b>	
	7	fission reactions fusion reactions		<b>CO1, CO4</b>	
	<b>1<sup>st</sup> Internal Examination</b>				
	8	Preparation of transuranic elements		<b>CO1</b>	
	9	Chain Reactions, Stellar energy	Power Point Presentation	<b>CO1</b>	

<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ H. J. Arnikaar, Essentials of Nuclear Chemistry, New Age</li> <li>❖ R. Gopalan, Elements of Nuclear Chemistry, Vikas Publ. House.</li> <li>❖ B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i>, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.</li> <li>❖ Satya Prakash, <i>Advanced Inorganic Chemistry, Volume 1</i>, 5th Edition, S. Chand and Sons, New Delhi, 2012.</li> <li>❖ Manas Chanda, <i>Atomic Structure and Chemical Bonding</i>, 4th Edition, Tata McGraw Hill Publishing Company, Noida, 2007.</li> </ul>			
<b>Unit III</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
<i>Chemical Bonding – II</i>	10	MO Theory <ul style="list-style-type: none"> <li>➤ Linear combination of atomic orbitals</li> <li>➤ Formation of molecular orbitals</li> <li>➤ Bonding and antibonding molecular orbitals</li> <li>➤ Stability of molecules based on bond order</li> <li>➤ Relation between bond order and bond length</li> </ul>		<b>CO1, CO2, CO3</b>
	11	MO diagram of homo nuclear system <ul style="list-style-type: none"> <li>➤ H<sub>2</sub>, He<sub>2</sub>, Li<sub>2</sub>, Be<sub>2</sub>, B<sub>2</sub>, C<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, F<sub>2</sub></li> <li>➤ Magnetic behaviour of these homo nuclear systems</li> </ul>	Power Point Presentation	<b>CO1, CO2, CO3</b>
	12	MO diagram of heteronuclear system <ul style="list-style-type: none"> <li>➤ CO and NO</li> <li>➤ Magnetic behaviour of these homo nuclear systems</li> <li>➤ Comparison of bond length, magnetic behaviour and bond energy of O<sub>2</sub>, O<sub>2</sub><sup>+</sup>, O<sub>2</sub><sup>2+</sup>, O<sub>2</sub><sup>-</sup> and O<sub>2</sub><sup>2-</sup></li> </ul>	Power Point Presentation	<b>CO1, CO2, CO3</b>
	13	Resonance structures of <ul style="list-style-type: none"> <li>➤ borate, carbonate and nitrate ions</li> <li>➤ Comparison of bond energy.</li> </ul>		<b>CO1</b>
	14	Comparison of VB and MO theories.	Group Discussion	<b>CO1</b>

<b>2<sup>nd</sup> Internal Examination</b>			
	15	Metallic Bond ➤ Free electron theory ➤ valence bond theory	<b>CO1</b>
	16	Band theory Explanation of metallic properties based on these theories.	<b>CO1</b>
	17	Intermolecular Forces ➤ Induction forces and dispersion forces	Individual Assignment: Various intermolecular forces
	18	Hydrogen bond Intra and inter molecular hydrogen bonds , Effect on physical properties.	<b>CO1</b>
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ B.R. Puri, L.R. Sharma and K.C. Kalia, <i>Principles of Inorganic Chemistry</i>, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.</li> <li>❖ Satya Prakash, <i>Advanced Inorganic Chemistry, Volume 1</i>, 5th Edition, S. Chand and Sons, NewDelhi, 2012.</li> <li>❖ Manas Chanda, <i>Atomic Structure and Chemical Bonding</i>, 4th Edition, Tata McGraw Hill</li> </ul>		

**DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA**

**COURSE PLAN : ACADEMIC YEAR 2015 - 2016**

<b>PROGRAMME</b>	: <i>B.Sc. Chemistry</i>	<b>SEMESTER</b>	: 3
<b>LECTURE HOURS</b>	: 54	<b>CREDITS</b>	: 3
<b>SUBJECT TITLE</b>	: <i>Fundamentals of Organic Chemistry</i>	<b>SUBJECT CODE</b>	: <i>CH3B01</i>
<b>COURSE TEACHERS</b>	: Dr. Joseph John (JJ), Dr. Thommachan Xavier (TX) & Dr. Grace Thomas (GT)		
<b>COURSE OUTCOMES (COs)</b>	: <b>CO1</b> - <i>Understand the classification and nomenclature of organic compounds.</i> <b>CO2</b> - <i>Describe aromaticity and stereochemistry of organic compounds.</i> <b>CO3</b> - <i>Understand the fundamentals of organic reaction mechanisms.</i> <b>CO4</b> - <i>Describe various emerging areas of organic chemistry and its applications.</i>		
<b>Instructional Hours</b>	: <i>Tuesday : Period 1 (9:30 to 10:30 am) - JJ</i> <i>Wednesday : Period 1 (9:30 to 10:30 am) - FJ</i> <i>Thursday : Period 5 (2:30 to 3:30 pm) - VSS</i>		

**GRACE THOMAS**

**Unit I : CLASSIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS**

Session s	Session Topic and Discussion Theme	Value additions	COs
1	Introduction to classification of organic compounds.		<b>CO1</b>
2	Rules of IUPAC system of nomenclature		<b>CO1</b>
3	Alkanes, alkenes, alkynes, cycloalkanes, bicycloalkanes, alkyl halides, alcohols and phenols.	Individual Assignment: <i>Nomenclature of Compounds</i>	<b>CO1</b>
4	Aldehydes, ketones, carboxylic acids and its derivatives, amines, nitro compounds. (Both aliphatic and aromatic)		<b>CO1</b>

**Unit IV: AROMATICITY**

5	Concept of resonance: <ul style="list-style-type: none"> <li>• Resonance energy in benzene.</li> <li>• Heat of hydrogenation and heat of combustion of Benzene</li> <li>• C-C bond lengths and orbital picture of Benzene</li> </ul>	Power Point Presentation Structure and resonance of Benzene	<b>CO2</b>
6	Structure of naphthalene and anthracene ( <i>Molecular Orbital picture and resonance</i> )		<b>CO2</b>
7	Concept of aromaticity – aromaticity (definition), <i>Huckel's rule:</i> Application to Benzenoids : Benzene, Naphthalene, Anthracene, Phenanthrene.		<b>CO2</b>
8	Non-Benzenoid compounds – cyclopropenyl cation, cyclopentadienyl anion and tropylium cation.		<b>CO2</b>
9	General mechanism of electrophilic substitution-mechanism of halogenation, nitration,		<b>CO2</b>

1 <sup>st</sup> Internal Examination			
10	Mechanism of Friedal Craft's alkylation and acylation, sulphonation.		CO2
11	Orientation of aromatic substitution – <i>ortho</i> , <i>para</i> and <i>meta</i> directing groups.		CO2
12	Ring activating and deactivating groups.	Power Point Presentation	CO2
13	Electronic interpretation of various groups like - NO <sub>2</sub> 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: <i>Illustration of orientation effects</i>	CO2
15	Reactivity of naphthalene towards electrophilic substitution. Nitration and sulphonation		CO2

### 2<sup>nd</sup> Internal Examination

16	Aromatic Nucleophilic substitutions - bimolecular displacement mechanism		CO2
17	Elimination –Addition mechanism : <i>Benzyne intermediate</i>	Power Point Presentation: <i>Benzyne intermediates</i>	CO2
18	Reactivity and orientation in Aromatic Nucleophilic substitutions.		CO2

#### References:

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

### JOSEPH JOHN

#### Unit II : ORGANIC REACTION MECHANISMS

Session s	Session Topic and Discussion Theme	Value additions	COs
1	Introduction to Organic Reaction Mechanisms		CO3
2	Drawing electron movements with arrows: <ul style="list-style-type: none"> <li>• Curved arrow notation.</li> <li>• Half headed and double headed arrows.</li> </ul>	Individual Assignment: <i>Reactions with different kinds of arrow notations</i>	CO3
3	<i>Types of reagents:</i> Electrophiles and Nucleophiles <i>Types and sub-types organic reactions:</i> Substitution, Addition reactions, Elimination and Rearrangement.	Classification of 20 named reactions	CO3
4	Reactive intermediates with examples – carbocations, carbanions	Power Point Presentation: <i>Structure of intermediates</i>	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	<ul style="list-style-type: none"> <li>• Aliphatic nucleophilic substitutions,</li> </ul>		CO3

	<ul style="list-style-type: none"> <li>mechanism of S<sub>N</sub>1 and S<sub>N</sub>2 reactions.</li> </ul>		
9	<ul style="list-style-type: none"> <li>Effects of structure, substrate, solvent, nucleophile and leaving groups</li> <li>Stereochemistry- Walden inversion</li> </ul>		<b>CO3</b>
<b>1<sup>st</sup> Internal Examination</b>			
10	<i>Elimination Reactions</i> :-Hoffmann and Saytzeff rules		<b>CO3</b>
11	<i>Cis</i> - and <i>trans</i> - eliminations		
12	<ul style="list-style-type: none"> <li>Mechanisms of E1 and E2 reactions</li> <li>Elimination <i>versus</i> substitution.</li> </ul>	Power Point Presentation	<b>CO3</b>
13	Addition reactions: <ul style="list-style-type: none"> <li>Mechanisms of addition of Bromine</li> <li>Inductomeric effect</li> </ul>		<b>CO3</b>
14	Mechanisms of addition of hydrogen halides to double bonds.		<b>CO3</b>
15	Markonikoff's rule and peroxide effect.		<b>CO3</b>
<b>2<sup>nd</sup> Internal Examination</b>			
16	Polymerisation reactions: Types of polymerization - free radical, cationic and anionic – polymerisations –including mechanism.		<b>CO4</b>
17	Pericyclic Reactions: Classification- electrocyclic, sigmatropic, cycloaddition reactions-Examples	Power Point Presentation: <i>Illustration of different reactions</i>	<b>CO4</b>
18	Diels- Alder reaction- Stereochemical aspects- Effect of substituents.		<b>CO4</b>

**References:**

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

**THOMMACHAN XAVIER**

**Unit III : STEREOCHEMISTRY OF ORGANIC COMPOUNDS**

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

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
<b>1<sup>st</sup> Internal Examination</b>			
10	Optical activity in compounds does not containing asymmetric carbon atoms-Biphenyls and allenes.		CO2
11	Geometrical isomerism - <i>cis-trans syn-anti</i> 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 <i>n</i> -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
<b>2<sup>nd</sup> Internal Examination</b>			
16	Conformation of methyl cyclohexane.		
<b>Unit V : PERICYCLIC REACTIONS</b>			
17	Classification- electrocyclic, sigmatropic, cycloaddition reactions.	Power Point Presentation:	CO4
18	Claisen rearrangement -Diels_Alder reation- . Stereochemical aspects.		CO4
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. P. Sykes, A Guide book to Mechanism in Organic Chemistry, 6<sup>th</sup> Edition, Orient Longman.</li> <li>2. P.S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.</li> <li>3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Co.</li> <li>4. P. Y. Bruice, 'Organic Chemistry' - 3rd Edn. Pearson Education.</li> </ol>			



**DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA****COURSE PLAN : ACADEMIC YEAR 2015 - 2016**

<b>PROGRAMME</b>	: <i>B.Sc. Chemistry</i>	<b>SEMESTER</b>	: 4
<b>LECTURE HOURS</b>	: 54	<b>CREDITS</b>	: 3
<b>SUBJECT TITLE</b>	: <i>Basic Organic Chemistry - I</i>	<b>SUBJECT CODE</b>	: <i>CH4B01</i>

<b>COURSE TEACHERS</b>	: Dr. Joseph John (JJ), Dr. Thommachan Xavier (TX) & Dr. Grace Thomas (GT)
<b>COURSE OUTCOMES (COs)</b>	: <p><b>CO1</b> - Understand the chemistry of some selected functional groups with a view to develop proper aptitude towards the study of organic compounds and their reactions.</p> <p><b>CO2</b> - 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</p> <p><b>CO3</b> - Understand and explain organic reaction mechanisms.</p>
<b>Instructional Hours</b>	: <p><i>Tuesday : Period 1 (9:30 to 10:30 am) - JJ</i></p> <p><i>Wednesday : Period 1 (9:30 to 10:30 am) - TX</i></p> <p><i>Thursday : Period 5 (2:30 to 3:30 pm) - GT</i></p>

**GRACE THOMAS****Unit I : HYDROXY COMPOUNDS**

Session s	Session Topic and Discussion Theme	Value additions	COs
1	Introduction to Alcohols.		<b>CO1</b>
2	Monohydric alcohols: Classification Physical properties–hydrogen bonding		<b>CO1</b>
3	Distinction between primary, secondary and tertiary alcohols. Ascent and decent in alcohol series	Individual Assignment: <i>Nomenclature of Alcohols</i>	<b>CO1</b>
4	Dihydric alcohols		<b>CO1</b>
5	Oxidative cleavage – Lead tetra acetate, Periodic acid Pinacol - Pinacolone rearrangement: mechanism	Power Point Presentation	<b>CO3</b>
6	Phenols – Acidity of phenols- effects of substituents – comparison of acidity with alcohols		<b>CO2</b>
7	Preparation and uses of nitrophenols, picric acid, catechol, resorcinol and quinol		<b>CO2</b>
8	Mechanisms of Reimer –Tiemann reaction, Lederer- Mannase reaction, Fries rearrangement		<b>CO3</b>

**Unit VI : GRIGNARD AND RELATED COMPOUNDS**

9	Grignard reagents-formation, structure and synthetic applications		<b>CO2</b>
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**1<sup>st</sup> Internal Examination**

10	Alkyl lithium, Reformatsky reaction		<b>CO2</b>
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<b>Unit VII : COMPOUNDS CONTAINING ACTIVE METHYLENE GROUPS</b>			
11	Synthetic uses of malonic ester.	<i>Assignment :</i> Synthetic Applications of active methylene compounds	<b>CO2</b>
12	Synthetic uses of acetoacetic ester.		<b>CO2</b>
13	Synthetic uses of cyanoacetic ester.		<b>CO2</b>
14	Keto-enol tautomerism of ethyl acetoacetate.		<b>CO2</b>
15	Alkylation of carbonyl compounds <i>via</i> enamines		<b>CO2</b>
<b>2<sup>nd</sup> Internal Examination</b>			
<b>Unit VIII : POLY NUCLEAR HYDROCARBONS AND THEIR DERIVATIVES</b>			
16	Classification – reactions and structure of naphthalene	Power Point Presentation	<b>CO2</b>
17	Reactions and structure of anthracene and phenanthrene		<b>CO2</b>
18	Elementary idea of naphthyl amines, naphthols, naphthaquinone and anthraquinone.		<b>CO2</b>
<b>References:</b>			
1. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6 <sup>th</sup> Edition - Prentice Hall of India.			
2. L. Finar, 'Organic Chemistry' - Vol.- 6 <sup>th</sup> Edition I, Pearson Education (chapters-20,21)			
3. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3 <sup>rd</sup> Edn, Vishal Publishing Co.			
4. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3 <sup>rd</sup> Edition, Vikas Publishing House,			
5. Peter Sykes, A Guide book to Mechanism in Organic Chemistry ;, 6 <sup>th</sup> Edition, Pearson Education.			
<b>THOMMACHAN XAVIER</b>			
<b>Unit II : ETHERS AND EPOXIDES</b>			
<b>Session s</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
1	Synthesis and Reactions of Epoxides		<b>CO2</b>
2	Cleavage of ether linkages by HI- Ziesels method of estimation of alkoxy groups	Power point presentation	<b>CO2</b>
3	Claisen rearrangement –mechanism.		<b>CO2</b>
<b>Unit III : ALDEHYDES AND KETONES</b>			
4	Structure and reactivity of the carbonyl group - acidity of alpha hydrogen. Comparative studies of -aldehydes and ketones -	Power Point Presentation:	<b>CO2</b>
5	aliphatic and aromatic aldehydes - formaldehyde and acetaldehyde-		<b>CO2</b>
6	Mechanism of nucleophilic additions to carbonyl groups : Claisen and Claisen-Schmidt condensations.		<b>CO2</b>
7	Mechanism of nucleophilic additions to carbonyl groups : Benzoin condensations and Aldol condensations.	Assignment: Mechanism of Named reactions	<b>CO2</b>
8	Mechanism of nucleophilic additions to carbonyl groups : Perkin and Knoevenagel condensations.		<b>CO2</b>
9	Condensation with ammonia and its derivatives.		<b>CO2</b>
<b>1<sup>st</sup> Internal Examination</b>			
10	Wittig reaction and Mannich reaction, Addition of Grignard reagents.		<b>CO3</b>
11	Oxidation and reduction of aldehydes and ketones: Baeyer-Villiger oxidation		<b>CO3</b>

12	Oxidation and reduction of aldehydes and ketones: Cannizzaro's reaction		CO3
13	Oxidation and reduction of aldehydes and ketones: Meerwein-Ponndorf-Verley, and Clemmensen, reductions		CO3
14	Oxidation and reduction of aldehydes and ketones: Wolff-Kishner, $\text{LiAlH}_4$ and $\text{NaBH}_4$ reductions.		CO3
15	Use of acetal as protecting group.	Power Point Presentation	CO2
<b>2<sup>nd</sup> Internal Examination</b>			
<b>Unit V : CARBONIC ACID DERIVATIVES</b>			
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
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. P. Sykes, A Guide book to Mechanism in Organic Chemistry, 6<sup>th</sup> Edition, Orient Longman.</li> <li>2. P.S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.</li> <li>3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Co.</li> <li>4. P. Y. Bruice, 'Organic Chemistry' - 3rd Edn. Pearson Education.</li> </ol>			
<b>JOSEPH JOHN</b>			
<b>Unit IV : CARBOXYLIC AND SULPHONIC ACIDS</b>			
<b>Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
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, cinnamic acid		CO2
8	Methods of formation and chemical reactions : acrylic acid		CO2
9	Methods of formation and chemical reactions : oxalic acid	Assignment	CO2
<b>1<sup>st</sup> Internal Examination</b>			
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
<b>2<sup>nd</sup> Internal Examination</b>			
16	Preparation, reactions and uses: benzene sulphonic acid		CO2
17	Preparation, reactions and uses: benzene sulphonyl chloride		CO2
18	Preparation, reactions and uses: <i>ortho</i> and <i>para</i> toluene sulphonyl chlorides		CO2
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. Peter Sykes, A Guide book to Mechanism in Organic Chemistry: 6<sup>th</sup> Edition, Pearson Education.</li> <li>2. P. S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.</li> <li>3. K.S. Tewari and N.K. Vishnoi 'Organic Chemistry', 3<sup>rd</sup> Edition, Vikas Publishing House.</li> <li>4. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Company Co.</li> <li>5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6<sup>th</sup> Edition - Prentice Hall of India,</li> <li>6. I. L. Finar, Organic Chemistry, 6<sup>th</sup> Edition. Vol.- I, Pearson</li> </ol>			

COURSE PLAN				
ACADEMIC YEAR 2014-15				
<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	: 54
<b>SEMESTER</b>	:	5	<b>CREDITS</b>	: 3
<b>SUBJECT TITLE</b>	:	<i>Chemistry of d and f block elements</i>	<b>SUBJECT CODE</b>	: U5CRCHE5
<b>COURSE TEACHERS</b>	:	<i>Dr. Joseph John (JJ), Mr. Midhun Dominic C D (MD), Ms. June Cyriac (JUC)</i>		
<b>Objectives</b>	:	<ul style="list-style-type: none"> <li>➤ To understand the general characteristics of the d and f block elements</li> <li>➤ To study the physical and chemical properties of d and f block elements</li> <li>➤ To study the Werner's theory of coordination compounds</li> <li>➤ To study isomerism in metal complexes</li> <li>➤ To study the bonding in coordination compounds</li> <li>➤ To understand the applications of coordination compounds</li> <li>➤ To understand the classification, properties and applications of organometallic compounds</li> <li>➤ To study the methods of preparation, properties, structure and bonding of metal carbonyls and metal clusters</li> <li>➤ To understand the role of metals in biological systems.</li> </ul>		
<b>Instructional Hours</b>	:	<i>3 hours per week</i>		
<b>JJ</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<i>U NI</i>	1	IUPAC nomenclature, coordination number, geometry of complexes with coordination numbers 4 and 6.		

<b>T 2 : Co-ordination Chemistry</b> (18 hours)	2	Stability of complexes - factors affecting the stability of metal complexes. Chelates, chelate effect, stepwise stability constant and overall stability constant.		
	3	Isomerism in coordination compounds – structural isomerism and stereo isomerism,	Assignment No: 1	
	4	Stereochemistry of complexes with 4 and 6 coordination numbers.		
	5	Bonding theories –Werner’s theory of coordination, EAN	Group Discussion	
	6	Valence bond theory, geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, high spin and low spin complexes, inner orbital and outer orbital complexes.		
	7	Crystal field theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes	MOODLE- Assignment No:2	
	8	low spin and high spin complexes, strong and weak field ligands, pairing energy		
	9	<b>FIRST INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.</li> <li>❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010</li> <li>❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.</li> </ul>			
<b>UNIT 2 : Co-ordination Chemistry</b>	10	Analysis of First internal examination	Assignment No.3	
	11	Jahn-Teller distortion, Jahn-Teller distortion in Cu (II) complexes		
	12	MO theory, evidence for metal ligand covalency, MO diagram of complexes of octahedral symmetry (sigma bonding only).		
	13	Spectral and magnetic properties of metal complexes-Electronic		

<b>(18 hours)</b>		absorption spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion.		
	14	Types of magnetic behavior, spin-only formula, calculation of magnetic moments.		
		<b>SECOND INTERNAL EXAMINATION</b>		
<b>Text Books</b>		<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.</li> <li>❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010</li> <li>❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.</li> </ul>		
<b>UNIT 2 : Co-ordination Chemistry</b>	15	Reactivity of metal complexes-Labile and inert complexes		
	16	ligand substitution reactions – $\text{S}_{\text{N}}1$ and, $\text{S}_{\text{N}}2$	Demonstration	
	17	Substitution reactions of square planar complexes – Trans effect and applications of trans effect.	PowerPoint presentation	
	18	Revision		
<b>Text Books</b>		<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.</li> <li>❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010</li> <li>❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.</li> </ul>		

<b>MD</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<b>UNIT 4 : Metal Carbonyls and Metal Clusters</b> (9 hours)	1	Introduction to metal carbonyls and metal clusters		
	2	Preparation and properties of mononuclear carbonyls.		
	3	Structures of Mo(CO) <sub>6</sub> , Fe(CO) <sub>5</sub> and Ni(CO) <sub>4</sub> .	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 <sub>6</sub> (CO) <sub>16</sub> and [Os <sub>6</sub> (CO) <sub>18</sub> ] <sup>2-</sup>	MOODLE- Assignment No:2	
	8	Metal only clusters (Zintl ions). Quadruple bond – structure of Re <sub>2</sub> Cl <sub>8</sub> <sup>2-</sup> .		
	9	<b>Revision</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (Chapter 31 and 32)</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006( Chapter 15)</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 5th edn., John Wiley, New York (Chapter 22 and 23)</li> </ul>			
<b>UNIT 5 :</b>	10	Essential and trace elements in biological systems, Myoglobin and Hemoglobin, role of myoglobin and hemoglobin in biological systems	Assignment No.3	
	11	Mechanism of oxygen transport, cooperativity, Bohr effect, Structure of Vitamin B12		



<b>Bioinorganic Chemistry (9 hours)</b>	12	Cytochromes- Structure and function.		
	13	Metalloenzymes: Inhibition and poisoning of enzymes. A brief study of the following metalloenzymes and their functions. Metallo enzymes of Zn		
	14	Electron Carriers		
	15	Role of alkali and alkaline earth metals in biological systems, Na/K pump.		
<b>T 2 : Coordination Chemistry (18 hours)</b>				
<b>SECOND INTERNAL EXAMINATION</b>				

<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.</li> <li>❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010</li> <li>❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.</li> </ul>		
<b>UNIT 5 : Bioinorganic Chemistry</b>	16	Biological function and toxicity of metals – Fe, Cu, Zn, Cr, Mn	
	17	Biological function and toxicity of metals – Ni, Co, Cd, Hg and Pb	
	18	Treatment of metal toxicity. Chelation therapy. Anti-cancer drugs – cisplatin and carboplatin	Demonstration
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi, 2010.</li> <li>❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry,5th Ed. Pearson 2009.</li> <li>❖ F.A.Cotton, G.Wilkinson, P. L. Gaus, Basic Inorganic Chemistry,3rd Edn,John –Wiley,1995</li> <li>❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley.</li> <li>❖ Ivano Bertini, Harry B Gray, Stephen J. Lippard, Joan Selvertone Valentine,Bioinorganic Chemistry.Viva Books Pvt Ltd. 2007.</li> </ul>		

<b>JUC</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<b>UNIT 1 : Chemistry of d and f block elements (9 hours)</b>	1	<b>Module 1 : Chemistry of d and f Block Elements</b> 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	
		<b>FIRST INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.</li> <li>❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010</li> <li>❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.</li> </ul>			

<b>UNIT 1 : Chemistry of d and f block</b>	8	Discussion on CIA	Assignment No.3	
	9	Lanthanide contraction, separation of lanthanides. Actinides, properties. Comparison of lanthanides and actinides		
<b>SECOND INTERNAL EXAMINATION</b>				
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008.</li> <li>❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010</li> <li>❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li> <li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.</li> </ul>			
<b>UNIT 3 : Organometallic Compounds (9 hours)</b>	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		

<i>Text Books</i>	<ul style="list-style-type: none"><li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Edn. Milestone Publishers, New Delhi 2010</li><li>❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004.</li><li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006</li><li>❖ R. C. Mehrotra and A. Singh, Organometallic chemistry, New age publishers.</li><li>❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 3rd edn., John Wiley, New York. 1995.</li><li>❖ A. G. Sharpe, Inorganic Chemistry, 3rd Edn. Pearson.</li></ul>
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COURSE PLAN				
ACADEMIC YEAR 2015-16				
<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	: 54
<b>SEMESTER</b>	:	5	<b>CREDITS</b>	: 3
<b>SUBJECT TITLE</b>	:	<b>Organic Chemistry - III</b>	<b>SUBJECT CODE</b>	: 15U5CRCHE06
<b>COURSE TEACHERS</b>	:	<i>Dr. V.S. Sebastian, Dr. Joseph T Moolayil, Dr. Franklin John, Dr. M. George</i>		
<b>COURSE OUTCOMES (COs)</b>	:	<p><b>CO1</b> - To learn the chemistry of nitro compounds, amines, dyes, organic polymers, soaps, detergents and organic reagents.</p> <p><b>CO2</b> - To understand and study mechanism of reactions of nitro compounds and amines</p> <p><b>CO3</b> - To have an elementary idea of chemotherapy, organic spectroscopy and photochemistry</p> <p><b>CO4</b> - <i>Ability to explore and reflect about the wide range of possibilities and applications of nuclear reactions and radio activity.</i></p> <p><b>CO5</b> - To identify organic compound using UV, IR and PMR spectroscopic techniques</p>		

	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-		<b>CO1</b>
	2	reduction products of nitrobenzene in acidic, neutral		<b>CO1</b>

<b>nic com pou nds cont aini ng Nitr ogen (10 hour s)</b>	3	reduction products of nitrobenzene in alkaline media-	Assignment No: 1	<b>CO1</b>
	4	Electrolytic reduction and selective reduction of poly nitro compounds- formation of charge transfer complexes		<b>CO1</b>
	5	Amines- isomerism- stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines -		<b>CO1</b>
	6	Structural features affecting basicity of aliphatic and aromatic amines. Quaternary amine salts as phase-transfer catalysts		<b>CO1, CO2</b>
	7	Comparative study of aliphatic and aromatic amines.	Assignment No:2	<b>CO1, CO2</b>
	8	Preparation of alkyl and arylamines (reduction of nitro compounds, nitriles),		<b>CO1, CO2, CO3</b>
	9	<b>FIRST INTERNAL EXAMINATION</b>		
	<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. I. L. Finar, Organic Chemistry -, 6<sup>th</sup> Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24).</li> <li>2. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6<sup>th</sup> Edition - Prentice Hall of India, (Chapter- 22,23).</li> <li>3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Company Co. (Chapter-22).</li> <li>4. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3<sup>rd</sup> Edition, Vikas Publishing House (Chapter- 22,23,24).</li> <li>5. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.</li> </ol>		
	10	Reductive amination of aldehydes and ketones Gabriel- Phthalimide reaction, Hoffmann bromamide reaction.	Assignment No.3	<b>CO1</b>
	11	Diazonium salts-preparation, synthetic transformations of aryldiazonium salts		<b>CO1</b>
	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
	12			<b>CO1</b>

	13	Azo Coupling - Mechanisms of Sandmeyer's and Gatterman reactions	Group Discussion	<b>CO1, CO3</b>
<b>SECOND INTERNAL EXAMINATION</b>				
<i>Text Books</i>	<ol style="list-style-type: none"> <li>1. I. L. Finar, Organic Chemistry -, 6<sup>th</sup> Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24).</li> <li>2. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6<sup>th</sup> Edition - Prentice Hall of India, (Chapter- 22,23).</li> <li>3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Company Co. (Chapter-22).</li> <li>4. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3<sup>rd</sup> Edition, Vikas Publishing House (Chapter- 22,23,24).</li> <li>5. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.</li> </ol>			
<b>Organic compounds containing Nitrogen (5 hours)</b>	14	Schiemann and Gomberg reactions		<b>CO1</b>
	15	Preparation and uses of Phenyl hydrazine		<b>CO1, CO5</b>
	16	Diazomethane - preparation, structure and synthetic uses	Demonstration	<b>CO1, CO5</b>
	17	Diazoacetic ester - preparation, structure and synthetic uses	PowerPoint presentation	<b>CO1, CO5</b>
	18	Arndt- Eistert synthesis- mechanism	PowerPoint presentation	<b>CO1, CO5</b>
	19	Wolff rearrangement –mechanism		
	20	Curtius rearrangement and its mechanism.		
<i>Text Books</i>	<ol style="list-style-type: none"> <li>6. I. L. Finar, Organic Chemistry -, 6<sup>th</sup> Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24).</li> <li>7. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6<sup>th</sup> Edition - Prentice Hall of India, (Chapter- 22,23).</li> <li>8. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Company Co. (Chapter-22).</li> <li>9. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3<sup>rd</sup> Edition, Vikas Publishing House (Chapter- 22,23,24).</li> <li>10. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.</li> </ol>			





<b>Unit II &amp; III , IV &amp; V</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
<b>Dyes (3 hours)</b>	1	Theory of colour and constitution. Classification - according to structure and method of application.		<b>CO1</b>
	2	Preparation and uses of Azo dye-methyl orange and Bismark brown,		<b>CO1, CO4</b>
	3	Preparation and uses of Triphenyl methane dye -Malachite green,		<b>CO1</b>
	4	Preparation and uses of Phthalein dye - phenolphthalein and fluroescen,		<b>CO1</b>
	5	Preparation and uses of Vat dye – indigo,		<b>CO1, CO4</b>
	7	Preparation and uses of Anthraquinone dye - alizarin		<b>CO1, CO4</b>
	<b>1<sup>st</sup> Internal Examination</b>			
<b>Text Books</b>	<ul style="list-style-type: none"> <li>○ I. L. Finar, Organic Chemistry, 6<sup>th</sup> Edition. Vol - I, Pearson. (Chapter-31)</li> <li>○ M. K. Jain and S. C. Sharma ‘Modern Organic Chemistry’, 3<sup>rd</sup> Edition, Vishal Publishing Company Co. (Chapter-22)</li> <li>○ K. S. Tewari and N. K. Vishnoi, ‘Organic Chemistry’, 3<sup>rd</sup> Edition, Vikas Publishing House (Chapter-38).</li> <li>○ B. S. Bahl, ‘Advanced Organic Chemistry’, S. Chand</li> </ul>			
<b>Unit V, VI &amp; VII</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
<b>Photo ch</b>	10	Introduction- Photochemical versus Thermal reactions. Reactions		<b>CO1, CO2, CO3</b>

<b>emical Reactions (3 hours), Organic Polymers (4hours), Soaps and Detergents (3) hours</b>	11	Norrish reactions of acyclic Ketones.	Power Point Presentation	<b>CO1, CO2, C03</b>	
	12	Patterno-Buchi, Photo-Fries reactions.	Power Point Presentation	<b>CO1, CO2, C03</b>	
	13	Synthesis and applications of the following polymers- Polyesters- terephthalates,		<b>CO1</b>	
	14	Nylon 6 and Nylon 6,6, phenol formaldehyde resins, urea formaldehyde resins .	Group Discussion	<b>CO1</b>	
	<b>2<sup>nd</sup> Internal Examination</b>				
	15	Epoxy resins and polyurethanes, PVC and Teflon.		<b>CO1</b>	
	16	Synthetic rubbers –SBR and Nitrile rubber- structure and applications		<b>CO1</b>	
	17	Composition of soaps- detergent action of soap	Individual Assignment:	<b>CO1</b>	
	18	Synthetic detergents- - their functions – comparison between soaps and detergents-		<b>CO1</b>	
	19	Environmental aspects. LAS and ABS detergents			
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. I. L. Finar, Organic Chemistry, 6<sup>th</sup> Edition. Vol- I, Pearson. (p.-323)</li> <li>2. M. K. Jain and S. C. Sharma, ‘Modern Organic Chemistry’, 3<sup>rd</sup> Edition, Vishal Publishing Company Co. (Chapter-22)</li> <li>3. K. S. Tewari and N. K. Vishnoi ‘Organic Chemistry’, 3<sup>rd</sup> Edition, Vikas Publishing House (Chapter-36).</li> <li>4. R. T. Morrison and R.N Boyd, ‘Organic Chemistry’, 6<sup>th</sup> Edition - Prentice Hall of India, (Chapter- 31)</li> <li>5. Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994.</li> <li>6. Gowariker V.R., Viswanathan N.V. and JayaderSreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> </ol>				
<b>VSS</b>					
<b>Unit VIII &amp; IX</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>	

<b>Aliphatic hydrocarbons (2 hours), Chemotherapy (5) hours Chemotherapy</b>	1	Cycloalkanes- relative stabilities..		<b>CO1</b>
	2	Butadiene – structure and stability, 1,4 addition and its mechanism		<b>CO1, CO4</b>
	3	Drugs- introduction –classification –mode of action		<b>CO1</b>
	4	Elementary idea of the structure and mode of action of drugs Sulphanilamides,		<b>CO1</b>
	5	Elementary idea of the structure and mode of action of drugs Amphicillin and Chloramphenicol		<b>CO1, CO4</b>
	7	Elementary idea of the structure and application of Chloroquine, Paracetamol, Analgin and Aspirin.		<b>CO1, CO4</b>
	<b>1<sup>st</sup> Internal Examination</b>			
<b>Text Books</b>	<ul style="list-style-type: none"> <li>○ I. L. Finar, Organic Chemistry, 6<sup>th</sup> Edition. Vol - I, Pearson. (Chapter-31)</li> <li>○ M. K. Jain and S. C. Sharma ‘Modern Organic Chemistry’, 3<sup>rd</sup> Edition, Vishal Publishing Company Co. (Chapter-22)</li> <li>○ K. S. Tewari and N. K. Vishnoi, ‘Organic Chemistry’, 3<sup>rd</sup> Edition, Vikas Publishing House (Chapter-38).</li> <li>○ B. S. Bahl, ‘Advanced Organic Chemistry’, S. Chand</li> </ul>			
<b>Unit IV &amp; V</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
<b>Chemistry of Organic</b>	10	Drugs in cancer therapy- Chlorambucil		<b>CO1, CO2, CO3</b>
	11	Analytical reagents – Tollens reagent, Fehling solution	Power Point Presentation	<b>CO1, CO2, CO3</b>
	12	Schiff’s reagents, Borsche’s reagent, Benedict solution-(Procedure not required.	Power Point Presentation	<b>CO1, CO2, CO3</b>

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

**COURSE PLAN**

**ACADEMIC YEAR 2015-16**

<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	:	36
<b>SEMESTER</b>	:	5	<b>CREDITS</b>	:	2
<b>SUBJECT TITLE</b>	:	Quantum Mechanics and Spectroscopy	<b>SUBJECT CODE</b>	:	
<b>COURSE TEACHERS</b>	:	<i>Dr.Jinu George, Dr.Jorphin Joseph, Senju Devassykutty</i>			
<b>Objectives</b>	:	<ul style="list-style-type: none"> <li>• To differentiate between classical and quantum mechanics</li> <li>• To study the postulates of quantum mechanics and the quantum mechanical model of the hydrogen atom</li> <li>• To study valence bond and molecular orbital theory</li> <li>• To study the principle and applications of microwave, infra red, Raman, electronic and magnetic resonance spectroscopy.</li> <li>• To study the fundamentals of mass spectrometry To study the fundamentals of photochemistry</li> </ul>			
<b>Instructional Hours</b>	:	<i>3 hours/week</i>			

	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Courses/ Text book/Web URL</b>
<b>Unit .2. Molecular spectroscopy</b>	1	<b>1. Introduction to spectroscopy</b> Introduction: electromagnetic radiation, regions of the spectrum,		<a href="#">Presentation on: Molecules and Molecular Spectroscopy - UAF 12/17/2017</a>
	2	interaction of electromagnetic radiation with molecules, various		

<b>py I</b>		types of molecular spectroscopic techniques,			
	3	Born-Oppenheimer approximation.			
	4	<b>2. Rotational spectroscopy</b> Introduction to Rotational spectrum:	ICT		
	5	diatomic molecules, energy levels of a rigid rotator, selection rules, determination of bond length.			
	7	<b>3. Vibrational spectroscopy</b>			
	<b>1<sup>st</sup> Internal Examination</b>				
	8	Vibrational spectrum: the simple harmonic oscillator			
	9	– energy levels, force constant, selection rules.			
	<b>Text Books</b>	<b>References</b>			
1. R. Puri, L. R. Sharma, M. S. Pathania, ' <i>Elements of Physical Chemistry</i> ', Vishal Pub. Co., 2. K. J. Laidler, John H. Meiser, ' <i>Physical Chemistry</i> ', 2 <sup>nd</sup> edn..					
	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>		
	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		
<b>2<sup>nd</sup> Internal Examination</b>					
	15	concept of group frequencies –		<a href="#">Classical Mechanics with a Bang! -</a>	

	16	– pure vibrational spectra of diatomic molecules,		<a href="https://modphys.hosted.uark.edu/markup/CMwBang_UnitsDetail_2017.html">URL is "https://modphys.hosted.uark.edu/markup/CMwBang_UnitsDetail_2017.html"</a>
	17	frequencies of common functional groups in organic compounds.		
	18	Revision		
<i>Text Books</i>	<b>References</b> <ul style="list-style-type: none"> <li>• K. K. Sharma, L R Sharma, ‘<i>A Text Book of Physical Chemistry</i>’, Vikas Publishing house.</li> <li>• S. Negi, S. C. Anand, ‘<i>A Textbook of Physical Chemistry</i>’, Second Edition, New Age International (P) limited, publishers.</li> </ul>			

	No. of Sessions	Session Topic and Discussion Theme	Value additions			
<i>Unit 1. Quantum mechanics</i>	1	Classical mechanics: concepts, failure of classical mechanics,	Assignment No. 1	<a href="https://modphys.hosted.uark.edu/markup/MPCFWeb.html">Modern Physics and its Classical Foundations - URL is "https://modphys.hosted.uark.edu/markup/MPCFWeb.html"</a> <a href="https://modphys.hosted.uark.edu/markup/PSDSWeb.html">Principles of Symmetry, Dynamics, and Spectroscopy {Text} - URL is "https://modphys.hosted.uark.edu/markup/PSDSWeb.html"</a> <a href="https://modphys.hosted.uark.edu/markup/QTCA_UnitsDetail.html">Quantum Theory for the Computer Age - URL is "https://modphys.hosted.uark.edu/markup/QTCA_UnitsDetail.html"</a>		
	2	Qualitative idea about the energy distribution in black body radiation. Plank’s radiation law, Compton effect.				
	3	Binding energy of an electron in hydrogen atom, radius of the hydrogen atom, de Broglie hypothesis, dual nature of electrons –				
	4	Davisson and Germer’s experiment. Heisenberg’s uncertainty principle and its significance.				
	5	Sinusoidal wave equation (no derivation needed).				
	7	Wave function – physical interpretation, concept of operators, eigen functions, eigen values.				
	<b>1<sup>st</sup> Internal Examination</b>					
	8	Postulates of quantum mechanics, Particle in one-dimensional box –				



	9	Derivation for energy, application to linear conjugated polyene (butadiene).		
<i>Text Books</i>	<b>References</b>			
	1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 4, Macmillan India Ltd Chaper 1,2 2. Mc Quarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd, Chapters 1,2,3,4,6 3. I. N. Levine, Physical Chemistry, Tata Mc Graw Hill, Chapter18 4. A. Bahl, B. S. Bahl, G. D. Tuli, Essentials of Physical Chemistry, S. Chand and Company, chapter 1,2 5. K. J. Laidler, John H.Meiser, Physical Chemistry,2nd edn, Chapters 11,12			
	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
	10	Introductory treatment of Schrödinger equation for hydrogen atom.		
	11	Quantum numbers and their importance, hydrogen like wave functions –	Power Point Presentation	
	12	Radial and angular wave functions, radial distribution curves.	Power Point Presentation	
	13	Molecular orbital theory: basic ideas – criteria for forming MO from AOs,		
	14	Construction of molecular orbital by LCAO method,	Group Discussion	
	<b>2<sup>nd</sup> Internal Examination</b>			
	15	H <sub>2</sub> <sup>+</sup> ion (elementary idea only), physical picture of bonding and anti bonding wave functions,		
	16	Concept of antibonding orbitals and their characteristics		
	17	Introduction to valence bond model of hydrogen molecule,		
	18	comparison of MO and VB methods.		

<i>Text Books</i>	<p><b>References</b></p> <ol style="list-style-type: none"> <li>1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 4, Macmillan India Ltd Chaper 1,2</li> <li>2. Mc Quarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd, Chapters 1,2,3,4,6</li> <li>3. I. N. Levine, Physical Chemistry, Tata Mc Graw Hill, Chapter18</li> <li>4. A. Bahl, B. S. Bahl, G. D. Tuli, Essentials of Physical Chemistry, S. Chand and Company, chapter 1,2</li> <li>5. K. J. Laidler, John H.Meiser, Physical Chemistry,2nd edn, Chapters 11,12</li> </ol>
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	No. of Sessions	Session Topic and Discussion Theme	Value additions		
<b>Unit 3. Molecular spectroscopy II</b>	1	➤ <i>Electronic Spectroscopy</i> : Introduction			
	2	Electronic spectrum: concept of potential energy curves for bonding and anti-bonding molecular orbitals			
	3	➤ electronic transition, the Frank-Condon principle,			
	4	dissociation energy. Polyatomic molecules – qualitative description of $\sigma$ , $\pi$ and n- molecular orbitals			
	5	➤ Polyatomic molecules- energy levels and the respective transitions	ICT		
	7	<i>NMR Spectroscopy</i> : NMR spectroscopy: basic principles of NMR spectroscopy			
	<b>1<sup>st</sup> Internal Examination</b>				
	8	Nuclear spin, Larmor precession. Proton magnetic resonance ( $^1\text{H}$ NMR or PMR)			
	9	Nuclear shielding and deshielding, chemical shift and molecular structure. Spin-spin splitting and coupling constant.			

<b>Text Books</b>	<b>References</b>			
	1. R. Puri, L. R. Sharma, M. S. Pathania, ' <i>Elements of Physical Chemistry</i> ', Vishal Pub. Co., 2. K. J. Laidler, John H. Meiser, ' <i>Physical Chemistry</i> ', 2 <sup>nd</sup> edn..			
	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<b>Unit 4. Photochemistry</b>	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	➤ <b>Mass Spectroscopy:</b> Mass spectrometry: Basic principle-ionization	Power Point Presentation	
	13	➤ Fragmentation, separation of ions and representation of the spectrum		
	14	Application in molecular mass determination.		
	<b>2<sup>nd</sup> Internal Examination</b>			
	15	➤ <b>Photochemistry:</b> 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.		
<i>Text Books</i>	<b>References</b> <ul style="list-style-type: none"> <li>• K. K. Sharma, L R Sharma, '<i>A Text Book of Physical Chemistry</i>', Vikas Publishing house.</li> <li>• S. Negi, S. C. Anand, '<i>A Textbook of Physical Chemistry</i>', Second Edition, New Age International (P) limited, publishers.</li> </ul>			

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA			
COURSE PLAN : ACADEMIC YEAR 2015 - 2016			
<b>PROGRAMME</b>	: <i>B.Sc. Chemistry</i>	<b>SEMESTER</b>	: 5
<b>LECTURE HOURS</b>	: 36	<b>CREDITS</b>	: 2
<b>SUBJECT TITLE</b>	: <i>States of Matter</i>	<b>SUBJECT CODE</b>	: <i>CH5B03</i>
<b>COURSE TEACHERS</b>	:	Dr. K. B. Jose (KBJ), Dr. Thommachan Xavier (TX) & Dr. Ignatious Abraham (IGA)	
<b>COURSE OUTCOMES (COs)</b>	:	<b>CO1</b> - Understand the intermolecular forces and dynamics of molecules in gases and liquids <b>CO2</b> - Describe the structure of solids and defects in crystals. <b>CO3</b> - Understand and explain surface phenomena.	
<b>Instructional Hours</b>	:	<i>Tuesday : Period 1 (9:30 to 10:30 am) - KBJ</i> <i>Wednesday : Period 2 (10:30 to 11:30 am) - IGA</i> <i>Thursday : Period 2 (10:30 to 11:30 pm) - TX</i>	

IGNATIUS ABRAHAM			
Unit I : GASES			
Session s	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
1 <sup>st</sup> Internal Examination			
10	van der Waals equation of state – derivation and application in explaining real gas behaviour.		CO1
11	Virial equation of state	<i>Assignment :</i> 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

<b>2<sup>nd</sup> Internal Examination</b>			
<b>Unit III : SYMMETRY</b>			
16	Symmetry of molecules-symmetry elements and symmetry operations – centre of symmetry, plane of symmetry, proper and improper axes of symmetry,	Power Point Presentation	<b>CO2</b>
17	Combination of symmetry elements, molecular point groups, Schoenflies symbol,	<i>Assignment</i>	<b>CO2</b>
18	Crystallographic point groups		<b>CO2</b>
<b>References:</b>			
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 Chapter 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			
<b>THOMMACHAN XAVIER</b>			
<b>Unit III : LIQUIDS</b>			
<b>Session s</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>COs</b>
1	Liquid State - introduction		<b>CO1</b>
2	Intermolecular forces in liquids	Power point presentation	<b>CO1</b>
3	Viscosity – Factors affecting viscosity		<b>CO1</b>
4	the viscometer method	Power Point Presentation:	<b>CO1</b>
5	surface tension		<b>CO1</b>
6	Determination of surface tension		<b>CO1</b>
7	Structure of liquids.		<b>CO1</b>
8	Unusual behaviour of water		<b>CO1</b>
<b>Unit III : LIQUID CRYSTALS AND ADSORPTION</b>			
9	Classification of liquid crystals	<i>Assignment</i>	<b>CO2</b>
<b>1<sup>st</sup> Internal Examination</b>			
10	Structure of nematic phases		<b>CO2</b>
11	Structure of cholestric phases		<b>CO2</b>
12	Adsorption – types		<b>CO3</b>
13	Adsorption of gases by solids		<b>CO3</b>
14	Factors influencing adsorption		<b>CO3</b>
15	Freundlich adsorption isotherm	Power Point Presentation	<b>CO3</b>
<b>2<sup>nd</sup> Internal Examination</b>			
16	Langmuir adsorption isotherm		<b>CO3</b>
17	The BET theory		<b>CO3</b>
18	Use of BET equation for the determination of surface area.		<b>CO3</b>
<b>References:</b>			
1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 1, Macmillan India Ltd Chapters 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			

## K B JOSE

## Unit III : SOLID STATE

Session s	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
<b>1<sup>st</sup> Internal Examination</b>			
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 AX <sub>2</sub> - (CaF <sub>2</sub> , Na <sub>2</sub> O)	Power Point	CO2
15	Defects in crystals – stoichiometric and non-stoichiometric defects	Assignment	CO2
<b>2<sup>nd</sup> Internal Examination</b>			
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: 6<sup>th</sup> 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', 3<sup>rd</sup> Edition, Vikas Publishing House.
4. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3<sup>rd</sup> Edition, Vishal Publishing Company Co.
5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6<sup>th</sup> Edition - Prentice Hall of India,
6. I. L. Finar, Organic Chemistry, 6<sup>th</sup> Edition. Vol.- I, Pearson

**SACRED HEART COLLEGE(AUTONOMOUS), THEVARA**

**DEPARTMENT OF CHEMISTRY**

**COURSE PLAN**

**ACADEMIC YEAR 2015-2016**

<b>PROGRAMME</b>	Open course	<b>SEMESTER</b>	5
<b>COURSE CODE AND TITLE</b>	15U5OCHE1 - Chemistry in Everyday life	<b>CREDIT</b>	3
<b>HOURS/SEM</b>	72		
<b>FACULTY NAME</b>	Dr. Joseph T Moolayil (JTM), Dr. Grace Thomas (GT), Dr. Ramakrishnan S (RKS), Dr. Abi T G (ATG)		

<b>COURSE OBJECTIVES</b>	
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

<b>Dr. Abi T. G.</b>				
<b>Plastics, Paper Dyes</b>				<b>(14 Hrs)</b>
<b>Sl.No</b>	<b>Session</b>	<b>Topic</b>	<b>Method of Teaching</b>	<b>Remarks</b>
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	
<b>First Internal Examination</b>				
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	
<b><i>Second internal Examination</i></b>				
13	13	Revision	Chalk & Board	
14	14	Revision	Chalk & Board	
<b>Synthetic Detergents</b>				<b>(3 Hrs)</b>
15	15	Enzymes used in commercial detergents	Chalk & Board	
16	16	Environmental hazards.	Chalk & Board	
17	17	Revision	Chalk & Board	

<b>Dr. Joseph T Moolayil</b>				
<b>Cosmetics</b>				<b>(12 Hrs)</b>
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	
<b><i>First Internal Examination</i></b>				
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	
<b>Soaps</b>				<b>(7 Hrs)</b>

13	13	Soaps – Introduction	Chalk & Board	
<i>Second Internal Examination</i>				
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	
<i>Second Internal Examination</i>				
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	

<b>Dr. Grace Thomas</b>				
<b>Drugs</b>			<b>(6 Hrs)</b>	
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	
<i>First Internal Examination</i>				
<b>Chemistry and Agriculture</b>			<b>(12 Hrs)</b>	
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	
<i>Second Internal Examination</i>				
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 2015-16**

<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	:	<i>54</i>
<b>SEMESTER</b>	:	<i>6</i>	<b>CREDITS</b>	:	<i>3</i>
<b>SUBJECT TITLE</b>	:	<i>Inorganic Chemistry II</i>	<b>SUBJECT CODE</b>	:	<i>15U6CRCHE09</i>
<b>COURSE TEACHERS</b>	:	<i>Dr. Joseph John (JJ), Mr. Midhun Dominic C D (MD), Ms. June Cyriac (JUC)</i>			
<b>Objectives</b>	:	<p>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.</p> <p>To understand the importance of our environment and its protection.</p>			
<b>Instructional Hours</b>	:	<i>3 hours per week</i>			

<b>JJ</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<b>UNIT 1 : Metallurgy</b>	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		

<b>(9 hours)</b>		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	<b>FIRST INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Ed. Milestone Publishers, New Delhi 2010.</li> <li>❖ S. Prakash, G. D. Tuli, S. K. Basu and R. D. Madan, Advanced Inorganic Chemistry, 5th edn, 2012, Volume I, S Chand.</li> <li>❖ A. Cottrell, An introduction to metallurgy, 2nd edn., University press. 1990.</li> </ul>			
<b>UNIT 6: Structure of Inorganic Solids (9 hours)</b>	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		
<b>SECOND INTERNAL EXAMINATION</b>				

<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010.</li> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006</li> <li>❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, , 3rd edn., Oxford University Press.</li> <li>❖ G.L. Meissler, D.A Tarr, Inorganic Chemistry, Pearson Education</li> <li>❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley.</li> <li>❖ A. R. West, Solid State Chemistry and its applications, John Wiley.</li> </ul>			
<i>UNIT 6: Structure of Inorganic Solids (9 hours)</i>	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		
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010.</li> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006</li> <li>❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, , 3rd edn., Oxford University Press.</li> <li>❖ G.L. Meissler, D.A Tarr, Inorganic Chemistry, Pearson Education</li> <li>❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley.</li> <li>❖ A. R. West, Solid State Chemistry and its applications, John Wiley.</li> </ul>			

<b>MD</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<b>UNIT 2 : Metal Carbonyls and Metal Clusters</b> (9 hours)	1	Introduction to metal carbonyls and metal clusters		
	2	Preparation and properties of mononuclear carbonyls.		
	3	Structures of Mo(CO) <sub>6</sub> , Fe(CO) <sub>5</sub> and Ni(CO) <sub>4</sub> .	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 <sub>6</sub> (CO) <sub>16</sub> and [Os <sub>6</sub> (CO) <sub>18</sub> ] <sup>2-</sup>	MOODLE- Assignment No:2	
	8	Metal only clusters (Zintl ions). Quadruple bond – structure of Re <sub>2</sub> Cl <sub>8</sub> <sup>2-</sup> .		
	9	Revision		
<b>FIRST INTERNAL EXAMINATION</b>				
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Edn. Milestone Publishers, New Delhi 2010.</li> <li>❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education 2004.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006.</li> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd. 2008.</li> <li>❖ M. Clyde Day, and J. Selbin Theoretical inorganic chemistry 2nd Edn. Reinhold Book Corp. 2008.</li> <li>❖ 6. B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3<sup>rd</sup> edn., John Wiley. 2006.</li> </ul>			



<b>UNIT 5 Compounds of s and p block elements</b>	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 <sub>5</sub> H <sub>9</sub> , B <sub>4</sub> H <sub>10</sub> (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).		
		<b>SECOND INTERNAL EXAMINATION</b>		
<b>Text Books</b>		<ul style="list-style-type: none"> <li>❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008.</li> <li>❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006.</li> <li>❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd edn., Oxford University Press, 2006.</li> <li>❖ M. N. Greenwood and A. Earnshaw, Chemistry of the elements 2nd edn, Butterworth, 1997.</li> </ul>		

JUC	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
<i>UNIT 3 : Inorganic Polymers (6 hours)</i>	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).		
	<b>FIRST INTERNAL EXAMINATION</b>			
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Edn. Milestone Publishers, New Delhi, 2010.</li> <li>❖ S. Prakash, G. D. Tuli, S. K. Basu and R. D. Madan, Advanced Inorganic Chemistry, Volume I, S Chand.</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006</li> </ul>			
<i>UNIT 4 : Non-Aqueous Solvents (4)</i>	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)		

<i>hours</i>	10	Liquid HF (acid base, amphoteric, solvation, oxidation – reduction, complex formation)		
	<b>SECOND INTERNAL EXAMINATION</b>			
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Milestone Publishers, New Delhi, 2010</li> <li>❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006.</li> <li>❖ M. Clyde Day, and J. Selbin, Theoretical Inorganic Chemistry, 2nd Edn. Reinhold Book Corp. 2008.</li> </ul>			
<i>UNIT 7 : Water Quality Parameters (7 hours)</i>	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		
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ B.K Sharma Environmental Chemistry, 12<sup>th</sup> Edn., Goel Publishing House, 2011.</li> <li>❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31<sup>st</sup> Edn. Milestone Publishers, New Delhi, 2010.</li> <li>❖ A.K Dee, Environmental Chemistry, 3<sup>rd</sup> Edn., New Age International Pvt. Ltd., 1996.</li> <li>❖ Sodhi. G.S., Concepts of Environmental Chemistry, Narsa Publication House, 2009.</li> <li>❖ Sindhu. P. S., Environmental Chemistry, New Age International Pvt. Ltd., 2011.</li> <li>❖ Balaram Pani, Environment Chemistry, I. K. International Publishing House Ltd., 2007.</li> <li>❖ Thomas G Spiro, Chemistry of Environment, Prentice Hall of India., 2006.</li> <li>❖ Raghavan Nambiar., Environmental Studies, Scitech Publications (India) Pvt. Ltd., 2008.</li> </ul>			



**COURSE PLAN**

**ACADEMIC YEAR 2015-16**

<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	:	54
<b>SEMESTER</b>	:	6	<b>CREDITS</b>	:	3
<b>SUBJECT TITLE</b>	:	<i>Organic Chemistry-IV</i>	<b>SUBJECT CODE</b>	:	<b>19U6CRCHE10</b>
<b>COURSE TEACHERS</b>	:	<i>V.S. Sebastian (VSS), Franklin J (FJ), Joseph T Moolayil (JTM), M. George (MG)</i>			

<b>FJ</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<b>UNIT 1 : Natural Products (12 hours)</b>	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 piperine	Assignment No:2	
	8	Synthesis of nicotine.		
	9	Vitamins – classification- structure (elementary idea) of vitamin A, C and B1, B2, B6		

		<b>FIRST INTERNAL EXAMINATION</b>			
	<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ I. L. Finar, <i>Organic Chemistry</i> - Volume I &amp; II - Pearson Education.</li> <li>❖ M. K. Jain and S. C. Sharma '<i>Modern Organic Chemistry</i>', 3<sup>rd</sup> Edition, Vishal Publishing Company Co .</li> <li>❖ K.S. Tewari and N.K. Vishnoi, '<i>Organic Chemistry</i>', 3<sup>rd</sup> Edition, Vikas Publishing House.</li> </ul>			
	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			
		<b>SECOND INTERNAL EXAMINATION</b>			
	<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ L. Finar, <i>Organic Chemistry</i> - Volume I &amp; II - Pearson Education.</li> <li>❖ M. K. Jain and S. C. Sharma '<i>Modern Organic Chemistry</i>', 3<sup>rd</sup> Edition, Vishal Publishing Company Co.</li> <li>❖ K.S. Tewari and N.K. Vishnoi, '<i>Organic Chemistry</i>', 3<sup>rd</sup> Edition, Vikas Publishing House.</li> </ul>			
<b>JTM</b>					
	<b>Unit II</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<b>Carbohydrates (12 Hours)</b>		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		
			<b>I<sup>st</sup> Internal Examination</b>		
		7	Cyclic structure. Pyranose and furanose forms		
		8	Determination of ring size.	Power Point Presentation	
	9	Determination of ring size. Haworth projection formula. Chain			

		lengthening and chain shortening of aldoses		
	10	. Inter conversion of aldoses and ketoses. Disaccharides - reactions and structure of sucrose and maltose. Ring structure		
	<b>2<sup>nd</sup> Internal Examination</b>			
	11	Structure and properties of starch and cellulose (elementary idea).		
	12	Industrial applications of cellulose.		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ I. L. Finar, <i>Organic Chemistry</i> - Volume I &amp; II - Pearson Education.</li> <li>❖ M. K. Jain and S. C. Sharma '<i>Modern Organic Chemistry</i>', 3<sup>rd</sup> Edition, Vishal Publishing Company Co.</li> <li>❖ K.S. Tewari and N.K. Vishnoi, '<i>Organic Chemistry</i>', 3<sup>rd</sup> Edition, Vikas Publishing House.</li> <li>❖ R. T. Morrison and R.N. Boyd, '<i>Organic Chemistry</i>', 6<sup>th</sup> Edition - Prentice Hall of India</li> </ul>			
<b>MG</b>				
<b>Unit III</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<b>Heterocyclic Compounds (10 Hours)</b>	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		

		<b>1<sup>st</sup> Internal Examination</b>		
		10		
<i>Unit VI</i>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<i>Steroids (3 Hours)</i>	1	Introduction – Diels hydrocarbon-	Individual Assignment:	
	2	Structure and functions of cholesterol.		
	<b>2<sup>nd</sup> Internal Examination</b>			
	3	Elementary idea of HDL, LDL, Vitamin D		
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ I. L. Finar, Organic Chemistry - Volume I &amp; II - Pearson Education.</li> <li>❖ M. K. Jain and S. C. Sharma ‘Modern Organic Chemistry’, 3rd Edition, Vishal Publishing Company Co.</li> <li>❖ K.S. Tewari and N.K. Vishnoi, ‘Organic Chemistry’, 3rd Edition, Vikas Publishing House.</li> <li>❖ R. T. Morrison and R.N. Boyd, ‘Organic Chemistry’, 6th Edition - Prentice Hall of India</li> </ul>			

<b>VSS</b>				
<i>Unit IV</i>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<i>Amino acids and Proteins Compounds (9 Hours)</i>	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 properties and on physiological functions.		
	5	Primary secondary tertiary and quaternary structure of proteins	Group Discussion	
	6	Helical and sheet structures ( <i>elementary treatment only</i> ). Nucleic acids. Types of nucleic acids		
	7	RNA and DNA,		



	8	polynucleotide chain components			
	9	Green Fluorescent Proteins ( <i>elementary idea</i> )			
<b>1<sup>st</sup> Internal Examination</b>					
<b>Unit VII</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>		
<i>Supramolecular Chemistry</i> (3 Hours)	1	Introduction-Molecular recognition-			
	2	Host-guest interactions			
	3	- types of non-covalent interactions			
<i>Unit V</i>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>		
<i>Enzymes</i> (3 Hours)	1	Nomenclature and classification of enzymes ( <i>based on substrate</i> ).	Individual Assignment:		
	2	Chemical nature of enzymes. Mechanism of enzyme action.			
	<b>2<sup>nd</sup> Internal Examination</b>				
	3	Substrate specificity of enzymes. Enzyme inhibition.			

<i>Text Books</i>	<ul style="list-style-type: none"><li>❖ I. L. Finar, Organic Chemistry - Volume I &amp; II - Pearson Education.</li><li>❖ M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co.</li><li>❖ K.S. Tewari and N.K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House.</li><li>❖ R. T. Morrison and R.N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India</li></ul> <ul style="list-style-type: none"><li>❖ <a href="http://en.wikipedia.org/wiki/Green_fluorescent_protein">en.wikipedia.org/wiki/Green_fluorescent_protein</a></li><li>❖ <a href="http://www.scholarpedia.org/article/fluorescent_protein">www.scholarpedia.org/article/fluorescent_protein</a></li><li>❖ <a href="http://www.conncoll.edu/ccacad/zimmer/GFP-ww/timeline.html">www.conncoll.edu/ccacad/zimmer/GFP-ww/timeline.html</a></li><li>❖ <a href="http://www.gonda.ucla.edu/bri_core/gfp.htm">www.gonda.ucla.edu/bri_core/gfp.htm</a></li></ul>
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**DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA****COURSE PLAN : ACADEMIC YEAR 2015 - 2016**

<b>PROGRAMME</b>	: <i>B.Sc. Chemistry</i>	<b>SEMESTER</b>	: 6
<b>LECTURE HOURS</b>	: 54	<b>CREDITS</b>	: 3
<b>SUBJECT TITLE</b>	: <i>Equilibrium and Kinetics</i>	<b>SUBJECT CODE</b>	: <i>CHE6B03</i>

<b>COURSE TEACHERS</b>	:	Dr. Ignatious Abraham (IGA), Dr. K. B. Jose (KBJ) & Senju Devassykutty (SD)
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<b>COURSE OUTCOMES (COs)</b>	:	<b>CO1</b> - <i>Understand the basics of thermodynamics.</i> <b>CO2</b> - <i>Understand the applicability of the laws of thermodynamics to various physical and chemical processes.</i> <b>CO3</b> - <i>Describe the phase diagrams of one- and two-component systems</i> <b>CO4</b> - <i>Understand the basic principles of chemical kinetics.</i>
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<b>Instructional Hours</b>	:	<i>Monday : Period 3 (9:30 to 10:30 am) - SD</i> <i>Tuesday : Period 1 (9:30 to 10:30 am) - KBJ</i> <i>Friday : Period 2 (10:30 to 11:30 am) - IGA</i>
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**IGNATIOUS ABRAHAM****Unit I : CLASSICAL THERMODYNAMICS**

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

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

### 2<sup>nd</sup> Internal Examination

#### Unit III : SYMMETRY

16	Third law of thermodynamics-statement and significance.	Power Point Presentation	CO2
17	Helmholtz energy and Gibbs energy	<i>Assignment</i>	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

Session s	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	<i>Assignment</i>	CO1

### 1<sup>st</sup> 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

2 <sup>nd</sup> 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**

Session s	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	<b>Theories of chemical kinetics:</b> effect of temperature on the rate of reaction	<i>Assignment</i>	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

**1<sup>st</sup> Internal Examination**

10	Kinetics of complex (composite) reactions: Opposing reactions, consecutive reactions, and parallel (simultaneous) reactions.	<i>Assignment</i>	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.	<i>Assignment</i>	CO4

**2<sup>nd</sup> Internal Examination**

**Unit I : Chemical Equilibrium**

16	Chemical equilibrium: conditions for chemical equilibrium.		CO2
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17	van't Hoff reaction isotherm, relation between $K_c$ and $K_x - K_p$		<b>CO2</b>
18	Temperature dependence of $K_p - \text{van't Hoff equation}$	Power Point	<b>CO2</b>

**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
<b>UNIT II : Ionic equilibrium</b>	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	<b>FIRST INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ K. L. Kapoor, '<i>A Textbook of Physical Chemistry</i>', Volumes 1, Macmillan India Ltd.</li> <li>❖ B. R. Puri, L. R. Sharma, M. S. Pathania, '<i>Elements of Physical Chemistry</i>', Vishal Pub. Co. Jalandhar.</li> <li>❖ I. N. Levine, '<i>Physical Chemistry</i>', Tata Mc Graw Hill.</li> </ul>			
<b>UNIT I:</b>	10	Introduction-- Binary liquid solutions – Raoult's law	Power point	

<b>Solutions</b>	11	Ideal and non-ideal solutions-Gmix, Vmix, and Smix for ideal solutions.	Chalk & Board	
	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
	12	Fractional distillation of binary liquid-liquid solutions.	Power point	
	13	Distillation of immiscible liquids, partially miscible liquid-liquid systems	Group Discussion	
		<b>SECOND INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ K. J. Laidler and J. M. Meiser, <i>Physical Chemistry</i>, 3rd Edition, Houghton Mifflin Comp., New York, International Edition (1999).</li> <li>❖ Barrow, G.M. <i>Physical Chemistry</i>, Tata McGraw-Hill (2007).</li> <li>❖ Castellan, G.W. <i>Physical Chemistry</i>, 4th Ed. Narosa (2004).</li> </ul>			
<b>UNIT 1 : Solutions</b>	14	Vapour pressure-composition and boiling point-composition curves of ideal and non-ideal binary liquid solutions.	Assignment No:2	
	15	Critical solution temperature (CST) - the lever rule, introduction to ternary liquid solutions.	Power point	
	16	Vapour pressure-composition and boiling point-composition curves of ideal and non-ideal binary liquid solutions.	Demonstration	
	17	Solubility of gases in liquids – Henry’s law. Distribution of a solute between two solvents – Nernst distribution law.	PowerPoint presentation	
	18	Colligative properties of dilute solutions - vapour pressure lowering, Boiling point elevation and freezing point depression (thermodynamic derivation).	PowerPoint presentation	



<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ F A Alberty and R J Silby, <i>Physical Chemistry</i>, John Wiley.</li> <li>❖ P. W. Atkins, <i>The elements of Physical chemistry</i>, 8th edn, Oxford University Press.</li> <li>❖ S. H. Marron and J. B. Lando, <i>Fundamentals of Physical Chemistry</i>, Macmillan Ltd.</li> </ul>
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**COURSE PLAN**

**ACADEMIC YEAR 2015-16**

<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	:	<i>54</i>
<b>SEMESTER</b>	:	<i>6</i>	<b>CREDITS</b>	:	<i>3</i>
<b>SUBJECT TITLE</b>	:	<i>SOLUTION CHEMISTRY</i>	<b>SUBJECT CODE</b>	:	<i>CH6B04</i>
<b>COURSE TEACHERS</b>	:	<i>Dr Jinu George (JG), Dr. Thommachan Xavier, Dr. K B Jose</i>			
<b>COURSE OBJECTIVES</b>	:	<i>To study the behaviour of binary liquid mixtures, CST, azeotropes, colligative properties</i> <i>To study solubility of gases in liquids,</i> <i>To study ionic equilibria and electrical properties of ions in solution.</i> <i>To study the concepts of acids and bases, pH and buffer solutions</i>			
<b>Instructional Hours</b>	:	<i>3 hours per week</i>			

	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
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<b>UNIT I and UNIT III : Solutions &amp; Electrical Conductance</b>	1	Molar mass determination-related problems- Osmotic pressure –laws of osmotic pressure - Reverse osmosis – purification of sea water.	Demonstration	
	2	Abnormal molecular masses – van't Hoff factor – degree of association and degree of dissociation.	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	
<b>FIRST INTERNAL EXAMINATION</b>				
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).</li> <li>❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006).</li> <li>❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.</li> </ul>			
	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 ( <i>no derivation</i> )	Group Discussion	

<b>SECOND INTERNAL EXAMINATION</b>				
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).</li> <li>❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006).</li> <li>❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.</li> </ul>			
<b>Electrical Conductance</b>	13	Activity, mean ionic activity and mean ionic activity coefficients of electrolytes.	PowerPoint presentation	
	14	Ionic strength of a solution, Debye-Hückel limiting law ( <i>no derivation</i> )	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	
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).</li> <li>❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006).</li> <li>❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.</li> </ul>			
<b>Unit IV</b>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	
<b>U N I T</b>	1	Introduction – Electrochemical Cells and Electrolytic cells, Galvanic cells	PowerPoint presentation	

<i>IV : Electromotive Force</i>	2	Characteristics of reversible cells. Reversible electrodes – different types	PowerPoint presentation		
	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 $\Delta G$ , $\Delta H$ and $\Delta S$ of cell reaction.	PowerPoint presentation		
	7	E.M.F and equilibrium constant of cell reaction	PowerPoint presentation		
	<b>1<sup>st</sup> Internal Examination</b>				
	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			
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006).</li> <li>❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.</li> <li>❖ F A Alberty and R J Silby, Physical Chemistry, John Wiley.</li> <li>❖ P. W. Atkins, The elements of Physical chemistry, 8thedn, Oxford University Press.</li> </ul>				
<i>Unit IV</i>	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>		
	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	
	<b>2<sup>nd</sup> Internal Examination</b>			
	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	
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006).</li> <li>❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.</li> <li>❖ F A Alberty and R J Silby, Physical Chemistry, John Wiley.</li> <li>❖ P. W. Atkins, The elements of Physical chemistry, 8thedn, Oxford University Press.</li> </ul>			

**COURSE PLAN**

**ACADEMIC YEAR 2015-16**

<b>PROGRAMME</b>	:	<i>B.Sc. Chemistry</i>	<b>LECTURE HOURS</b>	:	<i>54</i>
<b>SEMESTER</b>	:	<i>6</i>	<b>CREDITS</b>	:	<i>3</i>
<b>SUBJECT TITLE</b>	:	<i>Polymer Chemistry</i>	<b>SUBJECT CODE</b>	:	<i>CH6B06.3</i>
<b>COURSE TEACHERS</b>	:	<i>Dr. Joseph T Moolayil (JTM), Dr. Grace Thomas (GT), Mr. Senju Devassykutty (SD)</i>			
<b>Objectives</b>	:	<ul style="list-style-type: none"> <li>➤ To know about the types of polymers and the chemistry of polymerisation.</li> <li>➤ To understand the physical properties of polymers, their reactions and degradation.</li> <li>➤ To acquire knowledge about the polymerisation techniques and polymer processing.</li> <li>➤ To know the chemistry of individual polymers, their preparation and properties</li> <li>➤ To have an idea about the recent advances in polymer science</li> </ul>			
<b>Instructional Hours</b>	:	<i>3 hours per week</i>			

<b>JTM</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<i>UNIT 1: Introduction to Polymers</i>	1	Importance of polymers: Basic concept- monomers and polymers - definition.		
	2	Classification of polymers on the basis of microstructures, macrostructures and applications (thermosetting and thermoplastics)	Assignment No: 1	
	3	Distinction among plastics, elastomers and fibers.		

(9 hours)	4	Homo and heteropolymers. Copolymers.		
	5	Chemistry of polymerization ,Chain polymerisation, Free radical, ionic,		
	6	<b>FIRST INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>			
	7	Chemistry of polymerization - ionic, coordination, step Polymerisation		
	8	Polyaddition and polycondensation ,miscellaneous		
	9	Ring-opening & group transfer polymerisations.		
		<b>SECOND INTERNAL EXAMINATION</b>		
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>			
<b>UNIT 3 : Polymerization Techniques and Processing (9 hrs)</b>	1	Introduction to Polymerisation techniques; ,	Assignment No: 2	
	2	Polymerisation Techniques : Bulk, solution,		
	3	Polymerisation Techniques : Suspension, emulsion		
	4	melt condensation and interfacial polycondensation polymerisations.		
	5	Polymer Processing		
	6	Calendering - die casting,		
	7	Rotational casting - compression.		
	8	Injection moulding.		
	9	Revision		

<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>
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<b>SD</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
<b>UNIT 4 : Physical Properties and Reactions of Polymers (18 hours)</b>	1	Introduction to Physical Properties of Polymers and its importance		
	2	Properties: Glass transition temperature (Tg)- Definition- Factors affecting Tg		
	3	Relationships between Tg and molecular weight and melting point.	Assignment No: 1	
	4	Importance of Tg.	Group Discussion	
	5	Molecular weight of polymers: Number average, weight average		
	6	Revision		
<b>FIRST INTERNAL EXAMINATION</b>				



<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>		
	7	Sedimentation and viscosity average molecular weights	
	8	Sedimentation and viscosity average molecular weights	
	9	Molecular weights and degree of polymerisation.	
	10	Reactions: hydrolysis-hydrogenation	
	11	Reactions: Addition - Substitutions	
	12	Revision	Assignment No.3
	<b>SECOND INTERNAL EXAMINATION</b>		
	13	Reactions: vulcanisation and cyclisation reactions.	
	14	Polymer degradation.	
	15	Basic idea of thermal degradations of polymers	
	16	Basic idea of photo degradations of polymers	
	17	Basic idea of oxidative degradations of polymers	
18	Revision		

<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>				
	<b>GT</b>	<b>No. of Session</b>	<b>Session Topic and Discussion Theme</b>	<b>Value additions</b>	<b>Remarks</b>
	<b>UNIT 4 : Chemistry of</b>	1	Introduction to commercial polymers		
		2	General methods of preparation, properties and uses of the following Polymers: Teflon, polymethylmethacrylate, polyethylene		
		3	General methods of preparation, properties and uses of the following Polymers:, polystyrene, PAN	Assignment No: 1	
4		General methods of preparation, properties and uses of the following			

<b>Commercial Polymers (9 hours)</b>		Polymers: Polyesters, polycarbonates		
	5	General methods of preparation, properties and uses of the following Polymers: polyamides, (Kevlar), polyurethanes	Group Discussion	
	6	General methods of preparation, properties and uses of the following Polymers: PVC, epoxy resins		
	7	General methods of preparation, properties and uses of the following Polymers: Rubber-styrene and neoprene rubbers.	MOODLE- Assignment No:2	
	8	General methods of preparation, properties and uses of the following Polymers: Phenol - formaldehydes and urea-formaldehyde resins.		
	9	Revision		
<b>FIRST INTERNAL EXAMINATION</b>				
<b>Text Books</b>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>			
<b>UNIT 5 : Advances in Polymers</b>	10	Introduction to Polymer advances	Assignment No.3	
	11	Biopolymers - biomaterials		
	12	Polymers in medical field.		
	13	Polymers in medical field.		
	14	High temperature and fire-resistant polymers		
	15	Silicones		
	16	Conducting polymers		
	17	Carbon fibers		

<i>(9 Hou rs)</i>	18	Revision		
<b>SECOND INTERNAL EXAMINATION</b>				
<i>Text Books</i>	<ul style="list-style-type: none"> <li>❖ Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1994.</li> <li>❖ Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.</li> <li>❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.</li> <li>❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.</li> </ul>			

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN

ACADEMIC YEAR 2015-2016

PROGRAM ME	BSc PHYSICS	SEMESTER	1
COURSE CODE AND TITLE	CH1C01 Basic Theoretical and Analytical Chemistry	CREDIT	2
HOURS/ SEM	36		
FACULTY NAME	Dr. June Cyriac, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	To study atomic structure, basics of thermodynamics and the concept of equilibrium
2	To understand principles of analytical chemistry and chromatographic techniques

Dr. June Cyriac			
Sl.No	Session	Topic	Method of Teaching
<b>Atomic structure</b>			
1.	1.	Introduction: Atoms, Planck's quantum Theory, Photoelectric effect	Chalk & Board
2.	2.	Postulates of bohr's theory, Energy levels in atom	Chalk & Board
3.	3.	Shortcomings of Bohr Theory	Chalk & Board
4.	4.	Dual nature of matter and radiation. Derivation of de Broglie equation	Chalk & Board
5.	5.	Wave nature of electron and quantisation of angular momentum	Chalk & Board
<b>First Internal Examination</b>			
6.	6.	Heisenberg's uncertainty principle	Chalk & Board
7.	7.	Concept of orbital, Quantum numbers, shapes of orbitals	Chalk & Board
8.	8.	Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle	Chalk & Board
<b>MODULE II: Concept of Equilibrium: (5 hr)</b>			

9.	9.	Acids and bases, theories of acids and bases	Chalk & Board
10.	10.	ionic product of water, introductory idea of pH, pOH.	Chalk & Board
11.	11.	Strengths of acids and bases, $K_a$ and $K_b$ , $pK_a$ and $pK_b$	Chalk & Board
12.	12.	buffer solution, Henderson equation hydrolysis of salt, solubility	Chalk & Board
13.	13.	solubility product, Common ion effect application	Chalk & Board

***Second Internal Examination***

**MODULE V: Chromatographic techniques: (4 hr)**

14.	14	Chromatography, Principle of differential migration.	Chalk & Board
15.	15	Classification of chromatographic methods. Basic principle and uses of Thin layer chromatography (TLC)	Chalk & Board
16.	16	Paper chromatography (PC), $R_f$ value, Column chromatography,	Chalk & Board
17.	17	High performance Liquid chromatography (HPLC),	Chalk & Board
18.	18	Gas chromatography(GC)	Chalk & Board
19.	19	Ion Exchange chromatography (IEC)	Chalk & Board

**Mr.Senju Devassykutty**

**MODULE III: Laws of Thermodynamics:**

1	1	System and Surrounding	Chalk & Board
2	2	First law of Thermodynamics: Internal energy, Significance of internal energy change, enthalpy	Chalk & Board
3	3	Second law of Thermodynamics: free energy, Entropy and Spontaneity,	Chalk & Board
4	4	Statement of second law based on entropy	Chalk & Board
5	5	Entropy change in Phase transitions	Chalk & Board
6	6	entropy of fusion, entropy of vaporization, entropy of sublimation	Chalk & Board

***First Internal Examination***

7	7	The concept of Gibbs's free energy- Physical significance of free energy, conditions for equilibrium & spontaneity based on $\Delta G$ values.	Chalk & Board
8	8	Effect of temperature on spontaneity of Reaction. Third law of thermodynamics	Chalk & Board
<b>MODULE IV: Analytical Chemistry- Basic principles</b>			
9	9	Laboratory operations(Non-evaluative): Use of different glasswares like pipette, burette, standard measuring flask, distillation apparatus.	Chalk & Board
10	10	Heating methods, filtration techniques, weighing principle in chemical balance, weighing in electronic balance-general idea.	Chalk & Board
11	11	Evaluation of analytical data: Accuracy, precision, absolute error, relative error, types of error.	Chalk & Board
12	12	Methods of elimination or minimization of errors.	Chalk & Board
13	13	Titrimetric method of analysis: General principle, types of titrations, requirements for titrimetric analysis.	Chalk & Board
14	14	Concentration terms- molality, molarity, normality, weight percentage, ppm, and millimoles.	Chalk & Board
<b>Second Internal Examination</b>			
15	15	Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions, limitation of volumetric analysis, end point.	Chalk & Board
16	16	Acid-base titrations, redox titrations (general idea only). Gravimetric method of analysis: General principle-separation by precipitation.	Chalk & Board
17	17	Separation and purification techniques: Recrystallisation, use of drying agents, sublimation. General principles of distillation, fractional distillation,	Chalk & Board

		distillation under reduced pressure. Solvent extraction.	
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<b>TEXTBOOKS AND REFERENCES</b>	
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).



**SACRED HEART COLLEGE(AUTONOMOUS), THEVARA**

**DEPARTMENT OF CHEMISTRY**

**COURSE PLAN**

**ACADEMIC YEAR 2015-2016**

<b>PROGRAM ME</b>	BSc BOTANY	<b>SEMESTER</b>	1
<b>COURSE CODE AND TITLE</b>	CH1C01 Basic Theoretical and Analytical Chemistry	<b>CREDIT</b>	2
<b>HOURS/ SEM</b>	36		
<b>FACULTY NAME</b>	Dr. Abi T.G, Mr.Senju Devassykutty		

**COURSE OUTCOMES (COs)**

1	To study atomic structure, basics of thermodynamics and the concept of equilibrium
2	To understand principles of analytical chemistry and chromatographic techniques

**MODULE I : Atomic Structure : Dr. Abi T.G**

Sl.No	Session	Topic	Method of Teaching	COs
1	1	Introduction: Atoms, Planck's quantum Theory, Photoelectric effect	Chalk & Board	
2	2	Postulates of bohr's theory, Energy levels in atom	Chalk & Board	
3	3	origin of hydrogen spectrum	Chalk & Board	
4	4	Sommerfeld's extension of Bohr's Theory	Chalk & Board	
5	5	Shortcomings of Bohr Theory	Chalk & Board	
<b>First Internal Examination</b>				
6	6	Dual nature of matter and radiation. Derivation of de Broglie equation	Chalk & Board	
7	7	Wave nature of electron and quantisation of angular momentum, Heisenberg's uncertainty principle	Chalk & Board	
8	8	Concept of orbital, Quantum numbers, shapes of orbitals	Chalk & Board	
9	9	Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle	Chalk & Board	

<b>MODULE II: Concept of Equilibrium: Dr. Abi T.G</b>				
1	1	Acids and bases, theories of acids and bases	Chalk & Board	
2	2	ionic product of water, introductory idea of pH, pOH.	Chalk & Board	
3	3	Strengths of acids and bases, $K_a$ and $K_b$ , $pK_a$ and $pK_b$	Chalk & Board	
4	4	buffer solution, Henderson equation hydrolysis of salt, solubility	Chalk & Board	
5	5	solubility product, Common ion effect application	Chalk & Board	
<b>Second Internal Examination</b>				
<b>MODULE V: Chromatographic techniques: Dr. Abi T.G</b>				
1	1	Chromatography, Principle of differential migration.	Chalk & Board	
2	2	Classification of chromatographic methods. Basic principle and uses of Thin layer chromatography (TLC)	Chalk & Board	
3	3	Paper chromatography (PC), $R_f$ value, Column chromatography Gas chromatography(GC),	Chalk & Board	
4	4	High performance Liquid chromatography (HPLC), Ion Exchange chromatography (IEC)	Chalk & Board	
<b>MODULE III: Laws of Thermodynamics: Mr.Senju Devassykutty</b>				
1	1	System and Surrounding	Chalk & Board	
2	2	First law of Thermodynamics: Internal energy, Significance of internal energy change, enthalpy	Chalk & Board	
3	3	Second law of Thermodynamics: free energy, Entropy and Spontaneity,	Chalk & Board	
4	4	Statement of second law based on entropy	Chalk & Board	
5	5	Entropy change in Phase transitions	Chalk & Board	
6	6	entropy of fusion, entropy of vaporization, entropy of sublimation	Chalk & Board	
<b>First Internal Examination</b>				
7	7	The concept of Gibbs's free energy- Physical significance of free energy, conditions for equilibrium & spontaneity	Chalk & Board	

		based on $\Delta G$ values.		
8	8	Effect of temperature on spontaneity of Reaction. Third law of thermodynamics	Chalk & Board	
<b>MODULE IV: Analytical Chemistry- Basic principles : Mr.Senju Devassykutty</b>				
1	1	Laboratory operations(Non-evaluative): Use of different glasswares like pipette, burette, standard measuring flask, distillation apparatus.	Chalk & Board	
2	2	Heating methods, filtration techniques, weighing principle in chemical balance, weighing in electronic balance-general idea.	Chalk & Board	
3	3	Evaluation of analytical data: Accuracy, precision, absolute error, relative error, types of error.	Chalk & Board	
<b>Second internal Examination</b>				
4	4	Methods of elimination or minimization of errors.	Chalk & Board	
5	5	Titrimetric method of analysis: General principle, types of titrations, requirements for titrimetric analysis.	Chalk & Board	
6	6	Concentration terms- molality, molarity, normality, weight percentage, ppm, and millimoles.	Chalk & Board	
7	7	Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions, limitation of volumetric analysis, end point.	Chalk & Board	
8	8	Acid-base titrations, redox titrations (general idea only). Gravimetric method of analysis: General principle-separation by precipitation.	Chalk & Board	
9	9	Separation and purification techniques: Recrystallisation, use of drying agents, sublimation. General principles of distillation, fractional distillation, distillation under reduced pressure. Solvent extraction.	Chalk & Board	

<b>TEXTBOOKS AND REFERENCES</b>	
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).

<b>ASSIGNMENTS AND SEMINARS</b>				
<b>Sl No</b>	<b>Module</b>	<b>Topic</b>	<b>Nature of Assignment</b>	<b>Alignment with POs, PSOs and COs</b>
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 2015-2016

PROGRAM ME	BSc Zoology	SEMESTER	1
COURSE CODE AND TITLE	CH1C01 Basic Theoretical and Analytical Chemistry	CREDIT	2
HOURS/ SEM	36		
FACULTY NAME	Dr. June Cyriac, Mr.Senju Devassykutty		

COURSE OUTCOMES (COs)	
1	To study atomic structure, basics of thermodynamics and the concept of equilibrium
2	To understand principles of analytical chemistry and chromatographic techniques

Dr. June Cyriac			
Sl.No	Session	Topic	Method of Teaching
<b>Atomic structure</b>			
1.	1.	Introduction: Atoms, Planck's quantum Theory, Photoelectric effect	Chalk & Board
2.	2.	Postulates of bohr's theory, Energy levels in atom	Chalk & Board
3.	3.	Shortcomings of Bohr Theory	Chalk & Board
4.	4.	Dual nature of matter and radiation. Derivation of de Broglie equation	Chalk & Board
5.	5.	Wave nature of electron and quantisation of angular momentum	Chalk & Board
<b>First Internal Examination</b>			
6.	6.	Heisenberg's uncertainty principle	Chalk & Board
7.	7.	Concept of orbital, Quantum numbers, shapes of orbitals	Chalk & Board
8.	8.	Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle	Chalk & Board
<b>MODULE II: Concept of Equilibrium: (5 hr)</b>			

9.	9.	Acids and bases, theories of acids and bases	Chalk & Board
10.	10.	ionic product of water, introductory idea of pH, pOH.	Chalk & Board
11.	11.	Strengths of acids and bases, $K_a$ and $K_b$ , $pK_a$ and $pK_b$	Chalk & Board
12.	12.	buffer solution, Henderson equation hydrolysis of salt, solubility	Chalk & Board
13.	13.	solubility product, Common ion effect application	Chalk & Board

***Second Internal Examination***

**MODULE V: Chromatographic techniques: (4 hr)**

14.	14	Chromatography, Principle of differential migration.	Chalk & Board
15.	15	Classification of chromatographic methods. Basic principle and uses of Thin layer chromatography (TLC)	Chalk & Board
16.	16	Paper chromatography (PC), $R_f$ value, Column chromatography,	Chalk & Board
17.	17	High performance Liquid chromatography (HPLC),	Chalk & Board
18.	18	Gas chromatography(GC)	Chalk & Board
19.	19	Ion Exchange chromatography (IEC)	Chalk & Board

**Mr.Senju Devassykutty**

**MODULE III: Laws of Thermodynamics:**

1	1	System and Surrounding	Chalk & Board
2	2	First law of Thermodynamics: Internal energy, Significance of internal energy change, enthalpy	Chalk & Board
3	3	Second law of Thermodynamics: free energy, Entropy and Spontaneity,	Chalk & Board
4	4	Statement of second law based on entropy	Chalk & Board
5	5	Entropy change in Phase transitions	Chalk & Board
6	6	entropy of fusion, entropy of vaporization, entropy of sublimation	Chalk & Board

***First Internal Examination***

7	7	The concept of Gibbs's free energy- Physical significance of free energy, conditions for equilibrium & spontaneity based on $\Delta G$ values.	Chalk & Board
8	8	Effect of temperature on spontaneity of Reaction. Third law of thermodynamics	Chalk & Board
<b>MODULE IV: Analytical Chemistry- Basic principles</b>			
9	9	Laboratory operations(Non-evaluative): Use of different glasswares like pipette, burette, standard measuring flask, distillation apparatus.	Chalk & Board
10	10	Heating methods, filtration techniques, weighing principle in chemical balance, weighing in electronic balance-general idea.	Chalk & Board
11	11	Evaluation of analytical data: Accuracy, precision, absolute error, relative error, types of error.	Chalk & Board
12	12	Methods of elimination or minimization of errors.	Chalk & Board
13	13	Titrimetric method of analysis: General principle, types of titrations, requirements for titrimetric analysis.	Chalk & Board
14	14	Concentration terms- molality, molarity, normality, weight percentage, ppm, and millimoles.	Chalk & Board
<b>Second Internal Examination</b>			
15	15	Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions, limitation of volumetric analysis, end point.	Chalk & Board
16	16	Acid-base titrations, redox titrations (general idea only). Gravimetric method of analysis: General principle-separation by precipitation.	Chalk & Board
17	17	Separation and purification techniques: Recrystallisation, use of drying agents, sublimation. General principles of distillation, fractional distillation,	Chalk & Board

		distillation under reduced pressure. Solvent extraction.	
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<b>TEXTBOOKS AND REFERENCES</b>	
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).



SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN

ACADEMIC YEAR 2015-2016

PROGRAM ME	BSc PHYSICS	SEMESTER	2
COURSE CODE AND TITLE	CH2C01: Basic Organic Chemistry	CREDIT	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Abi T.G, Mr.Senju Devassykutty		

Mr.Senju Devassykutty

**Stereochemistry of Organic Compounds:**

1	1	Geometrical isomerism- <i>cis</i> and <i>trans</i> 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	Chalk & Board
9	9	Saw-horse projection	Chalk & Board
10	10	Conformations of Ethane	Chalk & Board
11	11	n - butane	Chalk & Board
12	12	Cyclohexane.	Chalk & Board
13	13	revision	Discussion

**Natural and Synthetic Polymers (5 Hrs)**

14	14	Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres	Chalk & Board
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15	15	homopolymers and copolymers. Polymerization reactions.	Chalk & Board
<b>Second Internal Examination</b>			
16	16	polyethene, polypropylene, PVC,	Chalk & Board
17	17	phenol-formaldehyde and melamine-formaldehyde resins, polyamides (nylons) and polyester	Chalk & Board
18	18	Natural rubber: structure, vulcanization	Chalk & Board

**Dr. Abi T.G**

<b>Mechanisms of Organic Reactions (15HRS)</b>			
1	1	Hybridization- $sp^3$ , $sp^2$ and $sp$ , (ethane, ethene, ethyne).	Chalk & Board
2	2	Polarity of bonds..	Chalk & Board
3	3	Inductive, mesomeric, and hyperconjugative effects	Chalk & Board
4	4	Practice Questions	Discussion
5	5	Bond fission- homolytic and heterolytic fission.	Chalk & Board
6	6	Reaction intermediates- radicals, carbocations and carbanions.	Chalk & Board
<b>First Internal Examination</b>			
7	7	Classification of reagents- electrophiles, nucleophiles.	Chalk & Board
8	8	Types of organic reactions – addition, substitution and elimination reactions.	Chalk & Board
9	9	Substitution reactions: nucleophilic substitution of alkyl halides- $S_N1$ and $S_N2$ mechanisms.	Chalk & Board
10	10	Electrophilic substitution in benzene- reaction mechanism.	Chalk & Board
11	11	Addition reactions: electrophilic addition to ethene, propene	Chalk & Board
12	12	Addition reactions: ethyne-the	Chalk & Board
13	13	Markwonikoff's rule, Peroxide effect.	Chalk & Board
14	14	Elimination reactions: $E1$ and $E2$	Chalk & Board

		mechanisms	
15	15	Practice questions	Discussion
<b>Second Internal Examination</b>			
<b>Natural and Synthetic Polymers (3 Hrs)</b>			
16	16	Synthetic rubbers- SBR	Chalk & Board
17	17	nitrile rubber, neoprene.	Chalk & Board
18	18	Biodegradability of polymers, environmental hazards.	Chalk & Board

<b>REFERENCES</b>	
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.	Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, 6th edn. Orient Longman, 1988
4.	S. M. Mukherji, S.P Singh, Reaction Mechanism in Organic Chemistry, Macmillan, Third Edn., 2003
5.	V. R. Gowariker, Polymer Science, Wiley Eastern(

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN

ACADEMIC YEAR 2015-2016

<b>PROGRAM ME</b>	BSc BOTANY	<b>SEMESTER</b>	2
<b>COURSE CODE AND TITLE</b>	<b>CH2C01: Basic Organic Chemistry</b>	<b>CREDIT</b>	2
<b>HOURS/ SEM</b>	36		
<b>FACULTY NAME</b>	Dr. Abi T.G, Mr.Senju Devassykutty		

<b>Mr.Senju Devassykutty</b>			
<b>Stereochemistry of Organic Compounds:</b>			
1	1	Geometrical isomerism- <i>cis</i> and <i>trans</i> 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
<b>First Internal examination</b>			
7	7	Racemisation	Chalk & Board
8	8	Conformation- Newman projection	Chalk & Board
9	9	Saw-horse projection	Chalk & Board
10	10	Conformations of Ethane	Chalk & Board
11	11	n - butane	Chalk & Board
12	12	Cyclohexane.	Chalk & Board
13	13	revision	Discussion
<b>Natural and synthetic polymers</b>			
14	14	Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres	Chalk & Board

15	15	homopolymers and copolymers. Polymerization reactions.	Chalk & Board
16	16	polyethene, polypropylene, PVC,	Chalk & Board
17	17	phenol-formaldehyde and melamine-formaldehyde resins, polyamides (nylons) and polyester	Chalk & Board
18	18	Natural rubber: structure, vulcanization	Chalk & Board

<b>Dr. Abi T.G</b>			
<b>Mechanisms of Organic Reactions (15HRS)</b>			
1	1	Hybridization- $sp^3$ , $sp^2$ and $sp$ , (ethane, ethene, ethyne).	Chalk & Board
2	2	Polarity of bonds..	Chalk & Board
3	3	Inductive, mesomeric, and hyperconjugative effects	Chalk & Board
4	4	Practice Questions	Discussion
5	5	Bond fission- homolytic and heterolytic fission.	Chalk & Board
6	6	Reaction intermediates- radicals, carbocations and carbanions.	Chalk & Board
7	7	Classification of reagents- electrophiles, nucleophiles.	Chalk & Board
8	8	Types of organic reactions – addition, substitution and elimination reactions.	Chalk & Board
9	9	Substitution reactions: nucleophilic substitution of alkyl halides- $S_N1$ and $S_N2$ mechanisms.	Chalk & Board
10	10	Electrophilic substitution in benzene-reaction mechanism.	Chalk & Board
11	11	Addition reactions: electrophilic addition to ethene, propene	Chalk & Board
12	12	Addition reactions: ethyne-the	Chalk & Board
13	13	Markwonikoff's rule, Peroxide effect.	Chalk & Board
14	14	Elimination reactions: $E1$ and $E2$ mechanisms	Chalk & Board
15	15	Practice questions	Discussion

**Natural and synthetic polymers**

16	16	Synthetic rubbers- SBR	Chalk & Board
17	17	nitrile rubber, neoprene.	Chalk & Board
18	18	Biodegradability of polymers, environmental hazards.	Chalk & Board

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN

ACADEMIC YEAR 2015-2016

PROGRAM ME	BSc Zoology	SEMESTER	2
COURSE CODE AND TITLE	CH2C01: Basic Organic Chemistry	CREDIT	2
HOURS/ SEM	36		
FACULTY NAME	Dr. Abi T.G, Mr.Senju Devassykutty		

Mr.Senju Devassykutty

**Stereochemistry of Organic Compounds:**

1	1	Geometrical isomerism- <i>cis</i> and <i>trans</i> 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
<b>First Internal Examination</b>			
7	7	Racemisation	Chalk & Board
8	8	Conformation- Newman projection	Chalk & Board
9	9	Saw-horse projection	Chalk & Board
10	10	Conformations of Ethane	Chalk & Board
11	11	n - butane	Chalk & Board
12	12	Cyclohexane.	Chalk & Board
13	13	revision	Discussion
<b>Natural and Synthetic Polymers (5 Hrs)</b>			
14	14	Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres	Chalk & Board

15	15	homopolymers and copolymers. Polymerization reactions.	Chalk & Board
<b>Second Internal Examination</b>			
16	16	polyethene, polypropylene, PVC,	Chalk & Board
17	17	phenol-formaldehyde and melamine-formaldehyde resins, polyamides (nylons) and polyester	Chalk & Board
18	18	Natural rubber: structure, vulcanization	Chalk & Board

**Dr. Abi T.G**

<b>Mechanisms of Organic Reactions (15HRS)</b>			
1	1	Hybridization- $sp^3$ , $sp^2$ and $sp$ , (ethane, ethene, ethyne).	Chalk & Board
2	2	Polarity of bonds..	Chalk & Board
3	3	Inductive, mesomeric, and hyperconjugative effects	Chalk & Board
4	4	Practice Questions	Discussion
5	5	Bond fission- homolytic and heterolytic fission.	Chalk & Board
6	6	Reaction intermediates- radicals, carbocations and carbanions.	Chalk & Board
<b>First Internal Examination</b>			
7	7	Classification of reagents- electrophiles, nucleophiles.	Chalk & Board
8	8	Types of organic reactions – addition, substitution and elimination reactions.	Chalk & Board
9	9	Substitution reactions: nucleophilic substitution of alkyl halides- $S_N1$ and $S_N2$ mechanisms.	Chalk & Board
10	10	Electrophilic substitution in benzene- reaction mechanism.	Chalk & Board
11	11	Addition reactions: electrophilic addition to ethene, propene	Chalk & Board
12	12	Addition reactions: ethyne-the	Chalk & Board
13	13	Markwonikoff's rule, Peroxide effect.	Chalk & Board
14	14	Elimination reactions: $E1$ and $E2$	Chalk & Board



		mechanisms	
15	15	Practice questions	Discussion
<b>Second Internal Examination</b>			
<b>Natural and Synthetic Polymers (3 Hrs)</b>			
16	16	Synthetic rubbers- SBR	Chalk & Board
17	17	nitrile rubber, neoprene.	Chalk & Board
18	18	Biodegradability of polymers, environmental hazards.	Chalk & Board

<b>REFERENCES</b>	
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, NewAge International(P) Ltd, 2006
3.	Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, 6th edn. Orient Longman, 1988
4.	S. M. Mukherji, S.P Singh, Reaction Mechanism in Organic Chemistry, Macmillan, Third Edn., 2003
5.	V. R. Gowariker, Polymer Science, Wiley Eastern(

COURSE PLAN					
ACADEMIC YEAR 2015-16					
<b>PROGRAMME</b>	:	<i>B.Sc. Physics</i>	<b>LECTURE HOURS</b>	:	54
<b>SEMESTER</b>	:	3	<b>CREDITS</b>	:	3
<b>SUBJECT TITLE</b>	:	ADVANCED PHYSICAL CHEMISTRY – I	<b>SUBJECT CODE</b>	:	CH3C01.1
<b>COURSE TEACHERS</b>	:	<i>Dr. MIDHUN DOMINIC C D, Dr. ABI T G, Dr. K B JOSE</i>			
<b>COURSE OUTCOMES (COs)</b>	:	<p><b>CO1</b> - To have idea about nuclear chemistry</p> <p><b>CO2</b> - Determination of symmetry of molecules</p> <p><b>CO3</b> - Study of phase equilibria of different systems</p> <p><b>CO4</b> - An idea of solid state ad crystal systems</p> <p><b>CO5</b> - An idea on properties of liquid state</p> <p><b>CO6</b> - To study the basic concepts of surface chemistry</p> <p><b>CO7</b> - To have an idea about colloids</p>			

<i>Dr. MIDHUN DOMINIC C D</i>				
Unit	No. of Sessions	Session Topic and Discussion Theme	Mode of teaching	COs
<b>Nuclear chemistry (13 hrs)</b>	1	Stability of Nucleus:- binding energy, magic number	Lecture	<b>CO1</b> <b>CO1</b>
	2	Packing fraction, n/p ratio.	Lecture	<b>CO1</b>
	3	Radioactivity: detection, GM counter, units of radioactivity	Lecture	<b>CO1</b>
	4	Nuclear Processes: natural radioactivity	Lecture	<b>CO1</b>
	<b><i>First Internal examination</i></b>			<b>CO1</b> <b>CO1</b>
	5	Induced radioactivity, fertile and fissile isotopes	Lecture	<b>CO1</b>
	6	Nuclear Reactions: fission and fusion,	Lecture	<b>CO1</b>
	7	chain reactions, disposal of nuclear wastes	Lecture	

	8	Applications	Lecture	
	9	Reactors – conventional and breeder, energy generation	Lecture	
	<b>Second Internal examination</b>			
<b>Surface Chemistry &amp; Colloids (6 hrs)</b>	10	rock dating and radiocarbon dating	Lecture	<b>CO1</b>
	11	neutron activation analysis.	Lecture	<b>CO1</b>
	12	Medical, agricultural and industrial applications	Lecture	<b>CO6</b>
	13	Revision	Lecture	<b>CO6</b>
	14	Adsorption – types of adsorption of gases by solids		<b>CO6</b>
	15	factors influencing adsorption		<b>CO7</b>
	16	Freundlich adsorption isotherm – Langmuir adsorption isotherm	Lecture	<b>CO7</b>
	17	Colloids: preparation, properties – optical and electrical	Lecture	<b>CO7</b>
	18	Electric double layer, coagulation,	Lecture	
	19	electrophoresis, electro osmosis, Surfactants, micelle, applications of colloids		
	<b>References:</b> <ol style="list-style-type: none"> <li>1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, 40th edn. Vishal Pub. Co. Jalandhar (2003)</li> <li>2. Ashcroft / Mermin, Solid State Physics, Thomson Publishers</li> <li>3. J. Tareen and T. Kutty, A basic course in Crystallography, University Press.</li> </ol>			
<b>Dr. ABITG</b>				
<b>Symmetry and Molecular Structure (6 hrs)</b>	1	Symmetry elements and symmetry operation	Lecture	<b>CO2</b>
	2	Centre of symmetry, plane of symmetry,	Lecture	<b>CO2</b>
	3	proper and improper axes of symmetry,	Lecture	<b>CO2</b>
	4	identity, molecular point groups,	Lecture	<b>CO2</b>
	5	Schoenflies symbol	Lecture	
	6	The phase rule, definition,	Lecture	<b>CO2</b>
	<b>First Internal examination</b>			
	7	equilibrium between phases, one component system – water system	Lecture	<b>CO2</b>
	8	Sulphur system.	Lecture	<b>CO2</b>
	9	Distribution law, partition coefficient,	Lecture	
	11	Intermolecular forces, liquids compared	Lecture	<b>CO5</b>

		with gases and solids				
<b>Phase Equilibrium(6 hrs)</b>	12	viscosity, surface tension	Lecture	<b>CO5</b> <b>CO5</b> <b>CO5</b>		
	13	structure of liquids (a qualitative description).Liquid crystals	Lecture			
	14	the intermediate phase between solid and normal liquid phases,	Lecture			
	<b>Second Internal examination</b>				<b>CO3</b>	Lecture
	15	thermographic behaviour	Lecture			
	16	Classification	Lecture	<b>CO3</b>		
	17	structure of nematic and cholesteric phases.	Seminar			
	18	Revision	Discussion			
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, 40th edn. Vishal Pub. Co. Jalandhar (2003)</li> <li>2. Ashcroft / Mermin, Solid State Physics, Thomson Publishers</li> <li>3. J. Tareen and T. Kutty, A basic course in Crystallography, University Press.</li> </ol>						
<b>Dr K B JOSE</b>					1	
	2	Lattice ,lattice energy (general idea)	Lecture	<b>CO4</b> <b>CO4</b> <b>CO4</b> <b>CO4</b>		
	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			
	6	Weiss and Miller indices, crystal systems	Lecture	<b>CO4</b> <b>CO4</b>		
	<b>First Internal examination</b>	Weiss and Miller indices, crystal systems				
	7			<b>CO4</b>	Lecture	
	8	structure determination of NaCl by X-ray diffraction.	Lecture	<b>CO4</b> <b>CO4</b> <b>CO4</b>		
	9	Theories of Solid: metallic bond	Lecture			
	10	band theory, conductors,	Lecture		Bravais lattices,	

	11	semiconductors and insulators,	Lecture	X-ray diffraction – Bragg's equation,	
	12	mention of super conductors.	Lecture		
	13	Defects in solids-stoichiometric	Lecture		
	14	Non-stoichiometric defects and consequences	Lecture		
	<i>Second Internal examination</i>				
	15			Magnetic Properties: classification	Lecture
	16	Diamagnetic, paramagnetic,	Lecture	<b>CO4</b>	
	17	Antiferromagnetic, ferro and ferrimagnetic,	Lecture		
	18	permanent and temporary magnets.	Lecture		
	19	Revision	Discussion		

Head of the Department

Thevara

Date 2/11/2018

<b>COURSE PLAN</b>			
<b>ACADEMIC YEAR 2015-16</b>			
<b>PROGRAMME</b>	:	<i>B.Sc. Botany</i>	<b>LECTURE HOURS</b> : <i>54</i>
<b>SEMESTER</b>	:	<i>3</i>	<b>CREDITS</b> : <i>3</i>
<b>SUBJECT TITLE</b>	:	Advanced Inorganic and Organic Chemistry	<b>SUBJECT CODE</b> : <i>CH3C01.2</i>
<b>COURSE TEACHERS</b>	:	<i>Dr. Ramakrishnan S., Dr. Jorphin Joseph, Dr. Midhun Dominic</i>	

<b>Dr. Ramakrishnan S</b>			
<b>Nuclear Chemistry (10 hrs)</b>			
1	1	Stability of Nucleus	Chalk & Board
2	2	natural radioactivity,	Chalk & Board
3	3	induced radioactivity	Chalk & Board
4	4	fertile and fissile isotopes,	Chalk & Board
5	5	units of radioactivity.	Chalk & Board
<i><b>First Internal examination</b></i>			
6	6	Nuclear Reactions: fission and fusion	Chalk & Board
7	7	chain reactions	Chalk & Board
8	8	disposal of nuclear wastes	Chalk & Board
9	9	applications of radioactivity	Chalk & Board
10	10	numericals	Chalk & Board
<b>Chemistry of Living cell (9 Hrs)</b>			
11	11	Thermodynamics of Living cell- Exergonic and endergonic reactions,	Chalk & Board
12	12	coupled reactions, biological oxidation reactions (general idea)	Chalk & Board
13	13	Photosynthesis- Metalloporphyrin, chlorophyll	Chalk & Board
14	14	elementary idea of photophosphorylation.	Chalk & Board

15	15	Photosynthesis and respiration – comparison.	Chalk & Board
16	16	Biologically important molecules Haemoglobin	Chalk & Board
<b><i>Second Internal examination</i></b>			
17	17	general functions of haemoglobin, transport of oxygen,	Chalk & Board
18	18	pH of blood, myoglobin, cytochromes	Chalk & Board
19	19	Ferredoxine	Chalk & Board

<b>Dr. Franklin John</b>			
<b>Heterocyclic Compounds (12 Hrs)</b>			
1	1	Aromaticity	Lecture
2	2	Huckel rule	Lecture
3	3	Structure of furan, indole, pyridine, pyrimidine, purine	Lecture
4	4	Aromaticity of furan	Lecture
5	5	Aromaticity of indole,	Lecture
6	6	Aromaticity of pyridine	Lecture
<b><i>First Internal examination</i></b>			
7	7	Aromaticity of pyrimidine	Lecture
8	8	Aromaticity of purine	Lecture
9	9	Preparation, properties :furan, pyridine	Lecture
10	10	Preparation , properties : indole	Lecture
11	11	Preparation , properties : purine and pyrimidine	Lecture
12	12	Revision	discussion
<b>Chemotherapy (6 Hrs)</b>			
13	13	Outline study and applications of antibiotics	Lecture
14	14	Outline study and applications of antibiotics	Lecture
15	15	sulpha drugs	Lecture
16	16	antipyretics, analgesics	Lecture
<b><i>Second Internal examination</i></b>			
17	17	tranquillizers, and antidepressants .	Lecture
18	18	Drug addiction abuse and prevention	Lecture

<b>Dr. Midhun Dominic</b>
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<b>Chemistry and Agriculture (12 Hrs)</b>				
1	1	Mineral nutrients-Macro nutrients-Primary and Secondary macro nutrients.	Lecture	
2	2	Micronutrients. Their role in plant growth.	Lecture	
3	3	Pesticides-classifications simple examples,	Lecture	
4	4	NPK value superphosphates, triple super phosphate	Lecture	
5	5	uses of mixed fertilizers,	Lecture	
6	6	Bio-fertilizers.	Lecture	
<b><i>First Internal examination</i></b>				
7	7	Plant growth hormones.	Lecture	
8	8	bio pesticides	Lecture	
9	9	Insecticides – stomach poisons,	Lecture	
10	10	contact insecticides, Examples	Lecture	
11	11	fumigants. Examples	Lecture	
12	12	Method of preparation of DDT, BHC, pyrethrin.	Lecture	
<b>Food Additives (5 Hrs)</b>				
13	13	Food Flavours (names only) –esters, aldehydes and heterocyclic compounds.		
14	14	Food colours- Restricted use, spurious colours.		
15	15	General discussion of emulsifying agents, preservatives, leavening agents, baking powder, yeast.		
<b><i>Second Internal examination</i></b>				
16	16	General discussion of emulsifying agents, preservatives, leavening agents, baking powder, yeast.		
17	17	Taste-enhancers- MSG, vinegar		
18	18	Food Flavours (names only) –esters, aldehydes and heterocyclic compounds.		



<b>COURSE PLAN</b>			
<b>ACADEMIC YEAR 2015-16</b>			
<b>PROGRAMME</b>	:	<i>B.Sc. Zoology</i>	<b>LECTURE HOURS</b> : <i>54</i>
<b>SEMESTER</b>	:	<i>3</i>	<b>CREDITS</b> : <i>3</i>
<b>SUBJECT TITLE</b>	:	Advanced Inorganic and Organic Chemistry	<b>SUBJECT CODE</b> : <i>CH3C01.2</i>
<b>COURSE TEACHERS</b>	:	<i>Dr. Ramakrishnan S., Dr. Franklin John ,Dr. Midhun Dominic C.D</i>	

<b>Dr. Ramakrishnan S</b>			
<b>Nuclear Chemistry (10 hrs)</b>			
1	1	Stability of Nucleus	Chalk & Board
2	2	natural radioactivity,	Chalk & Board
3	3	induced radioactivity	Chalk & Board
4	4	fertile and fissile isotopes,	Chalk & Board
5	5	units of radioactivity.	Chalk & Board
<b><i>First Internal examination</i></b>			
6	6	Nuclear Reactions: fission and fusion	Chalk & Board
7	7	chain reactions	Chalk & Board
8	8	disposal of nuclear wastes	Chalk & Board
9	9	applications of radioactivity	Chalk & Board
10	10	numericals	Chalk & Board
<b>Chemistry of Living cell (9 Hrs)</b>			
11	11	Thermodynamics of Living cell- Exergonic and endergonic reactions,	Chalk & Board
12	12	coupled reactions, biological oxidation reactions (general idea)	Chalk & Board
13	13	Photosynthesis- Metalloporphyrin, chlorophyll	Chalk & Board
14	14	elementary idea of photophosphorylation.	Chalk & Board

15	15	Photosynthesis and respiration – comparison.	Chalk & Board
16	16	Biologically important molecules Haemoglobin	Chalk & Board
<b><i>Second Internal examination</i></b>			
17	17	general functions of haemoglobin, transport of oxygen,	Chalk & Board
18	18	pH of blood, myoglobin, cytochromes	Chalk & Board
19	19	Ferredoxine	Chalk & Board

<b>Dr. Franklin John</b>			
<b>Heterocyclic Compounds (12 Hrs)</b>			
1	1	Aromaticity	Lecture
2	2	Huckel rule	Lecture
3	3	Structure of furan, indole, pyridine, pyrimidine, purine	Lecture
4	4	Aromaticity of furan	Lecture
5	5	Aromaticity of i ndole,	Lecture
6	6	Aromaticity of pyridine	Lecture
<b><i>First Internal examination</i></b>			
7	7	Aromaticity of pyrimidine	Lecture
8	8	Aromaticity of purine	Lecture
9	9	Preparation, properties :furan, pyridine	Lecture
10	10	Preparation , properties : indole	Lecture
11	11	Preparation , properties : purine and pyrimidine	Lecture
12	12	Revision	discussion
<b>Chemotherapy (6 Hrs)</b>			
13	13	Outline study and applications of antibiotics	Lecture
14	14	Outline study and applications of antibiotics	Lecture
15	15	sulpha drugs	Lecture
16	16	antipyretics, analgesics	Lecture
<b><i>Second Internal examination</i></b>			
17	17	tranquillizers, and antidepressants .	Lecture
18	18	Drug addiction abuse and prevention	Lecture

<b>Dr. Midhun Dominic C.D</b>
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<b>Chemistry and Agriculture (12 Hrs)</b>				
1	1	Mineral nutrients-Macro nutrients-Primary and Secondary macro nutrients.	Lecture	
2	2	Micronutrients. Their role in plant growth.	Lecture	
3	3	Pesticides-classifications simple examples,	Lecture	
4	4	NPK value superphosphates, triple super phosphate	Lecture	
5	5	uses of mixed fertilizers,	Lecture	
6	6	Bio-fertilizers.	Lecture	
<b><i>First Internal examination</i></b>				
7	7	Plant growth hormones.	Lecture	
8	8	bio pesticides	Lecture	
9	9	Insecticides – stomach poisons,	Lecture	
10	10	contact insecticides, Examples	Lecture	
11	11	fumigants. Examples	Lecture	
12	12	Method of preparation of DDT, BHC, pyrethrin.	Lecture	
<b>Food Additives (5 Hrs)</b>				
13	13	Food Flavours (names only) –esters, aldehydes and heterocyclic compounds.		
14	14	Food colours- Restricted use, spurious colours.		
15	15	General discussion of emulsifying agents, preservatives, leavening agents, baking powder, yeast.		
<b><i>Second Internal examination</i></b>				
16	16	General discussion of emulsifying agents, preservatives, leavening agents, baking powder, yeast.		
17	17	Taste-enhancers- MSG, vinegar		
18	18	Food Flavours (names only) –esters, aldehydes and heterocyclic compounds.		

COURSE PLAN					
ACADEMIC YEAR 2015-16					
<b>PROGRAMME</b>	:	<i>B.Sc. Physics</i>	<b>LECTURE HOURS</b>	:	54
<b>SEMESTER</b>	:	4	<b>CREDITS</b>	:	3
<b>SUBJECT TITLE</b>	:	ADVANCED PHYSICAL CHEMISTRY – II	<b>SUBJECT CODE</b>	:	CH4C01.1
<b>COURSE TEACHERS</b>	:	<i>Dr. MIDHUN DOMINIC C.D, Dr. ABI T G, Dr. K B JOSE</i>			
<b>COURSE OUTCOMES (COs)</b>	:	<b>CO1</b> -To understand the basics of spectroscopy <b>CO2</b> - To know the fundamental factors of chemical kinetics <b>CO3</b> - To have an idea about photochemistry <b>CO4</b> - basic understanding of electrochemistry <b>CO5</b> - To understand the fundamental aspects of redox reactions			

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

**Chemical Kinetics (8hrs)**

	10	Concept of group frequencies-frequencies of common functional groups in organic compounds.	Lecture	<b>CO2</b>
	11	Rotational Spectroscopy: diatomic molecules	Lecture	<b>CO2</b>
	12	Determination of bond length	Lecture	
	13	Rate of reaction, rate law	Lecture	<b>CO2</b>
	14	Order of reaction, molecularity of reaction	Lecture	<b>CO2</b>
	15	Integrated rate expression for first order reaction	Lecture	<b>CO2</b>
	16	Half life, determination of order of reactions	Lecture	
	<b><i>Second Internal examination</i></b>			
	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. ABI T G*

<b>Photochemistry (5 hrs)</b>	1	Laws of Photochemistry	Lecture	<b>CO3</b>
	2	Photochemical process – primary and secondary, quantum yield	Lecture	<b>CO3</b>
	3	Basic Concepts of Photosensitized reactions	Lecture	<b>CO3</b>
	4	Flash photolysis and chemiluminescence	Lecture	<b>CO3</b>
	5	Frank-Condon principle – fluorescence and phosphorescence	Lecture	
<b>Electrochemistry (12 hrs)</b>	6	Conductance of electrolytic solution, electrolytic conductivity (K)		<b>CO4</b>
	7	Molar conductivity of solutions of electrolytes	Lecture	<b>CO4</b>
	<b><i>First Internal examination</i></b>			
	8	Variation of conductivity and molar conductivity with concentration	Lecture	<b>CO4</b>
	9	Kohlrausch's law – application	Lecture	<b>CO4</b>
	10	Faraday's laws of electrolysis	Lecture	<b>CO4</b>
	11	Electrochemical equivalent and chemical equivalent	Lecture	<b>CO4</b>
	12	Transport number-determination by Hittorf's method	Lecture	<b>CO4</b>
13	Applications of conductance	Lecture	<b>CO4</b>	

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

**CO5**

**CO5**

<b>(6 hrs)</b>		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 2015-16			
<b>PROGRAMME</b>	:	<i>B.Sc. Botany</i>	<b>LECTURE HOURS</b> : <i>54</i>
<b>SEMESTER</b>	:	<i>4</i>	<b>CREDITS</b> : <i>3</i>
<b>SUBJECT TITLE</b>	:	<i>Advanced Bio- organic Chemistry</i>	<b>SUBJECT CODE</b> : <i>CH4C01.2</i>
<b>COURSE TEACHERS</b>	:	<i>Dr. Ramakrishnan S., Dr. Franklin John, Dr. Midhun Dominic</i>	

<b>Dr. Ramakrishnan S</b>			
	<b>No. of Sessions</b>	<b>Session Topic and Discussion Theme</b>	<b>Mode of teaching</b>
<b>Amino acids and proteins (12 Hrs)</b>			
1	1	Amino acids, Classification of amino acids	Lecture
2	2	Chemical properties of amino acid	Lecture
3	3	Separation of amino acids	Lecture
4	4	Synthesis amino acids (glycine and alanine)	Lecture
5	5	Synthesis amino acids (phenyl alanine)	Lecture
6	6	Peptides, peptide bonds, polypeptides	Lecture
<b><i>First Internal examination</i></b>			
7	7	Proteins, Classification of proteins	Lecture
8	8	Prosthetic group, properties of proteins	Lecture
9	9	Denaturation of proteins	Lecture
10	10	Structure of proteins	Lecture
11	11	Structure of proteins	Lecture
12	12	Revision	Discussion
<b>Lipids (5 Hrs)</b>			
13	13	Simple lipids and complex lipids- isolation- properties.	
14	14	Analysis of oils and fats- acid value	Lecture



<b><i>Second Internal examination</i></b>			
15	15	saponification value , iodine value.	Lecture
16	16	Detergents	Lecture
17	17	Soaps, cleaning action of soaps	Lecture
<b><i>Dr. Franklin John</i></b>			
<b>Vitamins, Steroids and Hormones ( 9 Hrs)</b>			
1	1	Structure and biological activity of vitamin A, B and C.	Lecture
2	2	Steroids- general introduction, cholesterol and bile acids.	Lecture
3	3	Steroids- general introduction, cholesterol and bile acids.	Lecture
4	4	Hormones (structure not required)Introduction,	Lecture
5	5	steroid hormones	Lecture
6	6	peptide hormones	Lecture
<b><i>First Internal examination</i></b>			
7	7	amine hormones	Lecture
8	8	artificial hormones	Lecture
9	9	revision	discussion
<b>Enzymes and Nucleic acids (9 Hrs)</b>			
10	10	Structure and biological activity of vitamin A,	Lecture
11	11	Structure and biological activity of B	Lecture
12	12	Structure and biological activity of B	Lecture
13	13	Steroids- general introduction	Lecture
14	14	cholesterol and bile acids	Lecture
<b><i>Second Internal examination</i></b>			
15	15	Hormones (structure not required)- Introduction	Lecture
16	16	steroid hormones , peptide hormones	Lecture
17	17	amine hormones, artificial hormones	Lecture

18	18	Revision	discussion
<b><i>Dr. Midhun Dominic</i></b>			
<b>Carbohydrates (11 Hrs)</b>			
1	1	Classification of carbohydrates ,	Lecture
2	2	preparation and properties of glucose	Lecture
3	3	fructose and sucrose	Lecture
4	4	Haworth configuration of -D glucose	Lecture
5	5	Haworth configuration D glucose, -D fructose, -D fructose	Lecture
6	6	maltose and cellobiose	Lecture
<b><i>First Internal examination</i></b>			
7	7	Mutarotation.	Lecture
8	8	Conversion of glucose to fructose and vice-versa..	Lecture
9	9	Structure of starch and cellulose.	Lecture
10	10	Industrial applications of cellulose	Lecture
11	11	Revision	discussion
<b>Natural Products (8 Hrs)</b>			
12	12	Terpenoids: Essential oils- isolation	Lecture
13	13	isoprene rule.	Lecture
14	14	Elementary study of citral	Lecture
15	15	Elementary study of geraniol natural rubber.	Lecture
<b><i>Second Internal examination</i></b>			
16	16		Lecture
17	17	Alkaloids- Isolation, general properties.	Lecture
18	18	Structure of coniine	Lecture
19	19	Structure of nicotine, piperine	Lecture

## References

1. L. Finar, Organic Chemistry Vol 1&2, 6 th 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 Mc Graw -Hill Publication ,1996
4. Dr. A.C. Deb, Fundamentals of Biochemistry 5. C. N. R Rao, University  
General Chemistry, Macmillan

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