

Sacred Heart College (Autonomous)

Department of Chemistry

MSc Applied Chemistry - Pharmaceutical

Course Plan

Academic Year 2014 – 15

Semester 3

Semester: Semester 3 Course: **CH3C09– Drug Design and Pharmacology**

Objectives

To enable the students

- To learn in detail drug design and pharmacology
- To have a thorough idea on application of drugs and their mechanism of action
- To understand the functions of enzymes, receptors , proteins and nucleic acids as drug targets
- To study the biotransformation of drugs

Session	Topic/Module	Hour	Teacher/invited persons etc.	Method of teaching *	COs
Session 1	General Principles of Drug Therapy. Relationship between chemical structure,	18 Hrs	Dr. Grace Thomas	Lecture	
Session 2	lipid solubility and biological activity of drugs. Stereochemistry and biological activity.				
Session 3	Drug action-receptor theories.				
Session 4	Drug metabolism–different pathways.				

Session 5	Drug design: various factors of drug design, rational drug design.				
Session 6	Methods of lead discovery: optimisation of the lead,				
Session 7	natural and synthetic sources of lead compounds.				
Session 8	Bioisosterism.				
Session 9	Prodrug and soft drug concept. Drug synthesis.				
Session 10	Combinatorial synthesis (basic concepts).				
Session 11	Retrosynthetic analysis of benzocaine,				
Session 12	saccharin, salbutamol and benzodiazepines.				
Session 13	Basic concepts of CADD,				
Session 14					

Session 15	molecular modeling,				
Session 16	molecular docking.				
Session 17	QSAR physicochemical parameters,				
Session 18	introduction to 2D 3D Introduction to 2D 3D				
	Pharmacology				
Session 19	General principles of pharmacology:	6 Hrs	Dr Grace Thomas	Lecture	
Session 20	biological response to drugs, passage of drugs across membranes.				
Session 21	Pharmacokinetic principles: absorption,				
Session 22	distribution, metabolism and excretion of drugs.				
Session 23	Dose of drugs and routes of administration.				
Session 24	Pharmacodynamic principles: dose response relationships, mechanism of drug action, unusual and adverse responses of drugs,				
Session 25	structurally specific and nonspecific drugs. Ferguson's principle Drug interactions-synergism, antagonism, drug addiction and drug dependence, drug tolerance, drug hypersensitivity.				
Session 26					

	Metallic compounds used in pharmaceutical chemistry			Lecture	
Session 27	Calcium lactate, calcium gluconate,	9 Hrs	Dr. Rmakrishna n		
Session 28	iron gluconate, iron fumerate, ferric ammonium citrate,				
Session 29	ferrous sulphate, aluminium hydroxide gel,				
Session 30	calamin, zinc oxide, zinc stearate,				
Session 31	magnesium stearate, talc,				
Session 32	yellow mercuric oxide, trivalent and pentavalent antomonials,				
Session 33	selenium sulfide, lithium salts, gold,				
Session 34	platinum and bismuth compounds.				
Session 35	Metal toxicity - cadmium, lead, copper and mercury				

SI No	Topic/Module	Hour/ session	Teacher/inv ited persons etc.	Method of teaching *	Remarks: Books, reference etc
	Drugs acting on CNS				
Session 36	General anaesthetics. Inhalation anaesthetics - ether,	12Hrs	Dr. IGA	Lecture	
Session 37	enflurane, halothane, nitrous oxide, cyclopropane. Intravenous anaesthetics - thiopentone sodium, ketamine.				
Session 38	Hypnotics, sedatives and anxiolytic agents.				
Session 39	Anxiolytic agents-benzodiazepines, buspirone and meprobamate.				
Session 40	Anticonvulsants: convulsions, types of epilepsy, barbiturates-hydantoins, oxazolidinediones, succinimides and benzodiazepines.				
Session 41	Analeptics: xanthines, amphetamines, nikethamide and ethamivan.				

Session 42	Centrally acting muscle relaxants: glyceryl ethers-mephenesin, alkane diol derivatives-meprobamate, benzodiazepines-librium, diazepam and baclofen.				
Session 43	Antiparkinson's agents: dopamine agonists, dopamine releasing agents and synthetic anticholinergics.				
Session 44	Drugs for Alzheimer's disease: cholinergic agonists and acetylcholine esterase inhibitors.				
Session 45	Synthesis of the following drugs - Enflurane, Ketamine, Etomidate, Phenobarbital, Diazepam, Chlordiazepoxide, Meprobamate, Buspirone, Ethinamide, Nikethamide, Ethamivan, Trimethadione, Ethosuximide, Denzimol, Topiramate, Mephenesin, Levodopa, Besiperidine and Tacrine.				

	Analgesics				
Session 46	Narcotic analgesics - morphine and its analogues, phenyl(ethyl) piperidines,	9 Hrs	Midhun Dominic	Lecture	
Session 47	diphenyl heptanones and benzocaine derivatives.				
Session 48	Antipyretics and NSAIDs: Basic idea of COX I & I inhibitors, salicylates aspirin, p-aminophenol derivatives-paracetamol, phenacetin,				
Session 49	pyrazolidinediones phenyl butazone, oxyphenbutazone, anthranilic acid derivatives-				
Session 50	mefanamic acid, flufenamic acid, indoleacetic acid derivatives-indomethacin, arylacetic/propionic acid derivatives(ibuprofen, ketoprofen,				
Session 51	flubiprofen and diclofenac), oxicams(piroxicam and tenoxicam).				
Session 52	5.3 Drugs used for gout - allopurinol, selective COX II inhibitors				
Session 53	Synthesis of the following drugs-levorphanol, pethidine, methadone,				
Session 54					

	phenyl butazone, flufenamic acid, diclofenac, piroxicam, allopurinol and celicoxib.				

References

01. G. Patrick, Medicinal Chemistry, BIOS. 2001.
02. T. Nogrady, D.F. Weaver, Medicinal Chemistry, Oxford University Press, 2005.
03. W.O. Foye, T.L. Lemke, D.A. Williams, Principles of Medicinal Chemistry, 4thEdn., Williams & Wilkins, 1995.
04. J.P. Remington, Remington's Pharmaceutical Sciences, Vol.13, , 19th Edn., Mack,1990.
05. D. Sriram , P. Yogeswari, Medicinal Chemistry, Pearson Education India, 2010.
06. K. D. Tripathi, Essentials of Medical Pharmacology, 6th Edn.,Jaypee, 2008
07. L.S. Goodman, A. Gillman, The Pharmacological Basis of Therapeutics, 10thEdn., McGraw Hill, 2001.
08. S.S. Kadam, Principles of Medicinal Chemistry, Vol.I& II, Pragati Books, 2008.
09. A. Kar, Medicinal Chemistry, New Age International, 2007.

10. C.O. Wilson, J.M. Beale, J.H. Block, Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th Edn., Lippincott Williams and Wilkins, 2010

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	:	<i>M.Sc. Applied Chemistry - Pharmaceutical</i>	LECTURE HOURS	:	72
SEMESTER	:	3	CREDITS	:	4
SUBJECT TITLE	:	<i>Organic Syntheses</i>	SUBJECT CODE	:	<i>CH3C10</i>
COURSE TEACHERS	:	<i>Dr. V.S. Sebastian (VSS) ; Dr. Franklin J (FJ) ; Dr. Grace Thomas (GT) ; Dr. Ignatious Abraham (IGA); Dr. June Cyriac (JUC)</i>			
Instructional Hours	:				

GT	No. of Session	Session Topic and Discussion Theme	Value additions		
<i>UNIT 1 : Organic Synthesis via Oxidation and Reduction</i> (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	<ul style="list-style-type: none"> ❖ 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. I. L. Finar, <i>Organic Chemistry</i> - 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 - LiAlH ₄ ,.		
	17	DIBAL-H, Red-Al, NaBH ₄ and NaCNBH ₃ , selectrides		
	18	trialkylsilanes and trialkylstannane. Meerwein-Ponndorf-Verley reduction. Baker's yeast		
SECOND INTERNAL EXAMINATION				
Text Books	<ul style="list-style-type: none"> ❖ 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. L. Finar, <i>Organic Chemistry</i> - Volume I & II - Pearson Education. 			

FJ

<i>Unit II</i>	No. of Sessions	Session Topic and Discussion Theme	Value additions		
<i>Modern Synthetic Methods and Reagents (18 Hours)</i>	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	Gilman reagent.			
	2nd Internal Examination				
	17	Introduction to multicomponent reactions			
18	Click reaction				
End Semester Examination					

<i>Text Books</i>	<ul style="list-style-type: none"> ❖ 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., Chapman and Hall, 1993. ❖ V.K. Ahluwalia, L.S. Kumar, S. Kumar, Chemistry of Natural Products, CRS 				
JUC					
<i>Unit III</i>	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.			
	1st 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				

<i>Text Books</i>	<ul style="list-style-type: none"> ❖ 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.
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VSS				
<i>Unit IV</i>	No. of Sessions	Session Topic and Discussion Theme	Value additions	
<i>Protecting group Chemistry (9 Hours)</i>	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				
<i>Text Books</i>	<ul style="list-style-type: none"> ❖ 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 2014-15				
PROGRAMME	:	<i>M.Sc. Applied Chemistry - Pharmaceutical</i>	LECTURE HOURS	: 72
SEMESTER	:	3	CREDITS	: 4
SUBJECT TITLE	:	<i>Physical Chemistry</i>	SUBJECT CODE	: CH3C11
COURSE TEACHERS	:	<i>Dr Jorphin Joseph, Dr Jinu George, Dr Ignatious Abrhaham, Dr Abi T G</i>		
COURSE OBJECTIVES	:	To understand the basic concepts in Surface Chemistry, Electrochemistry, Photochemistry and Chemical Kinetics		

IGA				
Unit V	No. of Sessions	Session Topic and Discussion Theme	Value additions	
Retrosynthetic Analysis (9 Hours)	1	Basic principles and terminology of retrosynthesis: 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		
	1st 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	<ul style="list-style-type: none"> ❖ 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.

Instructional Hours

: *4 HOURS/WEEK*

	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	Comparison of the two theories.	Assignment	
	4	Thermodynamic formulation of the two theories.		
	5	Thermodynamic formulation of the reaction rates.		
	6	Significance of ΔG^* , ΔH^* and ΔS^* . 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, 3 rd Edn. 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.		
<p>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.</p>				
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 loss spectroscopy (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	➤ 5.1 Laws 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			

<i>Unit V</i>	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, Physical chemistry: A Molecular Approach, University Science Books, 1997			
	8.	K.K. Rohatgi-Mukherjee, Fundamentals of Photochemistry, 2 nd Edn. New Age International, 1986.			
	9.	G. Aruldas, 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 surfaces, 6 th Edn, John Wiley, 1997			
	12.	D.O. Cowan, R.L. Drisko, Elements of Organic Photochemistry, Plenum Press., 1976			

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Programme: **M Sc Applied Chemistry - Pharmaceutical**

Semester: III

Course: **CH3C12 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, 2 nd 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, 5 th 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	