Sacred Heart College (Autonomous)

Department of Chemistry

MSc Chemistry

Course Plan

Academic Year 2015 – 16

Semester 3

COURSE PLAN					
ACADEMIC YEAR 2015 - 16					
PROGRAMME	**:**	MSc Chemistry	**LECTURE HOURS**	**:**	72
SEMESTER	**:**	III	**CREDITS**	**:**	4
SUBJECT TITLE	**:**	**Structural Inorganic Chemistry**	**SUBJECT CODE**	**:**	**CH3C09**
COURSE TEACHERS	**:**	Dr. Joseph John, Mr. Midhun Dominic C D, Mr. Senju Devassykutty, Dr.Ramakrishnan			
Instructional Hours	**:**	4			

Sessions	Topic/Module	Method of teaching *
1-3	**Unit 1: Solid State Chemistry (18 hours) (JJ)** Structure of solids: Imperfections in solids-point defects, line defects and plane defects.	Conventional Teaching
4-6	Structure of compounds of AX (Zinc blende, Wurtzite), AX_2 (Rutile,fluorite, antifluorite), A_mX_2 (Nickel Arsenide), ABX_3 (Perosvskite, Ilmenite). Spinels. Inverse spinel structures.	Conventional Teaching ICT
7-8	Solid state reactions-diffusion coefficient, mechanisms, vacancy diffusion,	Conventional Teaching
9-10	thermal decomposition of solid-Type I reactions, Type II reactions.	Conventional Teaching
11-13	Phase transition in solids: classification of phase transitions-first and second order phase transitions,	Conventional Teaching
14-16	Martensitic transformations, order-disorder transitions and spinodal decomposition. Kinetics of phase transitions, sintering.	Conventional Teaching Assignment

17-18	Growing single crystals-crystal growth from solution, growth from melt and vapor deposition technique.	Conventional Teaching
1-2	**Unit 2: Electrical, Magnetic and Optical Properties (18 Hrs) (MD)** Kronig-Penney model, Free electron theory	Conventional Teaching
2-6	Zone theory and MO theory of solids. Energy bands-conductors and non-conductors, intrinsic and extrinsic semiconductors	Conventional Teaching
7	Electrons and holes. Mobility of charge carriers. Hall Effect.	Conventional Teaching
8-9	Pyroelectricity, piezo electricity and ferro electricity. Conductivity of pure metals.	Conventional Teaching ASSIGNMENT
10-11	Magnetic properties of transition metal oxides, garnets, spinels, ilmenites and perovskites, magnetoplumbites.	Conventional Teaching
12	Optical properties-photoconductivity, photovoltaic effects, luminescence. Applications of optical properties	Conventional Teaching ICT
13-14	Super conductivity-Type I and Type II superconductors, Frolich diagram, Cooper pairs, theory of low temperature super conductors, junctions using superconductors,	Conventional Teaching

15-16	BCS theory of superconductivity (derivation not required). Super conducting cuprates - YBaCu oxide system, Meisner effect, conventional superconductors, organic superconductors .	Conventional Teaching
17-18	fullerenes, carbon nanotubes, high temperature superconductors	Conventional Teaching
1-2	**Unit 3: Inorganic Chains and Rings (18 Hrs) (SD)** Chains - catenation, heterocatenation.	Conventional Teaching
3-4	Silicate minerals. Structure of silicate common silicates, silicates containing discrete anions, silicates containing infinite chains, silicates containing sheets, framework silicates.	Conventional Teaching
5	Silicones. Zeolites synthesis,structure and applications.	Conventional Teaching
6-7	Isopoly acids of vanadium, molybdenum and tungsten.	Conventional Teaching
8	Heteropoly acids of Mo and W.	Conventional Teaching
9	Condensed phosphates-preparation, structure and applications. Phosphate esters in biological systems.	Conventional Teaching ICT

10	Polythiazil-one dimensional conductors	Conventional Teaching
11	Rings-topological approach to boron hydrides, Styx numbers	Conventional Teaching
12-13	Structure and bonding in borazines, ring silicates and silicones,	Conventional Teaching ASSIGNMENT II
14	phosphorous-nitrogen compounds, phosphazenes.	Conventional Teaching
15-16	Heterocyclic inorganic ring systems-structure and bonding in phosphorous-sulphur and sulphur-nitrogen compounds.	Conventional Teaching
17-18	Homocyclic inorganic ring systems-structure and bonding in sulphur, selenium and phosphorous compounds.	Conventional Teaching
1-2	**Unit 4: Inorganic Cages and Metal Clusters (9 Hrs)(RKS)** Cages: synthesis, structure and bonding of cage like structures of phosphorous.	Conventional Teaching ICT
3-4	Boron cage compounds-Wade Mingos Lauher rules, MNO rule	Conventional Teaching
5	boranes,carboranes, metallacarboranes.	Conventional Teaching

6-7	Metal clusters**:** dinuclear compounds of Re, Cu and Cr, metal-metal multiple bonding in $(Re_2X_8)_2$	Conventional Teaching
8	trinuclear clusters, tetranuclear clusters, hexanuclear clusters.	Conventional Teaching
9	Polyatomic zintl anion and cations. Infinite metal chains.	Conventional Teaching
1-2	**Unit 5: Chemistry of Materials (9 Hrs)(RKS)** Glasses, ceramics	Conventional Teaching
3	composites	Conventional Teaching
4-5	nanomaterials-preparative procedures. Sol-gel synthesis,	Conventional Teaching
6	glassy state-glass formers and glass modifiers,	Conventional Teaching
7	ceramic structures mechanical properties,	Conventional Teaching
8	clay products,	Conventional Teaching
9	refractories- characterizations, properties and applications.	Conventional Teaching Assignment

References

01. L.V. Azaroff, Introduction to Solids, Mc Graw Hill, 1984.
02. A.R. West, Solid State Chemistry and its Applications, Wiley-India, 2007.
03. D.K. Chakrabarty, Solid State Chemistry, New Age Pub., 2010.
04. D.M. Adams, Inorganic Solids: An Introduction to Concepts in Solid State Structural Chemistry, Wiley, 1974.
05. C.N.R. Rao, K.J. Rao, Phase Transitions in Solids, McGraw Hill, 2010.
06. B.E. Douglas, D.H. McDaniel, J.J. Alexander, Concepts and Models of Inorganic Chemistry, 3rd Edn., John Wiley & sons, 2006.
07. A. Earnshaw, Introduction to Magnetochemistry, Academic Press, 1968.
08. J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry Principles of Structure and Reactivity, 4th Edn., Harper Collins College Pub.,1993.

COURSE PLAN					
ACADEMIC YEAR 2015 - 16					
PROGRAMME	**:**	*M.Sc. Chemistry*	**LECTURE HOURS**	**:**	*72*
SEMESTER	**:**	*3*	**CREDITS**	**:**	*4*
SUBJECT TITLE	**:**	*Organic Syntheses*	**SUBJECT CODE**	**:**	***P3CHET09***
COURSE TEACHERS	**:**	*Dr. V.S. Sebastian (VSS) ; Dr. Franklin J (FJ) ; Dr. Grace Thomas (GT) ; Dr. Ignatious Abraham (IGA); Dr. June Cyriac (JUC)*			
Instructional Hours	**:**				

GT	No. of Session	Session Topic and Discussion Theme	Value additions	
UNIT 1 : Organic Synthesis via Oxidation and Reduction (18 hours)	1	Survey of organic reagents and reactions in organic chemistry with special reference to oxidation and reduction.		
	2	Metal based and non-metal based oxidations of alcohols to carbonyls (Chromium, Manganese)		
	3	Metal based and non-metal based oxidations of alcohols to carbonyls (aluminium and DMSO based reagents)	ICT	
	4	alkenes to epoxides (peroxides/per acids based)-		
	5	Sharpless asymmetric epoxidation,		
	6	Jacobsen epoxidation, Shi epoxidation		
	7	alkenes to diols	Assignment No:2	
	8	(Manganese and Osmium based)-Prevost reaction		
	9	Woodward modification		
		FIRST INTERNAL EXAMINATION		
	Text Books	❖ M.B. Smith, Organic Synthesis, 3rd Edn., Wavefunction Inc., 2010. ❖ F.A. Carey, R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edn., Springer, 2007. ❖ W. Carruthers, I. Coldham, Modern Methods of Organic Synthesis, 4th Edn., Cambridge University Press, 2004. ❖ J. Clayden, N. Greeves, S. Warren,P. Wothers, Organic Chemistry, Oxford University Press, 2001I. L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education.		
	10	alkenes to carbonyls with bond cleavage (Manganese and lead based, ozonolysis)		
	11	alkenes to alcohols/carbonyls without bond cleavage		
	12	- hydroboration-oxidation, Wacker oxidation, selenium/chromium based allylic oxidation		

	13	ketones to ester/lactones- Baeyer-Villiger oxidation		
	14	. Catalytic hydrogenation (Heterogeneous: Palladium/Platinum/Rhodium and Nickel. Homogeneous: Wilkinson).		
	15	Metal based reductions- Birch reduction, pinacol formation, acyloin formation		
	16	Hydride transfer reagents from Group III and Group IV in reductions - LiAlH4,.		
	17	DIBAL-H, Red-Al, NaBH4 and NaCNBH3, selectrides		
	18	trialkylsilanes and trialkylstannane. Meerwein-Pondorff-Verley reduction. Baker's yeast		
	SECOND INTERNAL EXAMINATION			
Text Books	❖ M.B. Smith, Organic Synthesis, 3rd Edn., Wavefunction Inc., 2010. ❖ F.A. Carey, R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edn., Springer, 2007. ❖ W. Carruthers, I. Coldham, Modern Methods of Organic Synthesis, 4th Edn., Cambridge University Press, 2004. ❖ J. Clayden, N. Greeves, S. Warren,P. Wothers, Organic Chemistry, Oxford University Press, 2001I. L. Finar, *Organic Chemistry* - Volume I & II - Pearson Education.			

FJ				
Unit II	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Modern Synthetic Methods and Reagents (18 Hours)	1	Baylis-Hillman reaction, .		
	2	Henry reaction, Nef reaction,		
	3	Kulinkovich reaction, Ritter reaction,		
	4	Sakurai reaction, Tishchenko reaction, Ugi reaction,		
	5	Noyori reaction. Brook rearrangement.		
	7	Tebbe olefination.		
	8	Metal mediated C-C and C-X coupling reactions: Heck,		
	9	Stille,		
	10	Suzuki,		
	1st Internal Examination			
	11	Suzuki-Miyaura,		
	12	Negishi-Sonogashira, Nozaki-Hiyama,	Power Point Presentation	
	13	Buchwald-Hartwig, Ullmann and Glaser coupling reactions.		
	14	Wohl-Ziegler reaction. Reagents such as NBS		
	15	DDQ and DCC		
	16	Gilmann reagent.		
	2nd Internal Examination			
	17	Introduction to multicomponent reactions		
	18	Click reaction		
	End Semester Examination			

Text Books	❖ M.B. Smith, Organic Synthesis, 3rd Edn., Wavefunction Inc., 2010. ❖ J. Clayden, N. Greeves, S. Warren,P. Wothers, Organic Chemistry, Oxford University Press. ❖ R.O.C. Norman, J.M. Coxon, Principles of Organic Synthesis, 3rd Edn., Chapmann and Hall, 1993. ❖ V.K. Ahluwalia, L.S. Kumar, S. Kumar, Chemistry of Natural Products, CRS			
JUC				
Unit III	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Construction of Carbocyclic and Heterocyclic Ring Systems *(9 Hours)*	1	Different approaches towards the synthesis of three, four, five and six-membered rings.		
	2	Photochemical approaches for the synthesis of four membered rings-oxetanes and cyclobutanes		
	3	ketene cycloaddition (inter and intra molecular), Pauson-Khand reaction,	Power Point Presentation	
	4	Volhardt reaction, Bergman cyclization,		
	5	Nazarov cyclization, Mitsunobu reaction,		
	6	cation-olefin cyclization and radical-olefin cyclization.		
	Ist Internal Examination			
	7	Inter-conversion of ring systems (contraction and expansion)-Demjenov reaction		
	8	Reformatsky reaction. Construction of macrocyclic rings-ring closing metathesis.		
	9	Formation of heterocyclic rings: 5-membered ring heterocyclic compounds with one or more than one hetero atom like N, S or O - pyrrole, furan, thiophene, imidazole, thiazole and oxazole		
	2nd Internal Examination			

Text Books	❖ M.B. Smith, Organic Synthesis, 3rd Edn., Wavefunction Inc., 2010. ❖ F.A. Carey, R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edn., Springer, 2007. ❖ W. Carruthers, I. Coldham, Modern Methods of Organic Synthesis, 4th Edn., Cambridge University Press, 2004. ❖ J. Clayden, N. Greeves, S. Warren,P. Wothers, Organic Chemistry, Oxford University Press, 2001. ❖ R. Noyori, Asymmetric Catalysis in Organic Synthesis, John Wiley & Sons, 1994.

VSS				
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Protecting group Chemistry (9 Hours)	1	Protection and deprotection of hydroxy, carboxyl,		
	2	carbonyl, and amino groups. Chemo and regio selective protection and deprotection.		
	3	Illustration of protection and deprotection in synthesis.	Power Point Presentation	
	4	Protection and deprotection in peptide synthesis.		
	5	common protecting groups used in peptide synthesis,	Group Discussion	
	6	protecting groups used in solution phase and		
	7	solid phase peptide synthesis (SPPS).		
	8	Functional equivalence and reactivity Umpolung.		
	9	Role of trimethyl silyl group in organic synthesis		
	Ist Internal Examination			

Text Books	❖ M.B. Smith, Organic Synthesis, 3rd Edn., Wavefunction Inc., 2010. ❖ F.A. Carey, R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edn., Springer, 2007. ❖ W. Carruthers, I. Coldham, Modern Methods of Organic Synthesis, 4th Edn., Cambridge University Press, 2004. ❖ J. Clayden, N. Greeves, S. Warren,P. Wothers, Organic Chemistry, Oxford University Press, 2001. ❖ R. Noyori, Asymmetric Catalysis in Organic Synthesis, John Wiley & Sons, 1994.

COURSE PLAN					
ACADEMIC YEAR 2015 - 16					
PROGRAMME	**:**	*M.Sc. Chemistry*	**LECTURE HOURS**	**:**	*72*
SEMESTER	**:**	*3*	**CREDITS**	**:**	*4*
SUBJECT TITLE	**:**	*Physical Chemistry*	**SUBJECT CODE**	**:**	*P3CHET11*
COURSE TEACHERS	**:**	*Dr Jorphin Joseph, Dr Jinu George, Dr Ignatious Abrhaham, Dr Abi T G*			
COURSE OBJECTIVES	**:**	To undertand the basic concepts in Surface Chemistry, Electrochemistry, Photochemistry and Chemical Kinetics			
Instructional Hours	**:**	*4 HOURS/WEEK*			

IGA				
Unit V	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Retrosynthetic Analysis *(9 Hours)*	1	Basic principles and terminology of reterosynthesis: method.		
	2	synthesis of aromatic compounds, one group		
	3	two group C-X disconnections, one group C-C and two group C-C disconnections.		
	4	Amine and alkene synthesis: important strategies of retrosynthesis,		
	5	functional group transposition, important functional group interconversions.		
	6	important functional group interconversions,		
	7	Enantioselective synthesis of Corey lactone		
	8	longifolene and luciferin.		
	9	Umpolung equivalent – Peterson olefination, enolate formation, Ireland		
	Ist Internal Examination			
Unit VI	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Biosynthesis and Biomimetic Synthesis (9 Hours)	1	Basic principles of the biosynthesis of terpenes,		
	2	steroids, alkaloids,.		
	3	carbohydrates,		
	4	proteins and nucleic acids. e		
	5	Biosynthesis of cholesterol,		
	6	α- terpineol, morphine		
	7	glucose and phenyl alanine.		
	8	Biogenesis of isoprenoids and alkaloids.		
	9	Biomimetic synthesis of progesterone and spatrein		
	2nd Internal Examination			
Text Books	❖ M.B. Smith, Organic Synthesis, 3rd Edn., Wavefunction Inc., 2010. ❖ F.A. Carey, R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edn., Springer, 2007. ❖ W. Carruthers, I. Coldham, Modern Methods of Organic Synthesis, 4th Edn., Cambridge University Press, 2004. ❖ J. Clayden, N. Greeves, S. Warren,P. Wothers, Organic Chemistry, Oxford University Press, 2001.			

	❖ R. Noyori, Asymmetric Catalysis in Organic Synthesis, John Wiley & Sons, 1994.

	No. of Session	Session Topic and Discussion Theme	Value additions	
UNIT 1 CHEMICAL KINETICS I (14 hours)	1	**Theories of reaction rates**: Collision theory-steric factor, potential energy surfaces.		
	2	Conventional transition state theory-Eyring equation,		
	3	Comparisonof the two theories.	Assignment	
	4	Thermodynamic formulation of the two theories.		
	5	Thermodynamicformulation of the reaction rates.		
	6	Significance of ΔG^*, ΔH^* andΔS^*.Volume of activation.		
	7	Effect of pressure and volume on velocity of gas reactions.		
	8	**Introduction** to Molecular Reaction Dynamics		
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	1.	J. Rajaram, J.C. Kuriakose, Kinetics and Mechanisms of Chemical Transformations, Macmillan India, 2000.		
	2.	K.J. Laidler, Chemical kinetics, 3rdEdn. Harper & Row, 1987.		
	3.	C. Kalidas, Chemical Kinetic Methods: Principles of Fast Reaction Techniques and Applications, New Age International, 2005.		
	4.	J.W. Moore, R.G. Pearson, Kinetics and Mechanisms, John Wiley & Sons, 1981.		
	5.	P.W. Atkins, Physical Chemistry, ELBS, 1994.		
	10	**Lindemann-Hinshelwood mechanism**	ICT	

	11	Qualitative idea of RRKM theory		
	No. of Session	**Session Topic and Discussion Theme**	**Value additions**	
	12	Chain reactions,free radical and chain reactions		
	13	Steady state treatment, kinetics of H_2-Cl_2 and H_2-Br_2 reactions,	Group Discussion	
		SECOND INTERNAL EXAMINATION		
CHEMICAL KINETICS - II (14 Hrs.)	14	Rice –Herzfeld mechanism, Branching chains H_2-O_2		
	15	Semenov-Hinshelwood mechanism of explosive reactions.		
	16	**Kinetics of polymerization:** mechanism of step growth		
	17	Ionic and addition polymerization	PowerPoint presentation	
	18	Kinetics of anionic and cationic polymerization.	PowerPoint presentation	

Unit III	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
Unit 4: Nanotechnology and Green Chemistry	1	Basic principles of nanochemistry,.		
	2	methods of synthesis of nanomaterials, a brief study of carbon nanotubes, fullerenes, quantum dots and metal nanoparticles. Applications of nanomaterials in medicine: immunogold labelling,		
	3	applications in medical diagnosis,		
	4	nanobased drug delivery,		
	5	biomimetic nanotechnology,		
	6	DNA nanotechnology and structural biomimicry.		

	1st Internal Examination			
	8	5.2 Principles of green chemistry		
	9	basic concepts, atom economy, twelve laws of green chemistry,	Power Point Presentation	
Text Books				
	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
	10	principles of green organic synthesis.		
	11	5.3 Green alternatives of organic synthesis:	Power Point Presentation	
	12	coenzyme catalysed reactions,	Power Point Presentation	
	13	green alternatives of molecular rearrangements,		
	14	electrophilic aromatic substitution reactions,	Group Discussion	
	2nd Internal Examination			
	15	oxidation-reduction reactions, clay catalysed synthesis,		
	16	condensation reactions. Green photochemical reactions.		
	17	Microwave assisted organic synthesis.	Individual Assignment: Various intermolecular forces	
	18	5.4 Green chemistry in the pharmaceutical industry: Ibuprofen manufacture, biocatalysis.		
Reference: Principles of green chemistry, basic concepts, atom economy, twelve laws of green chemistry, principles of green organic synthesis. 5.3 Green alternatives of organic synthesis: coenzyme catalysed reactions, green alternatives of molecular rearrangements, electrophilic aromatic substitution reactions, oxidation-reduction reactions, clay catalysed synthesis, condensation reactions. Green photochemical reactions. Microwave assisted organic synthesis. 5.4 Green chemistry in the pharmaceutical industry: Ibuprofen manufacture, biocatalysis.				
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	

SURFACE CHEMISTRY AND COLLOIDS	1	4.2 Spectroscopic techniques for probing solid surfaces		
	2	Temperature programmed desorption (TPD)		
	3	Reflection absorption infrared spectroscopy (RAIRS)		
	4	High resolution electron energy lossspectroscopy (HREELS).		
	5	4.3 Surface films -Introduction film pressure		
	7	criteria for spreading of one liquid on another		
	1st Internal Examination			
	8	**4.4 Adsorption from solutions**		
	9	Electrostatic adsorption, Gibbs adsorption isotherm (derivation) - verifications.	Power Point Presentation	
Unit IV	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	
	10	**4.5** Colloids &**Micellar systems**		
	11	Types of colloids, Electrical properties of colloids	Power Point Presentation	
	12	Electrical double layer, zeta potential	Power Point Presentation	
	13	Miscelles, and miscellisation		
	14	Structure of miscelles - ionic miscelles.	Group Discussion	
	2nd Internal Examination			
	15	➢ **5.1Laws of Photochemistry**:		
	16	Grothus –Draper Law, Stark-Einstein's Law, Laws of light absorption, Quantum yield. Chemical actinometry		
	17	➢ Excimers and exciplexes, photosensitization	Individual Assignment: Various intermolecular forces	
	18	chemiluminescence, bioluminescence, thermo luminescence		

Unit V	No. of Sessions	Session Topic and Discussion Theme	Value additions	
PHOTOCHEMISTRY	1	pulse radiolysis, hydrated electrons, photo stationary state, dimerization of anthracene.		
	2	**5.2Photo physical processes in electronically excited molecules**,		
	3	Jablonsky diagram		
	4	Fluorescence and Phosphorescence.		
	5	Quenching of fluorescence and its kinetics		
	7	Stern-Volmer equation, static and dynamic quenching.		
	1st Internal Examination			
	8	Concentration quenching,		
	9	E-type and P-type. Effect of temperature on emissions,	Power Point Presentation	
	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
	10	Two photon absorption spectroscopy		
	11	Principle of utilization of solar energy	Power Point Presentation	
	12	Solar cells and their working.	Power Point Presentation	
	13	Photochemistry of vision.		
	14	delayed fluorescence,	Group Discussion	
	2nd Internal Examination			
	15	Numericals		
	16	Revision		
	17	Revision	Individual Assignment: Various intermolecular forces	
	18	Revision		

Text Books

6. D.A. McQuarrie, J.D. Simon, Physiacl chemistry: A Molecular Approach, University Science Books,1997
8. K.K. Rohatgi-Mukherjee, Fundamentals of Photochemistry, 2nd Edn. New Age International, 1986.
9. G. Aruldhas, Molecular structure and Spectroscopy, PHI Learning, 2007.
10. M.R Wright, An Introduction to Chemical Kinetics, John Interscience-2007
11. A.W &Sons, Adamson, A.P. Gast, Physical chemistry of sufaces,6thEdn,John Wiley, 1997
12. D.O. Cowan ,R.L. Drisko , Elements of Organic Photochemistry, Plenum Press,.1976

Programme: **M Sc Chemistry**

Semester: III Course: **P3CHET12** Spectroscopic Methods In Chemistry

	Term – I (Before I Internal tests) – 30 % of the syllabus				
Sl No	Topic/Module	Hour/ session	Teacher/invited persons etc.	Method of teaching *	Remarks: Books, reference etc
1	**Unit 1: Drugs acting on ANS 1.1, 1.2, 1.3**	6 hrs	Dr Jorphin Joseph	Lecture ICT enabled	D.L. Pavia, G.M. Lampman, G.S. Kriz, Introduction to Spectroscopy
2	**Unit 2: Drugs acting on CVS**	6 hrs	Dr. Grace Thomas	Lecture ICT enabled	
3	**Unit 3: Chemotherapy 3.1, 3.2**	6 hrs	Midhun Dominic C D	Lecture ICT enabled	
4	**Unit 4: Antineoplastic Drugs**	6 hrs	Senju Devassykutty	Lecture	
5	**Unit 6: Miscellaneous class of compounds 6.1, 6.2**	6 hrs	June Cyriac	Lecture ICT enabled	

*ICT enabled, Lecture method (conventional)

	Term – II – 40 % of the syllabus (before the second Internal tests)				
Sl No	Topic/Module	Hour/ session	Teacher/invited persons etc.	Method of teaching *	Remarks: Books, reference etc
1	**Unit 1: Drugs acting on ANS 1.4, 1.5, 1.6**	6 hrs	Dr Jorphin Joseph	Lecture ICT enabled	W. Kemp, Organic Spectroscopy, 2nd Edn
2		6 hrs	Dr. Grace Thomas	Lecture ICT enabled	

3	**Unit 3: Chemotherapy** **3.3, 3.4**	6 hrs	Midhun Dominic C D	Lecture ICT enabled	
4		6 hrs	Senju Devassykutty	Lecture	
5	**Unit 6: Miscellaneous class of compounds** **6-3, 6.4, 6.5**	6 hrs	June Cyriac	Lecture ICT enabled	

	Term – III – 30 % of the syllabus (before the model examination)				
Sl No	Topic/Module	Hour/ session	Teacher/invited persons etc.	Method of teaching *	Remarks: Books, reference etc
1	**Unit 1: Drugs acting on ANS**	6 hrs	Dr Jorphin Joseph	Lecture ICT enabled	R.M. Silverstein, G.C. Bassler, T.C. Morril, Spectroscopic Identification of Organic Compounds, 5th Edn.,
2		6 hrs	Dr. Grace Thomas	Lecture ICT enabled	
3	**Unit 3: Chemotherapy** **3.5**	6 hrs	Midhun Dominic C D	Lecture ICT enabled	
4		6 hrs	Senju Devassykutty	Lecture	
5	**Unit 6: Miscellaneous class of compounds** **6.6, 6.7**	6 hrs	June Cyriac	Lecture ICT enabled	