



SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR CHHATTISGARH
BACHELOR OF PHARMACY SEMESTER IV

SCHEME OF TEACHING AND EXAMINATION

Table-I: Course of study for semester IV

Sr. No.	Subject Code	Name of the Course with PCI code	Internal assessment				Teaching hours per week				End semester exams			Total Marks
			TA	Sessional exams			L	T	P	Credit	Marks	Duration		
				CT	Duration	Total								
1	BPH401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
2	BPH402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
3	BPH403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
4	BPH404T	Pharmacology 0.I – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
5	BPH405T	Pharmacognosy and Phytochemistry I– Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
6	BPH402P	Medicinal Chemistry I – Practical	5	10	4 Hr	15			4	2	35	15	4 Hrs	50
7	BPH403P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15			4	2	35	15	4 Hrs	50
8	BPH404P	Pharmacology I – Practical	5	10	4 Hrs	15			4	2	35	15	4 Hrs	50
9	BPH405P	Pharmacognosy and Phytochemistry I – Practical	5	10	4 Hrs	15			4	2	35	15	4 Hrs	50
			70	115	21 Hrs	185	Total 28			515	185	31 Hrs	700	

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B. PHARMACY SEMESTER IV SYLLABUS

Course Title	Pharmaceutical Organic Chemistry III– Theory				
Course Code	BPH401T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Details	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	NIL				
Course objectives	At the end of the course, the student shall be able to 1. understand the methods of preparation and properties of organic compounds 2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions 3. know the medicinal uses and other applications of organic compounds				
Course Contents	Note: To emphasize on definition, types, mechanisms, examples, uses/applications UNIT-I 10 Hours Stereo isomerism Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute				

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	UNIT-II	10 Hours
	Geometrical isomerism Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions	
	UNIT-III	10 Hours
	Heterocyclic compounds: Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene – Relative aromaticity, reactivity and Basicity of pyrrole, Furan, Thiophene.	
	UNIT-IV	8 Hours
	Synthesis, reactions and medicinal uses of following compounds/derivatives <ul style="list-style-type: none">• Pyrazole, Imidazole, Oxazole and Thiazole.• Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	
	UNIT-V	07 Hours
	Reactions of synthetic importance Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.	

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	Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation.
Course outcomes	
Text and References	Recommended Books (Latest Editions) 1. Organic chemistry by I.L. Finar, Volume-I & II. 2. A text book of organic chemistry – Arun Bahl, B.S. Bahl. 3. Heterocyclic Chemistry by Raj K. Bansal 4. Organic Chemistry by Morrison and Boyd 5. Heterocyclic Chemistry by T.L. Gilchrist

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Course Title	Medicinal Chemistry I – Theory				
Course Code	BPH402T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Details	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	NIL				
Course objectives	<p>Upon completion of the course the student shall be able to</p> <ol style="list-style-type: none"> 1. understand the chemistry of drugs with respect to their pharmacological activity 2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs 3. know the Structural Activity Relationship (SAR) of different class of drugs 4. write the chemical synthesis of some drugs 				
Course Contents	<p>Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)</p> <p align="center">UNIT- I 10 Hours</p> <p>Introduction to Medicinal Chemistry History and development of medicinal chemistry Physicochemical properties in relation to biological action Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.</p> <p>Drug metabolism Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.</p>				

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	UNIT- II	10 Hours
	<p>Drugs acting on Autonomic Nervous System</p> <p>Adrenergic Neurotransmitters:</p> <p>Biosynthesis and catabolism of catecholamine.</p> <p>Adrenergic receptors (Alpha & Beta) and their distribution.</p> <p>Sympathomimetic agents: SAR of Sympathomimetic agents</p> <p>Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.</p> <ul style="list-style-type: none">• Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.• Agents with mixed mechanism: Ephedrine, Metaraminol. <p>Adrenergic Antagonists:</p> <p>Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.</p> <p>Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.</p>	
	UNIT-III	10 Hours
	<p>Cholinergic neurotransmitters:</p> <p>Biosynthesis and catabolism of acetylcholine.</p> <p>Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.</p>	

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Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isoflurophate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine Hydrochloride.

08 Hours

UNIT- IV

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital,

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Secobarbital

Miscellaneous:

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazines: SAR of Phenothiazines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterphenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital. **Hydantoins:** Phenytoin*, Mephentyoin, Ethotoin **Oxazolindione diones:**

Trimethadione, Paramethadione

Succinimides: Phensuximide, Methsuximide, Ethosuximide* **Urea and monoacylureas:** Phenacemide, Carbamazepine*

Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate

UNIT – V

07 Hours

Drugs acting on Central Nervous System

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	<p>General anesthetics:</p> <p>Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.</p> <p>Ultra short acting barbiturates: Methohexital sodium*, Thiomytal sodium, Thiopental sodium.</p> <p>Dissociative anesthetics: Ketamine hydrochloride.*</p> <p>Narcotic and non-narcotic analgesics</p> <p>Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.</p> <p>Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.</p> <p>Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.</p>
Course outcomes	
Text and References	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none">1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.2. Foye's Principles of Medicinal Chemistry.3. Burger's Medicinal Chemistry, Vol I to IV.4. Introduction to principles of drug design- Smith and Williams.5. Remington's Pharmaceutical Sciences.6. Martindale's extra pharmacopoeia.7. Organic Chemistry by I.L. Finar, Vol. II.8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.

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	<p>9. Indian Pharmacopoeia.</p> <p>10. Text book of practical organic chemistry- A.I.Vogel.</p>
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Course Title	Physical Pharmaceutics II – Theory				
Course Code	BPH403T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Details	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	NIL				
Course objectives	<p>Upon the completion of the course student shall be able to</p> <ol style="list-style-type: none"> 1. Understand various physicochemical properties of drug molecules in the designing the dosage form 2. Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation 3. Demonstrate use of physicochemical properties in evaluation of dosage forms. 4. Appreciate physicochemical properties of drug molecules in formulation research and Development 				
Course Contents	<p style="text-align: right;">UNIT-I 10 Hours</p> <p>Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.</p> <p style="text-align: right;">UNIT-II 10 Hours</p> <p>Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatants, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers</p> <p>Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus</p> <p style="text-align: right;">UNIT-III 10 Hours</p>				

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	<p>Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Physical stability of emulsions, preservation of emulsions, rheological properties of emulsions, phase equilibria and emulsion formulation.</p> <p style="text-align: center;">UNIT-IV 08 Hours</p> <p>Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.</p> <p style="text-align: center;">UNIT-V 07 Hours</p> <p>Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention</p>
Course outcomes	
Text and References	<p>Recommended Books: (Latest Editions)</p> <ol style="list-style-type: none">1. Physical Pharmacy by Alfred Martin, Sixth edition2. Experimental pharmaceutics by Eugene, Parott.3. Tutorial pharmacy by Cooper and Gunn.4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

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Course Title	Pharmacology I – Theory				
Course Code	BPH405P	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Details	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	NIL				
Course objectives	<p>Upon completion of this course the student should be able to</p> <ol style="list-style-type: none"> 1. Understand the pharmacological actions of different categories of drugs 2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels. 3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases. 4. Observe the effect of drugs on animals by simulated experiments 5. Appreciate correlation of pharmacology with other bio medical sciences 				
Course Contents	UNIT-I				08 hours
	General Pharmacology				
	a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.				
	b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination				
	UNIT-II				12 Hours
	General Pharmacology				

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- a. **Pharmacodynamics**- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
- b. Adverse drug reactions.
- c. Drug interactions (pharmacokinetic and pharmacodynamic)
- d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III

10 Hours

2. Pharmacology of drug acting on peripheral nervous system

- a. Organization and function of ANS.
- b. Neurohumoral transmission,co-transmission and classification of neurotransmitters.
- c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
- d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
- e. Local anesthetic agents.
- f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV

08 Hours

3. Pharmacology of central nervous system

- a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
- b. General anesthetics and pre-anesthetics.
- c. Sedatives, hypnotics and centrally acting muscle relaxants.
- d. Anti-epileptics

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	<p>e. Alcohols and disulfiram</p> <p style="text-align: center;">UNIT-V</p> <p>3. Pharmacology of drug acting on central nervous system</p> <p>a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.</p> <p>b. Drugs used in Parkinsons disease and Alzheimer's disease.</p> <p>c. CNS stimulants and nootropics.</p> <p>d. Opioid analgesics and antagonists</p> <p>e. Drug addiction, drug abuse, tolerance and dependence.</p> <p style="text-align: right;">07 Hours</p>
Course outcomes	
Text and References	<p>Recommended Books (Latest Editions)</p> <p>1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier</p> <p>2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill</p> <p>3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics</p> <p>4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins</p> <p>5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology</p> <p>6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.</p> <p>7.Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher</p> <p>8.Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,</p> <p>9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.</p>

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	10.Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
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Course Title	Pharmacognosy and Phytochemistry I– Theory				
Course Code	BPH405T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Details	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	NIL				
Course objectives	<p>Upon completion of the course, the student shall be able</p> <ol style="list-style-type: none"> 1. to know the techniques in the cultivation and production of crude drugs 2. to know the crude drugs, their uses and chemical nature 3. know the evaluation techniques for the herbal drugs 4. to carry out the microscopic and morphological evaluation of crude drugs 				
Course Contents	UNIT-I				10 Hours
	<p>Introduction to Pharmacognosy: (a) Definition, history, scope and development of Pharmacognosy (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilage's, oleoresins and oleo-gum -resins).</p> <p>Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs</p> <p>Quality control of Drugs of Natural Origin: Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.</p> <p>Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.</p>				

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	UNIT-II	10 Hours
	<p>Cultivation, Collection, Processing and storage of drugs of natural origin: Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants</p> <p>Conservation of medicinal plants</p>	
	UNIT-III	07 Hours
	<p>Plant tissue culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines</p>	
	UNIT IV	10 Hours
	<p>Pharmacognosy in various systems of medicine: Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.</p> <p>Introduction to secondary metabolites: Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins</p>	
	UNIT V	08 Hours
	<p>Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs</p> <p>Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens</p> <p>Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage,</p>	

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	<p>therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: Carbohydrates: Acacia, Agar, Tragacanth, Honey Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources</p>
Course outcomes	
Text and References	<p>Recommended Books: (Latest Editions)</p> <ol style="list-style-type: none">1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.3. Text Book of Pharmacognosy by T.E. Wallis4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.6. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 20078. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae.9. Anatomy of Crude Drugs by M.A. Iyengar

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Course Title	Medicinal Chemistry I – Practical				
Course Code	BPH402P			Total Practical periods : 04 Hrs / week	
Course Credits	L	T	P	Details	Total marks in the end semester : 35
			4	2	
Prerequisites	NIL				
Course objectives					
Course Contents	I				
	Preparation of drugs/ intermediates				
	1. 3-pyrazole				
	2. 1,3-oxazole				
	3. Benzimidazole				
	4. Benztriazole				
	5. 2,3- diphenyl quinoxaline				
	6. Benzocaine				
	7. Phenytoin				
	8. Phenothiazine				
9. Barbiturate					

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	<p style="text-align: center;">II</p> <p>Assay of drugs</p> <ol style="list-style-type: none">1. Chlorpromazine2. Phenobarbitone3. Atropine4. Ibuprofen5. Aspirin6. Furosemid <p style="text-align: center;">III</p> <p>Determination of Partition coefficient for any two drugs</p>
Course outcomes	
Text and References	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none">1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.2. Foye's Principles of Medicinal Chemistry.3. Burger's Medicinal Chemistry, Vol I to IV.4. Introduction to principles of drug design- Smith and Williams.5. Remington's Pharmaceutical Sciences.6. Martindale's extra pharmacopoeia.7. Organic Chemistry by I.L. Finar, Vol. II.8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.9. Indian Pharmacopoeia.10. Text book of practical organic chemistry- A.I.Vogel.

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Course Title	Physical Pharmaceutics II – Practical				
Course Code	BPH403P			Total Practical periods : 04 Hrs / week	
Course Credits	L	T	P	Details	Total marks in the end semester : 35
			4	2	
Prerequisites	NIL				
Course objectives					
Course Contents	<ol style="list-style-type: none">1. Determination of surface tension of given liquids by drop count and drop weight method2. Determination of HLB number of a surfactant by saponification method3. Determination of Freundlich and Langmuir constants using activated char coal4. Determination of critical micellar concentration of surfactants5. Determination of viscosity of liquid using Ostwald's viscometer6. Determination sedimentation volume with effect of different suspending agent7. Determination sedimentation volume with effect of different concentration of single suspending agent8. Determination of viscosity of semisolid by using Brookfield viscometer9. Determination of reaction rate constant first order.10. Determination of reaction rate constant second order11. Accelerated stability studies				
Course outcomes					
Text and References	Recommended Books: (Latest Editions) <ol style="list-style-type: none">1. Physical Pharmacy by Alfred Martin, Sixth edition				

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| | <ol style="list-style-type: none">2. Experimental pharmaceutics by Eugene, Parott.3. Tutorial pharmacy by Cooper and Gunn.4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.7. Physical Pharmaceutics by Ramasamy C, and Manavalan R. |
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Course Title	Pharmacology I – Practical				
Course Code	BPH404P			Total Practical periods : 04 Hrs / week	
Course Credits	L	T	P	Details	Total marks in the end semester : 35
			4	2	
Prerequisites	NIL				
Course objectives					
Course Contents	<ol style="list-style-type: none">1. Introduction to experimental pharmacology.2. Commonly used instruments in experimental pharmacology.3. Study of common laboratory animals.4. Maintenance of laboratory animals as per CPCSEA guidelines.5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.6. Study of different routes of drugs administration in mice/rats.7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.8. Effect of drugs on ciliary motility of frog oesophagus9. Effect of drugs on rabbit eye.10. Effects of skeletal muscle relaxants using rota-rod apparatus.11. Effect of drugs on locomotor activity using actophotometer.12. Anticonvulsant effect of drugs by MES and PTZ method.13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.14. Study of anxiolytic activity of drugs using rats/mice.15. Study of local anesthetics by different methods <p style="text-align: center;"><i>Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by</i></p>				

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	<i>softwares and videos</i>
Course outcomes	
Text and References	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none">1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

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Course Title	Pharmacognosy and Phytochemistry I – Practical				
Course Code	BPH405P		Total Practical periods : 04 Hrs / week		
Course Credits	L	T	P	Details	Total marks in the end semester : 35
			4	2	
Prerequisites	NIL				
Course objectives					
Course Contents	<ol style="list-style-type: none">1. Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil2. Determination of stomatal number and index3. Determination of vein islet number, vein islet termination and palisade ratio.4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer5. Determination of Fiber length and width6. Determination of number of starch grains by Lycopodium spore method7. Determination of Ash value8. Determination of Extractive values of crude drugs9. Determination of moisture content of crude drugs10. Determination of swelling index and foaming				
Course outcomes					
Text and References	<p>Recommended Books: (Latest Editions)</p> <ol style="list-style-type: none">1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.3. Text Book of Pharmacognosy by T.E. Wallis4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.6. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 20078. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae <p>Anatomy of Crude Drugs by M.A. Iyengar</p>				

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