

GANPAT UNIVERSITY

FACULTY OF PHARMACY

TEACHING AND EXAMINATION SCHEME

Programme	Bachelor of Pharmacy	Branch/Spec.	B.Pharm.																
Semester	II																		
Effective from Academic Year	2015-16	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
BPH2A1	Pharmaceutical Unit Operation□II	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH2A2	Physical Pharmacy□I	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH2A3	Pharmaceutical Inorganic Chemistry	3	-	3	2	2	3	-	3	3	1	4	40	60	100	40	60	100	
BPH2A4	Anatomy Physiology and Health Education□II	4	-	4	2	2	4	-	4	3	1	4	40	60	100	40	60	100	
BPH2B5	Biostatistics and Computer Applications	2	-	2	2	2	2	-	2	3	1	4	40	60	100	40	60	100	
Total		15	-	15	10	10	15	-	15	15	5	20	200	300	500	200	300	500	

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FACULTY OF PHARMACY									
Programme	Bachelor of Pharmacy				Branch/Spec.	B.Pharm.			
Semester	II				Version	2.0.0.0			
Effective from Academic Year	2015-16				Effective for the batch Admitted in	June 2015			
Subject code	BPH2A1		Subject Name		Pharmaceutical Unit Operations II				
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"> Students able to understand principle, construction, working and applications of equipments used for various unit operations in manufacturing of drugs/dosage forms. 									
Theory syllabus									
Unit	Content							Hrs	
1	Size Reduction Objectives, theory of size reduction, factors influencing size reduction, energy requirements in size reduction, study of various mills including ball mill, hammer mill, fluid energy mill, colloid mill, cutter mill, etc., application of size reduction in pharmacy.							08	
2	Size Separation Principles of size separation, screens- types, pharmacopoeial standards, screening methods, screening equipments including shaking and vibrating screens, gyratory screens, sedimentation tank, elutriation and cyclone type separators etc. Application of size separation in pharmacy.							08	
3	Mixing Theory of mixing, mixing mechanisms, solid – solid, solid – liquid and liquid – liquid mixing equipments. Importance of content uniformity in mixing.							08	
4	Crystallization Objectives, crystal lattice, types of crystal, crystal form, size and habit, formation of crystals, super saturation theory, factors affecting crystallization process, crystal growth. Study of various types of crystallizers including Swenson walker, tanks, circulating magma, vaccum and crystal cooling crystallizer, etc. Spherical crystallization and its application in pharmacy, Brief introduction of co-crystals, polymorphism and amorphous forms of drugs.							10	
5	Extraction Principle, theory, types of extraction, solvents used for extraction, leaching and extraction equipments, small scale and large scale extraction methods, special extraction techniques, rotary evaporator for extraction, application in pharmaceutical industry.							06	
6	Automated Process Control Systems Temperature, pressure, vacuum, flow level and their measurements. Elements of automatic process control systems, levels of automation, control systems.							05	
Practical content									
Practicals related to topics in theory shall be carried out such as size reduction, size separation, mixing demixing, crystallization, polymorphs, extraction, demonstration of Soxhlet extraction, industrial hazard and safety.									
Text Books									

1	Tutorial Pharmacy by Cooper & Gunn, ed. S.J.Carter, CBS Publishers & Distributors, Delhi, 6 th Edition, 2000.
2	Unit Operations of Chemical Engineering, 5th edition – McCabe, Smith & Harriott, McGraw – Hill Inc., New York, 2001.
3	The Theory & Practice of Industrial Pharmacy – Lachman L., Lieberman H.A. & Kanjig J.L., 3rd edition, 1990. Varghese Publishing House, Bombay.
4	Pharmaceutics II (Unit Operations) by G. K. Jani, B. S. Shah Prakashan, Ahmedabad, 2002.
Reference Books	
1	Elementary Chemical Engineering - Max S. Peters, Published by McGraw Hill Book Company, New York, 1954.
2	Perry's Chemical Engineer's Handbook - Robert H Perry, Green D.W., Maloney J.O. 7 th Edition, McGraw – Hill Inc., New York, 1998.
3	Pharmaceutics the Science of Dosage Form Design; M.E. Aulton; Churchill Livingstone, London, 2002.
4	Alfonso G. Remington: The Science & Practice of Pharmacy. Vol. I & II. Lippincott, Williams & Wilkins Philadelphia, 2005.
5	Introduction to Chemical Engineering, W. L. Badger and J. T. Banchemo, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.

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Programme	Bachelor of Pharmacy				Branch/Spec.	B.Pharm.			
Semester	II				Version	2.0.0.0			
Effective from Academic Year	2015-16				Effective for the batch Admitted in	June 2015			
Subject code	BPH2A2		Subject Name		Physical Pharmacy I				
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"> By the end of this course, the students able to understand the basic concepts of derived properties and measurements of powders, rheological properties of liquids and mixing of materials in various field of pharmacy. Students able to know the methods of preparation of different buffer solutions and complexation of polymers and drug materials. 									
Theory syllabus									
Unit	Content							Hrs	
1	States of Matter: Introduction, binding forces between molecules, states of matter-solids, liquids, gases, liquid crystals, glassy state, phase equilibrium & phase rule, condensed systems.							05	
2	Buffers: Buffer equation, buffer capacity, buffers in pharmaceuticals systems, preparation, stability, buffered, isotonic solutions, tonicity calculations & methods of adjusting isotonicity.							03	
3	Solubility and Distribution Phenomenon: General principles, solvent-solute interactions, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, distribution of solutes between immiscible solvents.							06	
4	Surface and Interfacial phenomenon: Liquid interface, adsorption at liquid interfaces, adsorption at solid interface, applications of surface active agents, electrical properties of interfaces.							06	
5	Disperse systems : Colloidal dispersions: Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy. Suspensions and Emulsions: Interfacial properties of suspended particles/globules, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicle, rheological considerations, emulsions: types, theories, physical stability.							10	
6	Micromeritics: Particle size and distribution, methods for determining particle size, particle shape and surface area, methods for determining surface area, permeability, adsorption, derived properties of powders (angle of repose, carr's index and hausner ratio) porosity, packing arrangement, densities, bulkiness and flow properties.							08	
7	Viscosity and Rheology: Newtonian system, kinematic viscosity, effect of temperature on viscosity, Non-Newtonian systems, thixotropy in formulation, determination of rheological properties, Determination of viscosity: capillary, falling ball, rotational viscometers, rheopexy,							07	

	negative thixotropy, applications in pharmacy.	
Practical content		
<p>Practicals related to topics covered in theory shall be carried out. Experiments on application of phase rule, two component systems, estimation of buffer capacity, experiments on tonicity adjustment, solubility determination of solids, determination of surface / interfacial tension, HLB value and CMC of surfactants, estimation of partition coefficient, determination of viscosity using different viscometers, demonstration of Brookfield viscometer, determination particle size and surface area, derived properties of powder. Study on polymorphs, their identification & properties. Determination of sedimentation parameters for suspensions and emulsions, etc.</p>		
Text Books		
1	Martin's Physical pharmacy by Patrick J. Sinko, 5th edition, Lippincott Williams & Wilkins, New York, 2006.	
2	Pharmaceutical Dosage Forms and Drug Delivery Systems, Ansel, Howard. C., Allen, Loyd V., Popovich, Nicholas G. Lippincott Williams & Wilkins, New York, 2002.	
3	Cooper and Gunn's Tutorial Pharmacy, ed. Carter, S. J., 6th edition, CBS Publishers & Distributors, Delhi, 2000.	
4	Bentley's Textbook of Pharmaceutics; Rawlins E A; AITBS Pub & Dist Delhi, 2004.	
Reference Books		
1	Encyclopedia of Pharmaceutical Technology, James Swarbrick, 3rd Ed. Informa Healthcare, 2007.	
2	Remington: The Science and Practice of Pharmacy, Vol-I & II, 20th edition, Gennaro, Alfonso R., Lippincott Williams & Wilkins, New York, 2002.	
3	Physicochemical Principles of Pharmacy, 3rd edition, Florence, A. T. Atwood, D. Macmillan Press Ltd., London 1998.	
4	Pharmaceutics: The Science of Dosage Form Design, 2nd edition, Aulton, Michael E., Churchill Livingstone, London, 2002.	

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Programme	Bachelor of Pharmacy				Branch/Spec.	B.Pharm.			
Semester	II				Version	2.0.0.0			
Effective from Academic Year	2015-16				Effective for the batch Admitted in	June 2015			
Subject code	BPH2A3		Subject Name		Pharmaceutical Inorganic Chemistry				
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"> The course will help the student to have a good understanding of the history and basic concepts of medicinal inorganic chemistry. Students become familiar with pharmacopoeia and pharmacopoeial monograph. Students will able to study the method of manufacturing, physical/chemical properties, assay, storage and uses of important inorganic substances as pharmaceutical aids, therapeutic agents, radioactive substance and diagnostic agents. 									
Theory syllabus									
Unit	Content							Hrs	
1	Introduction to inorganic chemistry and pharmacopoeia							02	
2	Impurities in Pharmaceuticals: Sources of impurities and methods to control, tests for purity and identity, limit tests for iron, arsenic, lead, heavy metals, chloride, sulphate.							04	
3	An outline of method of preparation, uses, special tests if any, of the following class of inorganic pharmaceuticals included in the current pharmacopoeia:								
	<ul style="list-style-type: none"> Acids, Bases, buffers and water. 							05	
	<ul style="list-style-type: none"> Gastrointestinal agents: Acidifying agents, Antacids, Protective and Adsorbents, Cathartics. 							05	
	<ul style="list-style-type: none"> Major intra and extra-cellular electrolytes: physiological ions, electrolytes used for replacement therapy, acids-base balance and combination therapy. 							04	
	<ul style="list-style-type: none"> Essential and trace elements: Transition elements and their compounds of pharmaceutical importance: Iron and haematinics, mineral supplements. 							03	
	<ul style="list-style-type: none"> Topical agents: Protective, Astringents and Anti-infectives. 							04	
	<ul style="list-style-type: none"> Gases and Vapors: Oxygen, Anesthetics and Respiratory Stimulants 							02	
	<ul style="list-style-type: none"> Dental products: Dentifrices, Anti-caries agents. 							02	
	<ul style="list-style-type: none"> Complexing and Chelating agents used in therapy 							02	
	<ul style="list-style-type: none"> Miscellaneous medicinal agents: Sclerosing agents, Expectorants, Emetics, Poisons and Anti-dotes, Sedatives and Hypnotics etc. 							04	
	<ul style="list-style-type: none"> Pharmaceutical Aids: Anti-oxidants, Preservatives, Filter aids, Adsorbents, Diluents 							04	
4	Inorganic radio pharmaceuticals: Nuclear radiopharmaceuticals, reactions, nomenclature, methods of obtaining their standards and units of activity, measurements of activity, clinical applications and dosage, hazards and precautions.							04	
Practical content									
<ul style="list-style-type: none"> Systematic qualitative analysis of inorganic mixture of up to 4 radicals. 									

- All identification tests for pharmacopoeial inorganic pharmaceuticals and qualitative tests for cations and anions should be covered.
- Limit tests for Cl^- , SO_4^{2-} , Iron and arsenic along with a few modifications.
- Volumetric analysis of few important compounds covered in theory.

Text Books

1	Practical Pharmaceutical Chemistry Vol. I edited by A.H. Beckett & J.B. Stenlake, CBS Publishers, New Delhi, 4 th Edition, 1986.
2	Inorganic Pharmaceutical Chemistry (Practical) by Dhake&Belsare; 2nd Edition.
3	Inorganic Medicinal and Pharmaceutical Chemistry : J. H. Block, E. B. Roche, T. O. Soine, C. O. Wilson, Varghese Publishing House, Indian edition
4	Pharmaceutical inorganic chemistry by G.R. Chatwal, volume-I, Himalaya Publishing house, Bombay.
5	Pharmaceutical Chemistry – I by A. V. Kasture and S. G. Vadodkar, 25 th Edition, NiraliPrakashan, Pune, 2008.

Reference Books

1	Bentley and Driver's Textbook of Pharmaceutical Chemistry: Revised by L. M. Atherden, 8 th Edition, Oxford University Press, London, 1969.
2	The Indian Pharmacopoeia, 6 th Edition, Controller of Publications – the Indian Pharmacopoeia Commission, Gaziabad, 2010.
3	Vogel's Qualitative Inorganic Analysis Revised by G. Svehla, 7 th Edition, Longman Group Ltd., London, 1996
4	A textbook of quantitative inorganic chemistry by A. I. Vogel, 3 rd Edition, The language book society, Longman, London.

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Programme	Bachelor of Pharmacy				Branch/Spec.	B.Pharm.			
Semester	II				Version	2.0.0.0			
Effective from Academic Year	2015-16				Effective for the batch Admitted in	June 2015			
Subject code	BPH2A4		Subject Name		Anatomy Physiology and Health Education-II				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	4	-	2		2	Theory	40	60	100
Hours	4	-	3	1	4	Practical	40	60	100
Pre-requisites:									
Nil									
Learning Outcome:									
<ul style="list-style-type: none"> • Adequate knowledge and scientific information regarding basic principles of Anatomy and Physiology. Adequate knowledge of practical aspects of urine analysis and different systems. • Upon completion of this course students should be able to distinct normal and abnormal functioning of human body. • At the end of semester students able to perform urine analysis experiments and interpret their results. 									
Theory syllabus									
Unit	Content							Hrs	
1	Cardiovascular System: Anatomy and physiology of the heart, Circulatory system including Arterial and Venous system with special reference to the names and positions of main arteries and veins, Properties of Cardiac muscle, Electrocardiogram (ECG), Blood pressure and its regulation, Coronary circulation, Basic understanding of Cardiac cycle and Heart sounds, Renin Angiotensin system and its significance, Cardiac output, Brief introduction to cardiovascular disorders like hypertension, congestive heart failure, cardiac arrhythmia, atherosclerosis, myocardial infarction.							12	
2	Respiratory System: Anatomy and physiology of Respiratory organs, Lung volumes and capacities, gas laws in reference to exchange of oxygen and carbon dioxide, external and internal respiration including transport of oxygen and carbon dioxide, control and regulation of respiration, Brief overview of measuring lung functions i.e. respiratory volumes, Vital capacity, Respiratory disorders i.e. hypoxia, asthma, emphysema, COPD, chronic bronchitis, pulmonary edema, severe acute respiratory syndrome.							07	
3	Nervous System: Structure, function and organization of nervous system, histology of nervous tissue, resting membrane potential, graded potential, propagation of nerve impulses, signal transmission at synapse, Post synaptic potentials (EPSP,IPSP) and their summation, Brief overview of types of neurotransmitter and nervous disorders: multiple sclerosis, epilepsy. Anatomy of spinal cord (External, Internal), Protective structures of Spinal cord and nerves, names and functions of spinal nerves, physiology of spinal cord, sensory and motor tracts, reflexes and reflex arcs, brief outline of meningitis and poliomyelitis. Major parts and protective coverings of brain, blood brain barrier, CSF, brain waves, cranial nerves names and functions, brief outline of cerebrovascular accident, transient ischemic attack, Alzheimer's disease, Dementia, Encephalitis, Attention Deficit Hyperactivity Disorder Comparison of somatic and autonomic nervous system, Anatomy of autonomic motor pathways. Synthesis, release and removal of neurotransmitters (e.g. Acetylcholine, Nor adrenaline), Physiology of the ANS, comparisons of sympathetic and parasympathetic divisions							18	

	of ANS.	
4	Special Senses: Sensory modalities, Process of sensation, sensory receptors, somatic sensation, somatic sensory and motor pathways, Brief outline of Parkinson's disease, Amyotropic lateral sclerosis. Anatomy of eye, ear, taste buds and papillae and physiology of vision, hearing, olfaction and gustation. Brief outline of cataract, glaucoma, deafness, meniere's disease, otitis media.	06
5	Reproductive System: Gross Anatomy of male reproductive system and their functions, sperm and spermatogenesis. Gross Anatomy of Female reproductive system and their functions, Ovum and Oogenesis, Physiology of Menstruation, Family planning, various contraceptive methods, Medical termination of pregnancy (Abortion), brief outline of erectile dysfunction (Impotence), Premenstrual syndrome, Male and female infertility, endometriosis, Benign prostatic hyperplasia.	07
6	Health Education a. Concepts of health & disease, disease causing agents and prevention of disease b. Classification of food requirements, balanced diet, nutritional deficiency disorders their treatment and prevention specifications for drinking water c. Demography and family planning: Demography cycle, family planning various contraceptive methods, medical termination of pregnancy d. Brief outline of communicable disease their causative agents, mode of transmissions and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, hepatitis, cholera, typhoid, food poisoning, helmenthiasis, malaria, filarasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhoea and AIDS) e. First Aid: Emergency treatment of shock, snake bites, burns, poisoning, fractures, resuscitation methods.	10
Practical content		
<ul style="list-style-type: none"> • Biochemical analysis of urine: physical characteristics, normal constituents, abnormal constituents. • Study with the help of charts and models of the anatomy of following systems: heart, arterial system, venous system, respiratory system, male and female reproductive system, eye and ear, nervous system. • Histology of various organs of above mentioned systems. • Determination of body temperature, pulse rate, blood pressure, listening to heart sounds, demonstration of ECG. • Determination of lung volumes and vital capacity. • Study of reflexes, vision and hearing capacity. 		
Text Books		
1	Derasari and Gandhi's Elements of Human Anatomy, Physiology & Health Education Eds R. K. Goyal et al. (B.S. Shah Prakashan, Ahmedabad).	
2	Goyal R.K. et al.: Practical Anatomy Physiology and Biochemistry (B.S. Shah Prakashan, Ahmedabad).	
3	Health Education by Ashok K. Gupta.	
4	Health Education & Community Pharmacy by P.C. Dandiya.	
5	Health Education by N.S. Parmar.	
Reference Books		
1	William J. Larsen: Anatomy – Development, function, Clinical Correlations– Saunders (Elsevier Science).	
2	Guyton A.C. and Hall J.E.: Textbook of Medical Physiology – 11 th Edition– W.B. Saunders, Philadelphia.	
3	Tortora G.J. and Bryan Derrickson, Principles of Anatomy and Physiology, 12 th Edition, John Willey & Sons, USA	
4	Waugh A. and Grant A.: Ross and Wilson's Anatomy and Physiology in Health & illness, 9 th Edition- Churchill Livingstone.	
5	West, J.B. Best and Taylor's physiological Basis of Medical Practice (Williams and Wilkins, Baltimore).	

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Semester	II				Version	2.0.0.0			
Effective from Academic Year	2015-16				Effective for the batch Admitted in	June 2015			
Subject code	BPH2B5		Subject Name		Biostatistics and Computer Applications				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	2	-	2		2	Theory	40	60	100
Hours	2	-	3	1	4	Practical	40	60	100
Pre-requisites:									
Nil									
Learning Outcome:									
<ul style="list-style-type: none"> • Skills of statistical analysis applicable in the pharmaceutical research. • Ability to analyze data through the application of appropriate statistical methods and make justifiable conclusions. • Acquainting latest developments of computer applications 									
Theory syllabus									
Unit	Content							Hrs	
1	Descriptive Statistics Population and Sample collection, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts. Measures of central tendency: computation of means, median and mode from grouped and ungrouped data. Measure of dispersion: computation of variance, standard deviation, standard error and their coefficients.							04	
2	Measures of Correlation and Regression Correlation, Types of Correlation, Methods for finding correlation: Scatter Diagram Method, Karl Pearson's correlation co-efficient method, Spearman's Rank Correlation co-efficient, Regression Analysis, Regression co-efficients, Lines of regressions, Properties of regression co-efficient.							04	
3	Statistical Inference and Testing of Hypothesis Null Hypothesis, Alternative Hypothesis, Test of Hypothesis, Type-I and Type-II Errors, Level of Significance, Degree of Freedom, One Tail and two tail test, Small Sample Test : Student's t-test, F-Test, Chi square test for Goodness of Fit, Independence of two Attributes, Homogeneity, One way and Two way Analysis of Variance (ANOVA):							05	
4	Non Parametric Test Run test for randomness, Wald-Wolfowitz Two Sample Run Test, Median Test for two samples, Signed test for matched pairs, Wilcoxon Signed Rank Test for matched pairs, Kolmogorov-Smirnov test.							02	
5	DOS and Windows Terminology MS-DOS, Introduction and need, MS-DOS operating system, Internal Commands, External Commands, batch files, MS Windows, Introduction to other operating systems							02	
6	MS Word, MS Excel and MS Power point MS Word: Addition, Inserting, Deleting, Formatting, Opening, Saving, Protecting, Managing and Printing Document. MS Excel: Introduction, Calculation in Excel, Statistical Functions in Excel, Drawing Graphs, Working with Data, Pivot tables and charts. MS Power point: Introduction to toolbar, design, template, animation, short keys, attachments,							09	

	hyperlink, end notes, and other important aspects.	
7	Data Analysis using MS Excel such as graphs, statistical functions and tools	04
Practical content		
Practicals related to topics in theory shall be carried out such as creating, editing, formatting of MS Word, MS Excel and MS Power point files, MS DOS internal and external commands, Statistical functions using MS Excel like t test, F test, ANOVA etc. Performing exercise on various statistical applications of pharmaceutical research, Exploring internets for pharmaceutical research and reviews.		
Text Books		
1	Basic Biostatistics for Pharmacy – Prin. G.C. Patel, Published by AtulPrakashan, Ahmedabad.	
2	Statistics in the Pharmaceutical Industry - Buncher, Marcel Dekker, New York.	
3	Introduction to Biostatics and Computer science -Y. I. Shah, Dr. A. R. Paradkar, and M. G. Dhaygude, Nirali Prakashan, Pune.	
4	Methods of Biostatics for Medical and Research students - B. K. Mahajan, Jaypee brothers medical publishers (P) Ltd., New Delhi.	
5	Fundamentals of Applied statistics - S. C. Gupta, V. K. Kapoor, Sultan Chand and Sons Publishers, New Delhi.	
Reference Books		
1	Pharmaceuticals Statistics- Practical & Clinical Applications- Bolton, Marcel & Dekker, New York.	
2	Computer Applications in Pharmacy- William and Fassett.	