

# GANPAT UNIVERSITY

## FACULTY OF PHARMACY

### TEACHING AND EXAMINATION SCHEME

Programme	Bachelor of Pharmacy	Branch/Spec.	B.Pharm.																
Semester	III																		
Effective from Academic Year	2016-17	Effective for the batch Admitted in												June 2015					
Subject Code	Subject Name	Teaching scheme												Examination scheme (Marks)					
		Credit						Hours (per week)						Theory			Practical		
		Lecture(DT)			Practical (Lab.)			Lecture(DT)			Practical(Lab.)			CE	SEE	Total	CE	SEE	Total
		L	TU	Total	P	TW	Total	L	TU	Total	P	TW	Total						
BPH3A1	Physical Pharmacy-II	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH3A2	Pharmaceutical Engineering-II	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH3A3	Pharmaceutical Analysis-I	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH3A4	Organic Chemistry-I	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH3A5	Pharmacognosy-I	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
<b>Total</b>		15	-	15	10	10	15	-	15	15	5	20	200	300	500	200	300	500	

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Programme		Bachelor of Pharmacy			Branch/Spec.		B.Pharm.		
Semester		III			Version		2.0.0.0		
Effective from Academic Year			2016-17		Effective for the batch Admitted in			June 2015	
Subject code		BPH3A1	Subject Name		<b>Physical Pharmacy-II</b>				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	2		2	Theory	40	60	100
Hours	3	-	3	1	4	Practical	40	60	100
Pre-requisites:									
Nil									
Learning Outcome:									
<ul style="list-style-type: none"> <li>By the end of this course, the student will have a good understanding of the basic concepts of electrolytes, kinetics, complexation, dissolution, diffusion and polymer science in various field of pharmacy.</li> </ul>									
Theory syllabus									
Unit	Content								Hrs
1	Solutions of Non electrolytes Concentration expressions, equivalent weights, ideal and real solutions, colligative properties, molecular weight determination								05
2	Solutions of electrolytes Properties of solutions of electrolytes, Arrhenius theory of electrolytic dissociation, theory of strong electrolytes, coefficients for expressing colligative properties								05
3	Reaction Kinetics Significance of reaction kinetics, rates and orders of reactions, calculations for rate constant, half-life and shelf life, influence of temperature and other factors on reaction rates, decompositions and stabilization of medicinal agents, photo degradation, ICH guidelines for stability study, accelerated and stress testing								10
4	Complexation and protein binding Types of complexes – Inclusion complexes, metal complexes, organic molecular complexes techniques for characterization of complexes and their application in protein binding								07
5	Polymer science Classification and fabrication technology, characterization of polymers, pharmaceutical applications of polymers in DDS and packing, polymers in drug delivery systems- cellulose derivatives								08
6	Dissolution and diffusion Objectives of dissolution and diffusion, theories and mechanism of dissolution and drug release, factors affecting dissolution and drug release, dissolution media and procedure Steady state diffusion, diffusion through membranes, procedure and apparatus for accessing drug diffusion, diffusion in close system and system with one open boundary								10
Practical content									
Practicals demonstrating any theoretical aspects of above topics shall be carried out.									
Text Books									
1	Martin's Physical Pharmacy and Pharmaceutical Sciences by Patrick J. Sinko, 6th ed., Lippincott Williams & Wilkins, New York, 2010.								

2	Cooper and Gunn's Tutorial Pharmacy, edited by Carter, S. J., 6th ed., CBS Publishers and Distributors, New Delhi, 2000.
3	Bentley's textbook of Pharmaceutics by Rawlins, E.A., 8 <sup>th</sup> ed., Elsevier Pvt. Ltd., 2010.
Reference Books	
1	Aulton's Pharmaceutics: The Design and Manufacture of Medicines, by Aulton, Michael E., 3 <sup>rd</sup> ed., Churchill Livingstone, London, 2007
2	Remington: The Science and Practice of Pharmacy Remington by Remington, 21th ed., Lippincott. W.W., Philadelphia, 2009.
3	Physicochemical Principles of Pharmacy, 3rd ed., Florence, A. T. Atwood, D. Macmillan Press Ltd., London, 1998.
4	Ansel's Pharmaceutical Dosage forms and Drug delivery systems by Allen, Loyd V., 9th ed., Walter Kluwer (India) Pvt. Ltd., New Delhi, 2009.

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Semester		III				Version		2.0.0.0	
Effective from Academic Year			2016-17			Effective for the batch Admitted in			June 2015
Subject code		BPH3A2		Subject Name		<b>Pharmaceutical Engineering-II</b>			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	2		2	Theory	40	60	100
Hours	3	-	3	1	4	Practical	40	60	100
Pre-requisites:									
Nil									
Learning Outcome:									
<ul style="list-style-type: none"> <li>Students understand appropriate methods for different types of operations used in pharmaceutical industry.</li> <li>By the end of this course, the students will have good understanding of the basic concepts of clarification and purification of solid and liquid raw materials in pharmacy.</li> </ul>									
Theory syllabus									
Unit	Content								Hrs
1	Content uniformity Importance of content uniformity means of achieving content uniformity, sampling techniques, statistical treatment, requirements of regulatory agencies, (FDA, USP and European Pharmacopoeia).								07
2	Powder flow Importance of flow in pharmacy, factors influencing powder/granules flow (moisture, particle size, etc.), determination of angle of repose (AR), Hausner ratio (HR), Carr's compressibility index (CI), sample calculations (examples), pharmacopoeial specifications for AR, HR and CI								07
3	Control charts and its applications in pharmacy Elements, functions, types and applications of control charts in pharmacy								06
4	Extrusion and Pelletization Definition, importance and factors affecting extrusion and pelletization, excipients and equipments in extrusion and pelletization, characterization and pharmaceutical applications of extrusion and pelletization, marketed formulations.								10
5	Reactors Introduction to reactors, objectives, types of reactors, factors and parameters for reactor design.								05
6	Industrial Hazard & Safety Precaution Mechanical, chemical, electrical, fire and dust hazards, parameters for safety.								05
7	Waste Management Introduction to waste, precaution for pollution control, method for management of solid, liquid and gaseous waste.								05
Practical content									
Practicals related to topics in pharmaceutical engineering theory shall be carried out.									
Text Books									
1	Cooper and Gunn's Tutorial Pharmacy, edited by Carter, S. J., 6th ed., CBS Publishers &								

	Distributors, New Delhi, 2000.
2	The Theory and Practice of Industrial Pharmacy by Lachman Leon, 3 <sup>rd</sup> ed., CBS Publishers & Distributors, New Delhi, 2009
Reference Books	
1	Perry's Chemical Engineer's Handbook by Robert H Perry 8 <sup>th</sup> ed. McGraw – Hill Inc., New Delhi, 2007.
2	Aulton's Pharmaceutics: The Design and Manufacture of Medicines, by Aulton, Michael E., 3 <sup>rd</sup> ed., Churchill Livingstone, London, 2007.
3	Remington: The science and practice of pharmacy Remington by Remington, 21 <sup>th</sup> ed., Lippincott W.W., Philadelphia, 2009.
4	Pharmacopoeia : I.P., U. S. P., B. P., E.P



- Acid-base titrations: Simple, back titrations, titrations of mixtures like NaOH + Na<sub>2</sub>CO<sub>3</sub>, borax + boric acid.
- Redox titrations: Simple, iodometry, cerimetry, 2,6-dichlorophenol-indophenol titrations, mixtures like Fe<sup>+2</sup> + Fe<sup>+3</sup>, oxalic acid + sodium oxalate.
- Complexometric titrations: Replacement, back titrations.
- Nonaqueous titrations, Argentometric titrations, Gravimetric assay of one pharmacopoeial drug.
- Calibrations/cleaning of glasswares and checking precision and lower limit of quantitation of titrimetric method.

#### Text Books

1	Practical Pharmaceutical Chemistry, Vol. I & II by Backett, A. H., 1st ed., CBS Publishers & Distributors, New Delhi, 1997.
2	Fundamentals of Analytical Chemistry by Skoog, Douglas A., 8th ed., Harcourt College Publishers, 2004
3	Text Book of Pharmaceutical Analysis by K. A. Connor, 3rd ed., John Willey & Sons, Delhi, 2009.

#### Reference Books

1	Pharmacopoeia: USP, B.P., I.P.
2	Quantitative chemical analysis by Vogel A. I., 6th ed., Pearson Education, 2000
3	Quantitative Chemical Analysis by Gilbert H. Ayres, 2nd Ed. Harper & Row, Ltd, New York, 1968

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Semester	III				Version	2.0.0.0			
Effective from Academic Year	2016-17				Effective for the batch Admitted in	June 2015			
Subject code	BPH3A4		Subject Name		<b>Organic Chemistry-I</b>				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	3	-	2		2	Theory	40	60	100
Hours	3	-	3	1	4	Practical	40	60	100
Pre-requisites:									
Nil									
Learning Outcome:									
<ul style="list-style-type: none"> <li>By the end of this course, the students shall have good understanding of the basic concepts of Organic Chemistry with reaction mechanisms.</li> <li>Students shall be able to describe preparation and reaction of organic compounds.</li> <li>The course may help the students in understanding novel approaches in synthesis.</li> </ul>									
Theory syllabus									
Unit	Content							Hrs	
1	Structure and Properties: Introduction to organic chemistry, quantitative analysis of elements, determination of molecular weight and molecular formula, Atomic structure, atomic orbitals, wave equation, molecular orbital theory, molecular orbitals, bonding and antibonding orbitals							12	
2	Chemical bonding and Properties: Introduction, covalent bond, hybridization and hybrid orbitals, intermolecular and intramolecular forces, bond dissociation energy, electronegativity, polarity of bonds, polarity of molecules, resonance, hyperconjugation, acids and bases							12	
3	Reactive intermediates of carbon: Carbocation, carbanion, free radical, carbenes, nitrenes and nitrinium ions, reaction involving these intermediates							4	
4	Structure, properties, nomenclature, preparation and reactions of the following class of functional groups Alkanes, alkenes, alkynes, dienes, cycloalkanes, alkyl halides, alcohols, ethers, epoxides.							10	
5	Electrocyclic, Cycloaddition and Sigmatropic reactions							3	
6	Introduction to Nanochemistry, Microwave synthesis and green chemistry.							4	
Practical content									
<ul style="list-style-type: none"> <li>Systematic qualitative analysis of organic compounds and preparation of their derivative such as Benzoic acid, acetanilide, alpha naphthol, para toludene, naphthalene, anthracene, resourcinol etc.</li> <li>Synthesis of important medicinal agents based on reaction mechanism such as nitration, sulfonation, halogenation, esterification etc.</li> <li>Following compounds shall be synthesized. Acetanilide, P-nitro acetanilide, Phthalimide etc.</li> </ul>									
Text Books									
1	Organic Chemistry, Robert T. Morrison and Robert N. Boyd, 6th ed., PH I Learning Pvt. Ltd., New Delhi, 2008								
2	Organic Chemistry, Vol I and II by I. L. Finar, 6th ed., Pearson Education, New Delhi, 2000								
Reference Books									
1	Advanced Organic Chemistry, Jerry March, 4th ed., Wiley India, 2007								





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Semester	III				Version	2.0.0.0			
Effective from Academic Year	2016-17				Effective for the batch Admitted in	June 2015			
Subject code	BPH3A5		Subject Name		<b>Pharmacognosy- I</b>				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	3	-	2		2	Theory	40	60	100
Hours	3	-	3	1	4	Practical	40	60	100
Pre-requisites:									
Nil									
Learning Outcome:									
<ul style="list-style-type: none"> <li>• Student will able to understand the basic principle of Pharmacognosy, sources, morphology, histology, cultivation practices and physicochemical properties of crude drugs and their constituents.</li> <li>• Students get acquainted with sources, chemistry, identification tests and important uses of crude drugs having pharmaceutical and commercial significance.</li> </ul>									
Theory syllabus									
Unit	Content							Hrs	
1	Definition, history, scope and development of Pharmacognosy. Sources of drugs: Plant, biological, marine, mineral, plant tissue culture -as source of drugs.							03	
2	Classification of crude drugs: Alphabetical, Morphological, Taxonomical, Chemical, Chemotaxonomical and Pharmacological.							03	
3	Definition, types, morphology and examples of different types of seeds, roots, stems, leaves, barks, woods, flowers and fruits. Modification of root and stem. Histology of dicot and monocot root, stem and leaf.							06	
4	Cultivation, collection, processing and storage of crude drugs. Different methods of cultivation, Factors influencing cultivation of medicinal plants. Different types of soils, fertilizers of common use. Different methods of pest control, insecticides and pesticides commonly used including natural pesticides. Plant hormones and their applications. Polyploidy, mutation and Hybridization with reference to medicinal plants.							08	
5	An introduction to active constituents of crude drugs. General physicochemical properties and identification tests of these constituents.							03	
6	General definitions, classification and physicochemical properties of carbohydrates. Systemic pharmacognostic study of Carbohydrates and derived products such as Agar, Guar gum, Honey, Isabgol, Pectin, Acacia, Starch, Sterculia, Tragacanth, Xanthan, chitin, carrageenan and Sodium alginate.							09	
7	General definitions, classification and physicochemical properties of lipids. Systemic pharmacognostic study of Lipids such as Beeswax, castor oil, coca butter, cod liver oil, hydnocarpus oil, sesame oil, wool fat, kokum butter, lard, linseed oil, rice bran oil and shark liver oil.							08	
8	Systemic pharmacognostic study of fibers used in pharmaceuticals such as cotton, silk, wool, nylon etc.							02	
9	Systemic pharmacognostic study of pharmaceutical aids like talc, diatomite, gelatin, bentonite, Kaoline etc.							03	

Practical content	
<ul style="list-style-type: none"> <li>• Morphological study of different plant parts indicated in theory.</li> <li>• Microscopy of monocot and dicot root, stem and leaf.</li> <li>• Identification testes of crude drugs belonging to carbohydrates, lipids and fibres.</li> <li>• Preparation of herbarium sheets.</li> </ul>	
Text Books	
1	Pharmacognosy; C. K. Kokate, A. P. Purohit, S. B. Gokhale; Nirali prakashan, Pune; 39 <sup>th</sup> Edition; 2007.
2	A Text book of pharmacognosy: C. S. Shah, J. S. Quadry, B. S. Shah Prakashan, Ahmedabad, 13 <sup>th</sup> revised edition, 2007-08.
3	Textbook of Pharmacognosy: T.E. Wallis, CBS Publishers and Distributors, New Delhi, 5 <sup>th</sup> Edition, reprinted, 2003.
4	Textbook of Pharmacognosy and Phytochemistry, Biren Shah and A K. Seth, Elsevier Publication, 1 <sup>st</sup> Edition, 2010.
Reference Books	
1	Pharmacognosy: V. E. Tyler, L. R. Brady, J. E. Habbers, Lea and Febiger Philadelphia, 9 <sup>th</sup> edition, 1988.
2	Trease and Evan's Pharmacognosy; W. C. Evans; W. B. Saunders Co., Singapore; 15 <sup>th</sup> Edition; 2008.
3	Botany for degree students: A. C. Dutta, Calcutta Oxford University Press, New Delhi, 6 <sup>th</sup> Edition, 2002.