SACRED HEART COLLEGE (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

BSC CHEMISTRY

COURSE PLAN

ACADEMIC YEAR 2014 – 15

SEMESTER 6

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Applied Inorganic Chemistry*			
COURSE TEACHERS	**:**	*Dr. Joseph John (JJ), Mr. Midhun Dominic C D (MD), Ms. June Cyriac (JUC)*			
Objectives	**:**	To understand the principle of metallurgical processes, the preparation and uses of inorganic polymers, importance of non-aqueous chemistry, metal carbonyls, the structure of solids and the general characteristics of p-block elements. To understand the importance of our environment and its protection.			
Instructional Hours	**:**	*3 hours per week*			

JJ	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 1 : Principles of inorganic qualitative analysis (3 hours)	1	Qualitative Analysis - solubility product, principle of elimination of interfering anions		
	2	Common ion effect, complex formation reactions including spot tests in qualitative analysis		
	3	Reactions involved in separation and identification of cations and anions in the analysis, semi micro techniques.		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ Vogel's qualitative inorganic analysis, Svehla, 7th edn., Pearson Education. ❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (Chapter 40)			
UNIT 3 : Applications of Radioactivity	4	Nuclear reactors – conventional and breeder types. Applications of nuclear fusion.		
	5	Rock dating, radio carbon dating, activation analysis		
	6	Study of reaction mechanism (ester hydrolysis) and medical applications of Co_{60}, I_{131} and Na_{24}. Disposal of nuclear wastes.		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (Chapter 38) ❖ H. J. Arnikar, Essentials of Nuclear Chemistry, New Age International Pub. ❖ H. J. Arnikar, Isotopes in the atomic age, Wiley Eastern(Chapter 12) ❖ R. Gopalan, Elements of Nuclear Chemistry, Vikas Pub. House. ❖ S. Glasstone, Sourcebook on Atomic Energy, East-west Press ❖ M. Sharon, M. Sharon, Nuclear Chemistry, 2009, Ane Books			

UNIT 9 : Analytical Techniques (12 hrs)	1	Introduction to different analytical techniques		
	2	Thermo analytical methods: Principle of thermo gravimetry, differential thermal analysis		
	3	differential scanning calorimetry. Applications - TGA of calcium oxalate monohydrate, DTA of calcium acetate monohydrate		
	4	Introduction to chromatographic methods of separation		
	5	Chromatography : Column Chromatography - Principle, types of adsorbents,		
	6	Preparation of the column, elution, recovery of substances and applications.		
	7	Thin Layer Chromatography - Principle, choice of adsorbent and solvent, Preparation of Chromatoplates, Rf-Values, significance of Rf values.		
	8	Paper Chromatography - Principle, Solvents used, Development of Chromatogram, ascending, descending and radial paper chromatography.		
	9	Ion - Exchange Chromatography – Principle - Experimental techniques.		
	10	Gas Chromatography - Principle - Experimental techniques - Instrumentation and applications.		
	11	High Performance Liquid Chromatography (HPLC) - Principle- Experimental techniques, instrumentation and advantages.		
	12	Revision		
Text Books	❖ Vogel's Textbook of Quantitative Analysis 6th edn., Pearson Education. ❖ D. A. Skoog, D. M. West, and S. R. Crouch, Fundamentals of Analytical Chemistry, Brooks/Cole Nelson. ❖ W. D. Callister Materials Science and Engineering- an introduction, , Wiley(NY). ❖ J. M. Martinez-Duart, R. J. Martin-Palma and F. Agullo- Rueda, Nanotechnology for microelectroics and optoelectronics, Elsevier. ❖ R. Booker and , E. Boysen, Nanotechnology, Wiley India Pvt Ltd, 2008 ❖ M. N. Greenwood and A. Earnshaw, Chemistry of the elements 2nd edn, Butterworth.			

	❖ D.F. Shriver and P.W. Atkins, Inorganic Chemistry, , 3rd edn., Oxford University Press. ❖ C. P. Poole Jr and F J Owens, Introduction to nanotechnology, Wiley IndiaPvt Ltd 2009. ❖ K. J. Klabunde, Nanoscale materials in chemistry, John Wiley and Sons. ❖ R. Gopalan, Inorganic Chemistry for Undergraduates, Universities Press ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry, Pearson Education

MD	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 4 : Inorganic Polymers (6 hours)	1	Inorganic polymers – general properties, comparison with organic polymers		
	2	Glass transition temperature. Sulphur based polymers – polymeric sulphur nitride and chalcogenic glasses (preparation)		
	3	Sulphur based polymers – polymeric sulphur nitride and chalcogenic glasses (properties and uses).	Assignment No: 1	
	4	Phosphorus based polymers – polyphosphazenes and polyphosphates.		
	5	Silicon based polymers – silicones and silicone rubber (preparation)	Group Discussion	
	6	Silicon based polymers – silicones and silicone rubber (properties and uses).		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Edn. Milestone Publishers, New Delhi 2010. ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006. ❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ M. Clyde Day,and J. Selbin Theoretical inorganic chemistry 2nd Edn. Reinhold Book Corp. 2008. ❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. 2006.		
UNIT 5 : Nanomaterials (3 hours)	7	Nanomaterials – synthesis – chemical precipitation, mechano-chemical method		
	8	Nanomaterials – synthesis –micro emulsion method, reduction technique, chemical vapour deposition and sol-gel method (brief study)		
	9	Nanomaterials Properties and applications of fullerenes and carbon nanotubes.		
Text Books	❖ V. S. Muraleedharan and A. Subramania, Nanosciece and nanotechnology, Ane Books Pvt. Ltd. New Delhi, 2009 ❖ T. Pradeep, Nano; The Essentials, Mc Graw-Hill education, New Delhi,2006.			

UNIT 8 Compounds of p block elements (9 hours)	10	Introduction to p block elements		
	11	Boron hydrides – diborane (preparation, properties and bonding)	Assignment No.3	
	12	B_5H_9, B_4H_{10} (structure only). Closo carboranes		
	13	Boron nitride, Borazine, boric acid		
	14	Peroxy acids of sulphur.		
	15	Oxides and oxy acids of halogens (structure only), superacids,		
	16	Interhalogen compounds, pseudohalogens, electropositive iodine, (structure only).		
	17	Fluorocarbons. Fluorides, oxides and oxy fluorides of xenon (structure only).		
	18	Revision		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Blackwell Science, London,2008. ❖ B. R. Puri, L. R. Sharma, K C Kalia, Principles of Inorganic Chemistry, 31st Edn.Milestone Publishers, New Delhi,2010. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006. ❖ D. F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd edn., Oxford University Press, 2006. ❖ M. N. Greenwood and A. Earnshaw, Chemistry of the elements 2nd edn, Butterworth, 1997.			

JUC	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	**Remarks**
UNIT 2 : Metallurgy (9 hours)	1	Introduction to metallurgy, different types of ores		
	2	Methods of concentration of ores- Gravity, magnetic and electrostatic separations, Froth flotation and leaching		
	3	Calcination and Roasting. Reduction to free metal- smelting and electrometallurgy,	Assignment No: 1	
	4	Hydrometallurgy. Goldschmidt Thermite Process.		
	5	Refining of metals- electrolytic, ion exchange, zone refining, vapour phase refining and oxidative refining.	Group Discussion	
	6	Thermodynamics of the oxidation of metals to metal oxides - Ellingham diagrams.		
	7	Extractive metallurgy of U, Ti	MOODLE- Assignment No:2	
	8	Extractive metallurgy of Th and Ni.		
	9	Revision		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Edn. Milestone Publishers, New Delhi,2010. ❖ S. Prakash, G. D. Tuli, S. K. Basu and R. D. Madan, Advanced Inorganic Chemistry,Volume I, S Chand. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006			

UNIT 6 : Industrially important materials (6 hours)	10	Introduction to industrially materials	Assignment No.3	
	11	Refractory materials - carbides, nitrides, borides.		
	12	Graphite and graphite oxide, intercalation compounds of alkali metals,		
	13	carbon monofluoride, intercalation compounds of graphite with metal halides		
	14	glass, silicates, zeolites, ultramarines and ceramics.		
	15	Revision		
	SECOND INTERNAL EXAMINATION			
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi(Chapter 14) ❖ S Prakash, G D Tuli, S K Basu and R D madan, Advanced Inorganic Chemistry,Volume I, S Chand,(Chapter 26, 27)			
UNIT 7 Non aqueous solvents (3	16	Classification of solvents, characteristics of solvents		
	17	Reactions in liquid ammonia, liquid sulphur dioxide (acid base, amphoteric, solvation, oxidation – reduction, complex formation)		
	18	Reactions in liquid HF (acid base, amphoteric, solvation, oxidation – reduction, complex formation)	Demonstration	
Te xt Bo	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi(Chapter 7) ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, 4th edn., Pearson 2006 (Chapter 9)			

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Chemistry of Natural Products and Biomolecules*			
COURSE TEACHERS	**:**	*V.S. Sebastian (VSS), Franklin J (FJ), Joseph T Moolayil (JTM), M. George (MG)*			

FJ	**No. of Session**	**Session Topic and Discussion Theme**	**Value additions**	
UNIT 1 : Natural Products (12 hours)	1	Natural Products - Terpenoids		
	2	Isoprene rule. Structure elucidation of citral and geraniol		
	3	Structure elucidation of geraniol	Assignment No: 1	
	4	Alkaloids - general methods of isolation .		
	5	Alkaloids-classification – structure elucidation		
	6	Synthesis of coniine		
	7	Synthesis of pipperine	Assignment No:2	
	8	Synthesis of nicotine.		
	9	Vitamins – classification- structure (elementary idea) of vitamin A, C and B1, B2, B6		
		FIRST INTERNAL EXAMINATION		
	Text Books	❖ I. L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma '*Modern Organic Chemistry'*, 3rd Edition, Vishal Publishing Company Co . ❖ K.S. Tewari and N.K. Vishnoi,'*Organic Chemistry'*, 3rd Edition, Vikas Publishing House.		
	10	Lipids – biological functions – oils and fats – common fatty acids		
	11	Extraction and refining- hydrogenation –		
	12	Rancidity- identification of oils and fats		
	13	Revision-Natural products, alkaloids		

	SECOND INTERNAL EXAMINATION
Text Books	❖ L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma '*Modern Organic Chemistry'*, 3rd Edition, Vishal Publishing Company Co. ❖ K.S. Tewari and N.K. Vishnoi,'*Organic Chemistry'*, 3rd Edition, Vikas Publishing House.

JTM

Unit II	No. of Sessions	Session Topic and Discussion Theme	Value additions	
Carbohydrates (12 Hours)	1	Classification - constitution of glucose and fructose.		
	2	Reactions of glucose-osazone formation		
	3	Reactions of fructose - osazone formation.		
	4	Reactions of glucose and fructose - Mutarotation and its mechanism.		
	5	Epimerisation		
	6	Configuration of monosaccharides		
		Ist Internal Examination		
	7	Cyclic structure. Pyranose and furanose forms		
	8	Determination of ring size.	Power Point Presentation	
	9	Determination of ring size. Haworth projection formula. Chain lengthening and chain shortening of aldoses		
	10	. Inter conversion of aldoses and ketoses. Disaccharides - reactions and structure of sucrose and maltose. Ring structure		
		2nd Internal Examination		
	11	Structure and properties of starch and cellulose (elementary idea).		
	12	Industrial applications of cellulose.		
Text Books	❖ I. L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education. ❖ M. K. Jain and S. C. Sharma '*Modern Organic Chemistry'*, 3rd Edition, Vishal Publishing Company Co. ❖ K.S. Tewari and N.K. Vishnoi,'*Organic Chemistry'*, 3rd Edition, Vikas Publishing House. ❖ R. T. Morrison and R.N. Boyd, '*Organic Chemistry'*, 6th Edition - Prentice Hall of India			

MG

Unit III	No. of Sessions	Session Topic and Discussion Theme	Value additions	
Heterocyclic Compounds (10	1	Aromaticity of heterocyclic compounds.		
	2	Preparation, properties and uses of furan	Power Point Presentation	

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

VSS				
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Amino acids and Proteins Compounds (9 Hours)	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 (*elementary treatment only*). Nucleic acids. Types of nucleic acids		
	7	RNA and DNA,		
	8	polynucleotide chain components		
	9	Green Fluorescent Proteins (*elementary idea*)		
	Ist Internal Examination			
Unit VII	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Supramolecular Chemistry (3 Hours)	1	Introduction-Molecular recognition-		
	2	Host-guest interactions		
	3	- types of non-covalent interactions		
Unit V	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Enzymes (3 Hours)	1	Nomenclature and classification of enzymes (*based on substrate*).	Individual Assignment:	
	2	Chemical nature of enzymes. Mechanism of enzyme action.		
	2nd Internal Examination			
	3	Substrate specificity of enzymes. Enzyme inhibition.		

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

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA					
COURSE PLAN : ACADEMIC YEAR 2014 - 2015					
PROGRAMME	**:**	*B.Sc. Chemistry*	**SEMESTER**	**:**	*6*
LECTURE HOURS	**:**	*54*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Equilibrium and Kinetics*			
COURSE TEACHERS	**:**	Dr. Ignatious Abraham (IGA), Dr. K. B. Jose (KBJ) & Senju Devassykutty (SD)			
Instructional Hours	**:**	*Monday : Period 3 (9:30 to 10:30 am) - SD* *Tuesday : Period 1 (9:30 to 10:30 am) - KBJ* *Friday : Period 2 (10:30 to 11:30 am) - IGA*			

IGNATIOUS ABRAHAM			
Unit I : CLASSICAL THERMODYNAMICS			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	**Remarks**
1	**Introduction to Thermodynamics:** Definition of thermodynamic terms, intensive and extensive properties		
2	Path and state functions, exact and inexact differentials		
3	Reversible and irreversible processes,		
4	Spontaneous and non-spontaneous processes, internal energy, work and heat		
5	Zeroth law of thermodynamics	Power Point Presentation	
6	**First law of thermodynamics:** Statement and mathematical expression		
7	Enthalpy, heat capacity, Cp and Cv relation in ideal gas systems,		

8	Change in thermodynamic properties of an ideal gas during isothermal reversible / irreversible processes.		
9	Change in thermodynamic properties of an ideal gas during adiabatic, reversible / irreversible processes.		
1st Internal Examination			
10	Joule-Thomson experiment,		
11	Joule-Thomson coefficient μ_{JT}, inversion temperature	*Assignment* : Synthetic Applications of active methylene compounds	
12	**Second law of Thermodynamics:** Limitations of first law – statements of second law,		
13	Carnot's cycle – efficiency of heat engines, Carnot theorem.		
14	Entropy – entropy change for various reversible/irreversible processes,		
15	Change in entropy of an ideal gas with pressure, volume and temperature.		
2nd Internal Examination			
Unit III : SYMMETRY			
16	Third law of thermodynamics-statement and significance.	Power Point Presentation	
17	Helmholtz energy and Gibbs energy	*Assignment*	
18	Variation of Gibbs energy with T and P		

References:

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

SENJU DEVASSYKUTTY

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

References:

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

K B JOSE

Unit III : SOLID STATE

Sessions	Session Topic and Discussion Theme	Value additions	
1	Rate of reaction, rate equation, order and molecularity of reactions	Power Point Presentation	
2	Integrated rate expressions for first and second order reactions.		
3	Zero order reactions, pseudo-order reactions, half-life.		
4	**Theories of chemical kinetics:** effect of temperature on the rate of reaction	*Assignment*	
5	Arrhenius equation, concept of activation energy		
6	Collision theory, transition state theory.	Models	
7	Thermodynamic parameters for activation – Eyring equation (no derivation needed),	Power Point	
8	Enthalpy and entropy of activation.		
9	Theory of unimolecular reactions – Lindemann theory.	Assignment	
1st Internal Examination			
10	Kinetics of complex (composite) reactions: Opposing reactions, consecutive reactions, and parallel (simultaneous) reactions.	*Assignment*	
11	Chain reactions – steady state treatment, hydrogen bromine reaction.		

12	Catalysis: Homogeneous catalysis,	Power Point	
13	Enzyme catalysis – Michaelis-Menten equation (no derivation needed).	Power Point	
14	Heterogeneous catalysis – surface catalysis, uni and bi molecular reactions on surface.	Power Point	
15	Elementary idea about autocatalysis.	*Assignment*	
2nd Internal Examination			
Unit I : Chemical Equilibrium			
16	Chemical equilibrium: conditions for chemical equilibrium.		
17	van't Hoff reaction isotherm, relation between Kc and Kx – Kp		
18	Temperature dependence of Kp – van't Hoff equation	Power Point	

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.

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*SOLUTION CHEMISTRY*			
COURSE TEACHERS	**:**	*Dr Jinu George (JG), Dr.Thommachan Xavier, Dr. K B Jose*			
COURSE OBJECTIVES	**:**	*To study the behaviour of binary liquid mixtures, CST, azeotropes, colligative properties* *To study solubility of gases in liquids,* *To study ionic equilibria and electrical properties of ions in solution.* *To study the concepts of acids and bases, pH and buffer solutions*			
Instructional Hours	**:**	*3* ***hours per week***			

	No. of Session	Session Topic and Discussion Theme	Value additions	WEB url/ADDITIONAL RESOURCES
UNIT I1 : Ionic equilibrium	1	Introduction-concepts of acids and bases	Power point	
	2	relative strength of acid-base pairs, influence of solvents	Chalk & Board	
	3	Classification of acids and bases as hard and soft acids and bases. Pearson's HSAB concept, applications,.	Chalk & Board	
	4	Dissociation constants – acids, bases, and polyprotic acids.	Chalk & Board	
	5	Ostwald's dilution law. Ionic product of water – pH.	Chalk & Board	
	6	Buffer solutions – mechanism of buffer action,	Assignment No:1	
	7	Henderson equation. Hydrolysis of salts – hydrolysis constant, degree of hydrolysis, pH of salt solutions.(contd derivation)	Chalk & Board	

	8	Acid-base indicators, theories, determination of pH by indicators, solubility product principle – applications.	Power point	
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ K. L. Kapoor, '*A Textbook of Physical Chemistry*', Volumes 1, Macmillan India Ltd. ❖ B. R. Puri, L. R. Sharma, M. S. Pathania, '*Elements of Physical Chemistry*', Vishal Pub. Co. Jalandhar. ❖ I. N. Levine, *Physical Chemistry*, Tata Mc Graw Hill.			
UNIT I: Solutions	10	Introduction-- Binary liquid solutions – Raoult's law	Power point	
	11	Ideal and non-ideal solutions-Gmix, Vmix, and Smix for ideal solutions.	Chalk & Board	
	No. of Session	**Session Topic and Discussion Theme**	**Value additions**	
	12	Fractional distillation of binary liquid-liquid solutions.	Power point	
	13	Distillation of immiscible liquids, partially miscible liquid-liquid systems	Group Discussion	

		SECOND INTERNAL EXAMINATION		
Text Books	❖ K. J. Laidler and J. M. Meiser, *'Physical Chemistry',* 3rd Edition, Houghton Mifflin Comp., New York, International Edition (1999). ❖ Barrow, G.M. *Physical Chemistry*, Tata McGraw-Hill (2007). ❖ Castellan, G.W. *Physical Chemistry*, 4th Ed. Narosa (2004).			
UNIT I : Solutions	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	
Text Books	❖ F A Alberty and R J Silby, *Physical Chemistry*, John Wiley. ❖ P. W. Atkins, *The elements of Physical chemistry*, 8thedn, Oxford University Press. ❖ S. H. Marron and J. B. Lando, *Fundamentals of Physical Chemistry*, Macmillan Ltd.			

	No. of Session	Session Topic and Discussion Theme	Value additions	
UNIT 1 and UNIT III : Solutions & Electrical Conductance	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	
		FIRST INTERNAL EXAMINATION		
Text Books	❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998). ❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.			
	9	Transport Numbers – determination by Hittorf's method and moving boundary method.	Assignment No.3	
	10	Debye-Hückel theory of strong electrolytes	Chalk & board	
	11	The concept of ionic atmosphere, Asymmetry and electrophoretic effect.	Chalk & board	
	12	Debye- Hückel-Onsager equation (*no derivation*)	Group Discussion	
		SECOND INTERNAL EXAMINATION		

Text Books	❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998). ❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.			
Electrical Conductance	13	Activity, mean ionic activity and mean ionic activity coefficients of electrolytes.	PowerPoint presentation	
	14	Ionic strength of a solution, Debye-Hückel limiting law (*no derivation*)	PowerPoint presentation	
	15	Applications of conductance measurements	Demonstration	
	16	Determinations of degree of dissociation of weak electrolytes, ionic product of water	PowerPoint presentation	
	17	Solubility of sparingly soluble salts .	PowerPoint presentation	
	18	conductometric titrations.	PowerPoint presentation	
Text Books	❖ Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998). ❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house.			

Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
UNIT IV : Electromotive Force	1	Introduction – Electrochemical Cells and Electrolytic cells, Galvanic cells	PowerPoint presentation	
	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 ΔG, ΔH and ΔS of cell reaction.	PowerPoint presentation	
	7	E.M.F and equilibrium constant of cell reaction	PowerPoint presentation	
	1st Internal Examination			
	8	Effect of electrolyte concentration on electrode potential and e.m.f - Derivation of Nernst equation.	Chalk & board	
	9	Concentration cells – electrode concentration cell and electrolyte concentration cells	Power Point Presentation	
Text Books	❖ Glasstone S, An Introduction to Electrochemistry, East-West Press (Pvt.) Ltd. (2006). ❖ Gurdeep Raj, Advanced Physical Chemistry, Goel publishing house. ❖ F A Alberty and R J Silby, Physical Chemistry, John Wiley. ❖ P. W. Atkins, The elements of Physical chemistry, 8thedn, Oxford University Press.			
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
	10	Types of electrolyte concentration cells – with transference and without transference	Power Point Presentation	
	11	Liquid junction potential. Fuel cells – the hydrogen-oxygen fuel cell.	Power Point Presentation	
	12	Applications of e.m.f measurements – determination of solubility product	Power Point Presentation	

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

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*6*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Polymer Chemistry*			
COURSE TEACHERS	**:**	*Dr. Joseph T Moolayil (JTM), Dr. Grace Thomas (GT), Mr. Senju Devassykutty (SD)*			
Objectives	**:**	➢ To know about the types of polymers and the chemistry of polymerisation. ➢ To understand the physical properties of polymers, their reactions and degradation. ➢ To acquire knowledge about the polymerisation techniques and polymer processing. ➢ To know the chemistry of individual polymers, their preparation and properties ➢ To have an idea about the recent advances in polymer science			
Instructional Hours	**:**	*3 hours per week*			

JTM	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 1 : Introduction to Polymers (9 hours)	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.		
	4	Homo and heteropolymers. Copolymers.		
	5	Chemistry of polymerization ,Chain polymerisation, Free radical, ionic,		
	6	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			
	7	Chemistry of polymerization - ionic, coordination, step Polymerisation		
	8	Polyaddition and polycondensation ,miscellaneous		
	9	Ring-opening & group transfer polymerisations.		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			

UNIT 3 : Polymerization Techniques and Processing (9 hrs)	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		
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			

SD	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 4 : Physical Properties and Reactions of Polymers (18 hours)	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		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			
	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	

	SECOND INTERNAL EXAMINATION			
	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		
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			

GT	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 4 : Chemistry of Commercial Polymers (9 hours)	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 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		
		FIRST INTERNAL EXAMINATION		
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			

UNIT 5 : Advances in Polymers (9 Hours)	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		
	18	Revision		
	SECOND INTERNAL EXAMINATION			
Text Books	❖ Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. ❖ Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi. ❖ Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989. ❖ Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.			